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ФАН ВА ТАЪЛИМ**

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ИЛИМ ҲӘМ ТӘЛИМ**

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FEATURES OF NUTRITION OF THE WOLF (*CANIS LUPUS LINNAEUS*, 1758) IN THE CONDITIONS OF THE SOUTHERN ARAL REGION

Kidirbayeva A.Yu., Davletmuratova V.B.

Karakalpak State University named after Berdakh

Summary: *The article discusses the features of wolf nutrition in the conditions of the South Aral Sea region. It has been established that in Ustyurt, mainly natural food predominates - 80%, and food resources of anthropogenic origin occupy about 20%. In the central part of the South Aral Sea region, 56% belongs to the fodder resources of anthropogenic origin, 44% belongs to fodder resources of natural origin.*

Key words: *nutrition, diet, population, territory, domestic animals, rodents, ungulates, birds.*

Introduction

Nutrition is one of the most important conditions in the life of mammals. The nature of nutrition is determined by the relationship of this species to the sources of essential nutrients and determines the position of this animal in biocenoses - natural groups of organisms (Barabash - Nikiforov, Formozov, 1963).

The food ration, first of all, depends on the food supply of the wolf's habitat. It has been established that the diet of the wolf includes both wild and domestic ungulates, including the tolai hare, rodents, reptiles and birds. In addition, their diet includes predatory mammals (fox, corsac, cats, jackals, dogs). With a lack of food, it obtains fish, insects, mollusks in small quantities, eats plants (loach, vegetables, cereals). According to our data, the wolf labilely uses food resources in all natural areas of its habitat.

Materials and methods

This work is based on data collected for the period from 2016 to 2021. in the South Aral Sea region on the example of the Republic of Karakalpakstan. Ground studies were carried out in accordance with the approved program for the study of the ecological characteristics of the wolf population. At the same time, field expeditionary trips were carried out on the territory of the regions of the Republic of Karakalpakstan.

The generally accepted methods were used: route accounting for mapping the territorial habitats of the wolf with the help of a survey and questioning; identification of individuals by measuring trace prints; analysis of excreta and prey residues; finding and examining lairs and burrows (Novikov, 1953, Priklonsky, 1983).

Field studies on the study of wolf ecology were carried out according to the generally accepted methodology of Novikov G.A. (1953). Determination of the age of animals was carried out according to the method of Klevezal G.A. (2007).

When studying the nutrition of the wolf, a caprological analysis of excrement was carried out in the laboratory. A survey of the population was also conducted about attacks by wolves on domestic animals and economic damage to farms in the studied regions of the Republic of Karakalpakstan.

Results and discussions

During the study, the frequency of occurrence of a certain type of food was recorded, that is, the qualitative composition of the diet was assessed. According to Palvaniyazov (1974), on the territory of Ustyurt, wild ungulates occupy an average of 41.0% in the annual diet of wolves: saiga antelope (*Saiga tatarica*) - 23.7%, goitered gazelle (*Gazella subgutturosa*) - 17.3%. The main object of hunting for wolves in Ustyurt are saigas and small mammals such as tolai hare (*Lepus tolai*), yellow ground squirrel (*Spermophilus fulvus*), large gerbil (*Rhombomys opimus*) and other rodents. Also,

according to his data, it was noted that gazelles, due to their low numbers, practically fell out of the wolf's diet.

As a result of our analysis of the qualitative composition of the food base of the wolf, it was found that in Ustyurt, mainly natural food predominates 80%, including saiga and gazelle, in some places wild boar, and food resources of anthropogenic origin occupy about 20% (Fig. 1. A).

Comparative analysis with the data of Palvaniyazov (1974) showed that there is a decrease in the consumption of wild ungulates due to a decrease in their numbers. The second place after ungulates in the diet of the wolf belongs to the tolai hare.

In the Southern Aral region, the abundance of the tolai hare is of significant importance for the wolf, since, according to the data of specialists (Palvaniyazov, 1974), it was noted that in the years of increased abundance of the hare, the number and fatness of the wolf are higher than in the years of the small number of the tolai hare.

During expeditionary trips over the years of research, we noted a large number of hares in the central part of the Southern Aral region. The wolf excrement found by us (N 43°15' 46, E 059° 19') also contained remains of hare hair. This is consistent with the data of Bibikov et al. (1985) on food specialization, which indicates that the occurrence of hares in wolf feces collected in Ustyurt is 12.4%, in spring -16%, in summer -4.6% and in autumn 16.4%. He also noted that in the years of the abundance of the hare - tolai (*Lepus tolai*), wolves less often pursue wild ungulates.

According to literature data (Palvaniyazov, 1974, 1990), with the advance to the South-Eastern part of the territory of Karakalpakstan, wild ungulates noticeably lose their priority in the diet of a predator, but domestic animals and small mammals become the main components of the diet. According to the results of our research, in the territory of the South Aral Sea region, this trend manifests itself not only in the direction from north to south, but also in the direction from west to east.

A quantitative analysis of the diet of the wolf in the Central part of the South Aral Sea region showed that the main share belongs to the food resources of anthropogenic origin (about 56%), and 44% to food of natural origin (Fig. 1. A, B).

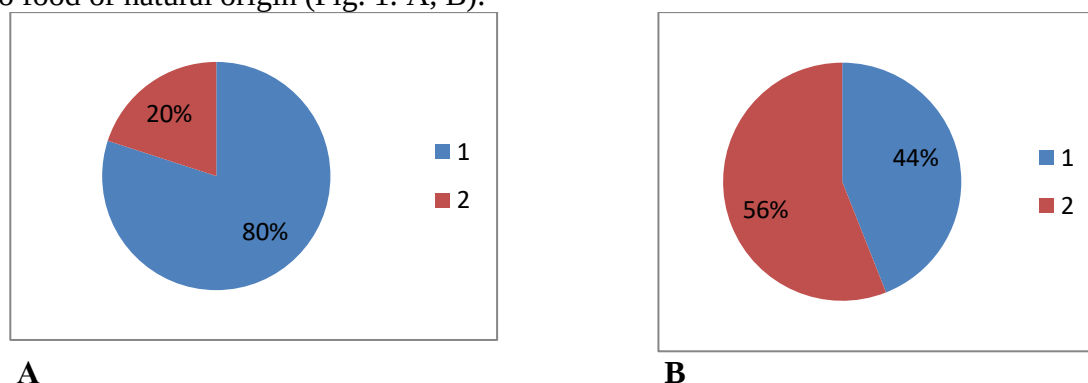


Fig. 1. Ratio (%) of natural (■ 1) and anthropogenic feeds (■ 2) in the diet of the wolf in different natural zones of the Southern Aral region

Note: A - Northern zone, B - Central zone

The main difference in the food specialization of different wolf populations in the South Aral Sea region concerns the ratio of the frequency of occurrence of a resource of anthropogenic and natural origin in the diet of a predator, while differences in the species composition of natural food are of secondary importance.

According to Bibikov D.I. et al. (1985), the main prey of the wolf from domestic animals is the following decreasing order: sheep, calves, foals, donkeys, cows, horses, dogs and poultry. [Certain](#) differences [in the range of nutrition of](#) flocks [and solitary](#) individuals [and torary](#) associations [of](#) pereyarks (last year's brood) were [also](#) established.

Basically, domestic ungulates in the diet of the wolf predominate in the Central part of the South Aral Sea region due to the intensive development of animal husbandry. According to

questionnaire survey data on the territory of Uchsay (Muynak district), a high frequency of occurrence of solitary wolves was established.

Solitary individuals prefer mostly small domestic animals (dogs, cats, goats, sheep, foals) as easier prey compared to wild ungulates, which require a partner to hunt. The diet of temporarily combined pereyarks (last year's brood) is dominated by domestic animals. Everywhere, wolves in the territories we studied eat mouse-like rodents. According to our observations and, according to the literature, rodents in terms of occurrence in the annual diet occupy the next place, which is 24% (Palvaniyazov, 1974). According to Bibikov et al. (1985), their occurrence in the diet usually ranges from 2–3 to 10%.

It is noted that the following types of rodents prevail in the diet of the Southern Aral region wolf: *Rhombomys opimus*, *Meriones erythrourus* Gray, *Meriones tamariscinus* Pall, *Meriones meridianus*, *Spermophilus fulvus*, *Spermophilus pygmaeus*, *Spermophilopsis leptodactylus*, *Pygeretmus platyurus*, *Nesokia indica*, *Ondatra zibethicus*, *Mus musculus* and *Ellobius talpinus*. Of the birds in his feed, there are larks (*Alauda arvensis*), field sparrow (*Passer montanus*). From reptiles - turtle, lizards and snakes, various beetles and locusts are eaten. Of the plants, green cereals, fruits of sucker and mulberry are often eaten. Occasionally, the wolf hunts the fox (*Vulpes vulpes*) - 0.9%, the corsac (*Vulpes corsac*) - 0.8%, the steppe polecat (*Mustela eversmani*) - 1.0% and the eared hedgehog (*Hemiechinus auritus*) - 0.9%. Of the ungulates in the diet of the wolf, adult wild boars (*Sus scrofa*) are of great importance - 8.1–14.5%, piglets - 2.6–35.5% (Palvaniyazov, 1974).

Thus, we note that throughout the study area of the Southern Aral Sea region, the list of wolf food varies according to the seasons of the year. However, in general, the predator's diet is similar, and the difference for each season is determined only by the range of local food resources available at a given time of the year.

In winter, wild ungulates and rodents predominate in the feed of the predator; it often attacks sheep and goats, birds and eats carrion. In spring, saiga antelope (*Saiga tatarica*), wild boar (*Sus scrofa*), tolai hare (*Lepus tolai*) are also of paramount importance in the wolf's diet in spring, but at this time it also hunts sheep. In summer, wolves gather in places with an accessible watering place, where flocks of sheep keep and saigas breed. At the same time, they especially often attack pregnant and prey on young individuals.

In autumn, in addition to ungulates, rodents and hares are often found in the food of this predator, the proportion of birds, reptiles and insects caught is noticeably reduced. The attack of wolves on wild ungulates becomes noticeably rarer during the years of mass reproduction of hares. In recent years, according to our observations and according to a survey of the population in the central part of the region, the number of hares is kept at a high level. And also in the excrement of the wolf, we found numerous remains of hares.

During the period of reproduction and rearing of young animals in the diet of the wolf, changes in food objects occur, the transition from large animals to small ones. This is due to several reasons:

1. Due to a sedentary lifestyle tied to a lair;
2. During the period of a non-herding lifestyle, there is a sharp decrease in the availability of large prey for single individuals;
3. During lactation and rearing of young animals, wolves need a variety of complete foods (rich in various microelements, minerals and vitamins), which are small animals and vegetation. The latter aspect is more characteristic not only of the wolf, but also of other terrestrial predators.

One of the important food sources of the wolf is carrion. The presence of carrion in the lands is associated with the natural death of various wild animals, with the creation of a food reserve by the predator himself during the period of excess prey and resulting from human activities.

As you know, at the end of winter and in spring, before the appearance of young animals in wild animals and the start of grazing, when the remains of animals that died during the winter begin to melt from under the snow, carrion is the most important food for the wolf. In addition to the accidental discovery of the corpses of dead animals, in which birds help the wolves, wolves repeatedly

visit the places of previous successful hunts and eat the remains abandoned by them during the period of abundance of food.

According to our observations and according to oral reports from the shepherds of the Kegeyli (Aspantay) and Chimbay (Shakaman) regions, the wolves living in their territory rarely feed on carrion due to the fact that there is an excess of food supply. In the northern part of Southern Aral Sea region on the territory of Ustyurt, in the conditions of jute and ice, carrion is also included in the diet of the wolf.

The daily diet of the wolf, according to various literary data, remains contradictory. Experts give the following examples: one pack (7–8 wolves) can eat the meat of a whole horse carcass, two wolves can eat a boar carcass weighing 30–40 kg at a time (Geptner, 1967).

According to our data and according to oral reports from the inhabitants of the farm "May 1" in Chimbay district, in August 2010, a pack of wolves (9 individuals) ate 2 donkeys (adults). Assumptions that hungry wolves can eat for future use are doubtful, however, hungry wolves can eat more than the usual daily allowance at one meal (Bibikov et al, 1985).

Wolves are the largest and most experienced hunters. When capturing a prey, they usually rip open stomach to get to the liver and other internal organs. According to the authors, "If they are really hungry, wolves will eat every organ—bones, skin, fur, whatever—and as fast as possible." If they usually eat well, they will first eat the internal organs and meat, and then the rest, and later come back for what is left. They will not eat the horns, very large bones or rows of teeth of an adult prey" (Mech, 2003).

Many scientists believe that wolves eat large amounts of wool and fur, which is confirmed by analysis of wolf feces. According to our data, during the study of the stomach of a wolf, shreds of wool, small ribs, pieces of meat of the victim were found on the territory of Aspantay. In general, the mass of the stomach, together with the contents, weighed 1 kg. The contents of the stomach separately amounted to 300 g.

Scientists have also noted that among wolves, cannibalism or eating their dead relatives is probably common. A wounded wolf always avoids his fellows and joins them when the wounds heal somewhat. During the rut, cannibalism in wolves is also possible in relation to perfectly healthy individuals. Sometimes there is cannibalism of the mother to the inferiorly developing puppies (Korytin, 1976). According to our observation and according to the survey data, the phenomenon of cannibalism in the region under study was not revealed.

Conclusions

Summarizing the above and according to our observations, the largest percentage of food resources of anthropogenic origin (domestic animals, cultivated plants, household waste) in the diet of a predator is inherent in the population in the zone of the Central part of the South Aral Sea region, where settlements are located, the smallest percentage refers to the Ustyurt wolf populations.

It has been established that domestic animals in the diet of wolves occupy a dominant position, which, apparently, is associated with the deterioration of the food supply of natural origin, including the drying up of most lakes and due to a change in the hydrological regime in the South Aral Sea region. This is confirmed by the fact that a large concentration of wolf packs is observed around the preserved small lakes, where the food ration is more stable.

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Rezyume: Maqolada Janubiy Orol dengizi mintaqasi sharoitida bo‘rilarning oziqlanish xususiyatlari ko‘rib chiqiladi. Aniqlanishicha, Ustyurtda asosan tabiiy oziq-ovqat mahsulotlari – 80%, antropogen oziq-ovqat resurslari esa 20%ga yaqinni egallaydi. Janubiy Orolbo‘yining markaziy qismida 56% antropogen, 44% tabiiy oziq resurslariga to‘g‘ri keladi.

Резюме: В статье рассматриваются особенности питания волков в условиях Южного Приаралья. Установлено, что на Устьурте преобладают преимущественно натуральные продукты питания – 80 %, а пищевые ресурсы антропогенного происхождения занимают около 20 %. В центральной части Южного Приаралья 56% приходится на кормовые ресурсы антропогенного происхождения, 44% – на кормовые ресурсы естественного происхождения.

Kalit so‘zlar: oziqlanishi, oziqlanishi, populyatsiyasi, hududi, uy hayvonlari, kemiruvchilar, tuyoqlilar, qushlar.

Резюме: питание, рацион, популяция, территория, домашние животные, грызуны, копытные, птицы.

UDK 569.32

**RESEARCH CONDUCTED ON *MICROTUS TRANSCASPICUS* IN THE AREA OF THE
LOWER AMUDARYA STATE BIOSPHERE RESERVE
(2020-2023)**

Matrasulov G.J.^{1,3}, Paluanova G.J.².

¹Karakalpak State University, ²Nukus State Pedagogical Institute, ³Lower Amudarya State Biosphere Reserve

Summary: *The article describes the materials of zoological research carried out in 2020-2023 on *Microtus transcaspicus*, a representative of the rodent family in the territory of the Lower Amudarya State Biosphere Reserve.*

Key words: *Lower Amudarya state biosphere reserve, reserve, wheat grove, Rodentia, *Microtus transcaspicus*, *Mus musculus*, *Nesokia indica* Gray.*

The Amudarya delta differs from Ustyurt and Kyzylkum in that it has a comfortable living climate [1.18]. In this delta, the Lower Amudarya state biosphere reserve, which is part of the protected natural areas of our Republic, is located in the Beruniy and Amudarya districts of the Republic of Karakalpakstan, and was established on the basis of the decision N 243 of the Cabinet of Ministers of the Republic of Uzbekistan dated August 26, 2011.

The territory of the Lower Amudarya State Biosphere Reserve consists of 68,717.8 hectares, which is located on land plots assigned to the Biosphere Reserve for permanent use, as well as on land plots of other legal entities and individuals within the borders of the State Biosphere Reserve.

In order to fulfill its goals and objectives, reserve, buffer and transition zones are allocated in the territory of the biosphere reserve.

- The reserve zone consists of 11,568.3 hectares, which is a strictly protected zone. This zone is intended for the complete preservation of natural objects and complexes, scientific research and monitoring.

- The buffer zone consists of 6731.4 hectares and is intended for preservation, reproduction and restoration of natural objects and complexes. Buffer zone lands are owned or used by land users, landowners, or tenants.

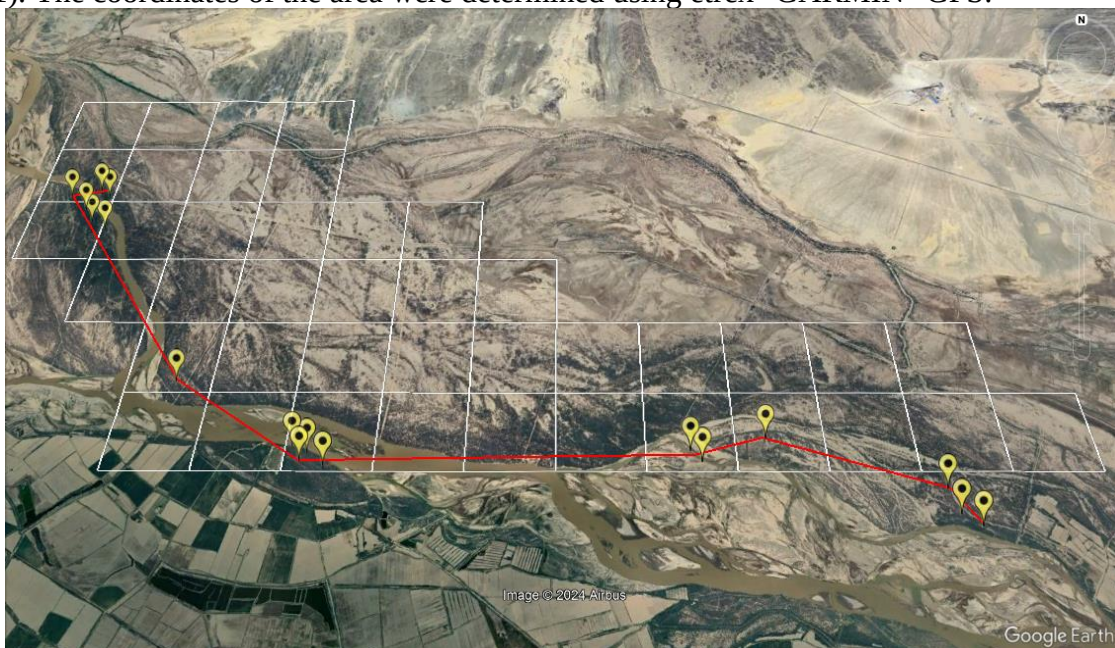
- The transition zone is 50418.1 hectares and it is intended for the implementation of economic or other activities that do not harm the natural objects and complexes of the biosphere reserve [4.191, 5.351].

In this protected natural area, species included in the Red Book of the Republic of Uzbekistan, as well as rare species included in the Red List of the International Union for Conservation of Nature, at the same time, all species found in wild nature are protected. However, the geographical distribution, bioecology, and importance of rodents in this area have not been fully studied. For this reason, a comprehensive study of representatives of the group of rodents in this area is of great scientific and practical importance.

This article includes the occurrence of *Microtus transcaspicus* in the Lower Amudarya State Biosphere Reserve in 2020-2023 and the results of bioecological studies. Generally accepted zoological, zoogeographic and biometric methods were used in scientific research work.

In the course of conducting scientific research, every year in the spring, summer, autumn and winter seasons of the Lower Amudarya State Biosphere Reserve "Baday Tugay" and Zhumurtov departments (in the 1-8 roundabouts and their quarters close to the river), the field depends on the observation regime. was carried out by the trap-line method, in field research N.A. Bobrinsky et al. (1965) [2.382] and G.A. The methods given in the source of Novikov (1953) [7.501] were used. Observation work was carried out on permanent routes suitable for the climatic conditions of the year, the length of the route was 14 km. During the years of research, it was found that *Microtus*

transcaspicus was found (photo-trapped, photographed and trapped) in total 17 places in this area (Fig. 1). The coordinates of the area were determined using etrex "GARMIN" GPS.



1-picture Areas where *Microtus transcaspicus* was identified from members of the Rodentia family in the Lower Amudarya State Biosphere Reserve (Google Earth Pro).

To date, a number of scientists have conducted zoological and ecological research in the Amudarya delta, including the Lower Amudarya State Biosphere Reserve and its surroundings (Lim, 1973, 1974, 1977; Asenov, 1999, 2019; Mambetullaeva 2019; Bekbergenova, 2016, 2018; Marmazinskaya 2012, 2014, 2017, 2018; Yeshchanova 2019, 2020, 2022; Matrasulov, 2019, 2021, 2022, 2023; et al.).

Zoologists noted that a total of 16 species of representatives of the rodentia family were registered in the Amudarya Delta reserve, including: 2 species of the mollusk family, 4 species each from the gerbil, gerbil, and gerbil families, and 2 species of the mouse family [5.351]. The fact that *Microtus transcaspicus* was found in a very small number in several such studies was also expressed in scientific sources.

Trans-Caspian field mouse (*Microtus transcaspicus* Satunini) lives in orchards, riverbanks, rice fields (Table 1, Fig. 2). They feed on leaves, stems, and eggs of aquatic plants such as reeds and reeds. Breeding occurs in April-May. Each birth gives birth to 1-7 children. It is found in the Amudarya delta in Karakalpakstan. In most cases, in the Amudarya delta, we can meet house mouse (*Mus musculus*) and flat-toothed rat (*Nesokia indica* Gray) in areas where living conditions are almost the same.

Table 1

Identification of the Caspian field mouse in the Lower Amudarya State Biosphere Reserve (2020-2023)

Species Name Years	Number ratio of <i>Microtus transcaspicus</i> by sex				
	Total	Sexually mature ♂	Sexually mature ♀	Sexually immature, young	Gender indeterminate
2020	8	1	3	1	3
2021	6	-	3	-	3
2022	16	2	3	3	8
2023	11	1	4	2	4
Overall	41	4	13	6	18

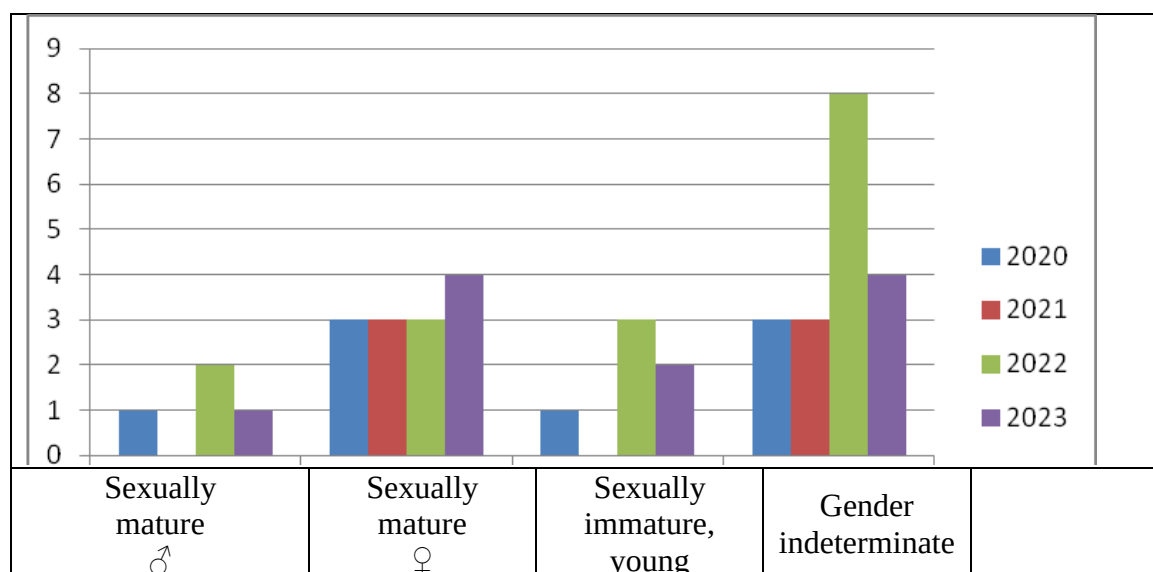


Figure 2. Number ratio of *Microtus transcaspicus* by sex

As can be seen from Table-1 and Figure 2, the ratio of the number of *Microtus transcaspicus* depending on the gender in the scientific research conducted in 2020 in different quarters of the Lower Amudarya State Biosphere Reserve, i.e. along the designated route (Figure 1), totaled 8 heads. In this case, it was determined that there was one adult male, three adult females, one juvenile, one young individual, and three individuals whose gender could not be determined.

During the research years, the lowest number, i.e. 6 heads, was detected in 2021. There are only 3 sexually mature females and 3 juvenile, young individuals.

In 2022, there will be more, that is, 16 heads, of which there are 2 heads of sexually mature males, 3 heads of sexually mature females, 3 heads of juveniles, young individuals, and 8 heads of which it is not possible to determine the sex.

In 2023, there were 11 heads, of which 1 was a sexually mature male, 4 were sexually mature females, 2 were juveniles, young individuals, and 4 were those whose gender could not be determined.

Those whose gender could not be determined were tabulated based on the numbers in the photos taken in the photo trap placed in places where there was constant active movement or taking pictures during the observations.

In conclusion, there is very little research on this species in our area, and water shortages and droughts caused by climate change have a negative impact on the reduction of biodiversity. For this reason, it is necessary to study in depth the comfortable living conditions for animals, to study the place of each species in the food chain in nature. We also believe that we should create a ground for the reproduction of common species as well as rare animals on our land.

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Rezyume: Мақолада 2020-2023 йиллардаги Қўйи Амударё давлат биосфера резервати ҳудудидаги кемирувчилар туркуми вакили *Microtus transcaspicus* бўйича олиб борилган зоологик тадқиқотлар материаллари баён қилинади.

Резюме: В статье описаны материалы зоологических исследований, проведенных на представителях семейства грызунов *Microtus transcaspicus* на территории Нижне-Амударьинского государственного биосферного резервата в 2020-2023 гг.

Kalit soʻzlar: Қўйи Амударё давлат биосфера резервати, қўриқхона, Бодай тўқай, Rodentia, *Microtus transcaspicus*, *Mus musculus*, *Nesokia indica* Gray.

Ключевые слова: Нижне-Амударьинский государственный биосферный резерват, заповедник, Бодай тугай, Rodentia, *Microtus transcaspicus*, *Mus musculus*, *Nesokia indica* Gray.

NEGATIVE HUMAN IMPACT ON SOIL AND WAYS TO REDUCE THEM

Allamuratov M.O.

Karakalpak State University named after Berdakh

Summary: *Analysis of the negative influence of the person is brought in article on ground. It is shown that ground fund of our planet is the most varied category lands characterized by combination - from intensive used before unfit for use glacier and desert. It is installed that use the land of the person at time is indicative of expansion before the last time of the farmlands, particularly in economic not strong country.*

Key words: *erosion, ground, антропогенный, departure, conversion, рекуперация, опустынивание, экосистема, vegetable cover, аридная zone.*

The soil provides all the renewable resources of flora and fauna. The importance of soil cannot be overestimated: it is the basis of agriculture and forestry. It is unlikely that humanity will be able to exist independently of the soil - the basis of material wealth and its main wealth. And although it itself is the result of a long natural history process, currently the quality of soils is largely determined by the nature and intensity of human economic activity.

The land fund of our planet is characterized by a combination of the most diverse categories of land - from intensively used to unusable glaciers and deserts.

Analysis of human land use over time indicates an expansion of arable land until recently, especially in economically underdeveloped countries. "Over the past 80 years, land under cultivation has doubled [1]. In most economically developed countries, the arable land area has been stable in recent years (it is more profitable for these countries to invest in the intensification of agriculture than in the development of new lands)." However, in general, the world continues to have a tendency to expand the area of arable land, especially noticeable in developing countries of the hot zone. The area occupied by buildings, ground communications and other engineering structures is steadily growing. The increase in such residential areas occurs mainly due to arable lands, and, as a rule, highly productive ones. Thus, a chain arises: urban lands crowd out rural ones, and the latter expand at the expense of forests and pastures. Ultimately, the area of forests is reduced and their quality deteriorates. At first, open forests and shrubs are used as pastures, and then either plowed over or built on. Our planet's usable land reserves are running out. There remain lands, the development of which most often requires enormous costs. In addition, if used improperly, significant land losses may occur due to the development of erosion, salinization, desertification, deforestation, direct destruction during mining or soil pollution. The damage caused by these processes to the global land fund has recently reached alarming proportions throughout the world. I will focus on the main causes of deterioration in the quality of land resources and measures to combat them.

Under the influence of human activity, accelerated erosion occurs, which often leads to the complete destruction of soils. With accelerated erosion, the loss of soil components is not compensated for, and a sharp decrease in its fertility occurs. Moreover, soil destruction occurs 100-1000 times faster than during natural erosion processes. "As a result of accelerated erosion over the last century, 2 billion hectares of fertile land have been lost on our planet, or 27% of land under active agricultural use." Soil erosion in the United States has become a national disaster. Erosion processes began to develop especially strongly there in the last 170-200 years, that is, since the time of mass plowing of the land. As a result of soil erosion in this country, 4 billion tons of the top layer of soil, richest in nutrients, is washed away annually, which contains more than 90 million tons of basic plant nutrients. Currently, the US government is allocating a lot of money to combat erosion and this is yielding positive results [2].

In Latin American countries, soil erosion covers 75% of arable land. This is due to the use of firewood, deforestation, slash-and-burn farming and monoculture. Widespread deforestation in Brazil is predicted to lead to the creation of a second Sahara. Erosion is also very widespread in Mediterranean countries, India, Pakistan, China, Iran, and Africa. The development of erosion is

facilitated by a number of both anthropogenic and natural factors. Among anthropogenic factors, soil plowing without the use of anti-erosion measures plays an important role.

Under natural conditions, soil fertility is constantly maintained by the fact that substances taken by plants return to it with litter, mineralize and enrich it again. In modern agriculture, only a small part of the produced biomass is returned to the soil annually, the rest is irrevocably carried away with the harvest. Monocultures are especially depleting of soil. Monoculture has become the main disaster of modern agriculture: the cotton and corn belts of the United States and the wheat belts of Argentina give us the most striking examples of its destructive effects [3].

The rate of erosion processes increases if such incorrect agrotechnical practices are used, such as plowing and intensive use of erosive lands without proper anti-erosion protection, plowing along a slope and areas with large slopes, as well as improperly installed. The development of erosion is facilitated by the destruction of forests, which deprives the soil of its protective cover. In addition, the thermal regime changes in clearings, rapid heating and drying of soils occurs, and clearings also affect wind speed. And one of the most important reasons for accelerated erosion, which is mainly observed in developing countries, is excessive grazing, which upsets the balance between the rate of destruction and restoration of vegetation cover.

Another important problem that is closely related to accelerated erosion is desertification. Desertification is a process that leads to the loss of continuous vegetation cover by a natural ecosystem with the further impossibility of its restoration without human intervention. Occurs mainly in arid regions as a result of natural and predominantly anthropogenic factors (destruction of sparse vegetation due to excessive grazing (the basis of agriculture in these areas is nomadic animal husbandry); plowing of former pastures; cutting down trees and shrubs (for fuel); disturbance soil cover as a result of road, industrial construction and other types of economic activities.

According to climate data, deserts and semi-deserts occupy more than a third of the land surface, and over 15% of the world's population lives in this area. Only as a result of human economic activity over the past 25 years, more than 20 million square kilometers of deserts have appeared. Now desert areas occupy about 40% of the land. And another 30 million square kilometers are under threat of desertification.

This danger is felt by over 100 countries of the world and, first of all, by developing countries. "The areas with the highest degree of desertification are in Asia - about 19%, in Africa - 23%, in Australia - 45% and in South America about 10% of the total territory." The countries of the African continent are particularly affected, in particular, in Mauritania, due to the progressive drought, 250 thousand square kilometers are under the threat of severe desertification. The Sahara Desert is moving south at an average speed of 6 km/year, so out of 200 thousand hectares of rainfed land suitable for agricultural work, only 50 thousand hectares remain. In Mali, over 30% of its territory is under threat of desertification [4].

Secondary soil salinization is the scourge of irrigated landscapes in arid climates with a long dry season. Secondary salinization is the process of accumulation of easily soluble salts in the upper layers of soil, which have a detrimental effect on plant communities. The main reasons are: excessive, unsystematic watering of lands in the absence of drainage, disturbance of the water balance by filtration waters of irrigation systems, especially in arid regions. It is known that even with weak soil salinity, crop productivity decreases sharply (cotton by 50-60%, barley by 30-40%, corn by 40-50%, wheat by 50-60%), and with stronger salinity some crops (for example, wheat) die completely. "270 million hectares are irrigated in the world. lands, of which 40% are subject to secondary salinization. For example, in Pakistan, 75% of the area of irrigated land is salinized, in Iraq and Iran - more than 50%, in Egypt - 44%, in the USA - more than 27%."

Centuries of clearing forests for arable land and pastures, collecting firewood, and industrial logging have reduced the forest area by one third. Although 40% of the Earth's land is still covered with woody vegetation, the state of the forests cannot be considered favorable. The annual volume of forest cuttings is more than 3 billion cubic meters, which has a great impact on the radiation balance, atmospheric circulation and air humidity, and the water regime of land. The extraction of mineral raw

materials leads to the formation of specific anthropogenic landscapes - mining ones. The greatest destruction of the earth's surface occurs during the open-pit method of mining, which in our republic accounts for more than 25% of the volume of mining production [5].

The area of territories disturbed by mining is especially large in the USA, Germany, Romania, France, etc., in particular in the UK, open-pit mining has led to the degradation of agricultural land on an area of 70 thousand hectares. Mining contributes to the destruction of vegetation and the emergence of man-made landforms, changes in groundwater regime, air pollution, surface drainage, deformation of sections of the earth's crust. Local subsidence of the earth's crust in coal mining areas is known in the Silesian region of Poland, Great Britain, the USA, Japan, etc. The problem of waste is currently very acute in many countries around the world. Thus, about 150 million tons of waste are generated annually in US cities, and by 2020 their volume is expected to increase by another 20%. In Japan, the amount of household waste exceeds 72 million tons annually [6].

For many years, we have been conducting research to reduce the negative anthropogenic impact on the soil. For this purpose, we are developing various highly swelling hydrogels synthesized based on local raw materials. Preliminary studies of the hydrogels we developed in the Aral Sea region showed that they can be used when there is a shortage of water, to prevent drying out of the soil, salinization of the soil, to save mineral fertilizers, and to prevent the emergence of various harmful bacteria in the soil. It has been established that when seeds are introduced into the soil together with a hydrogel, the germination, growth and survival of some plant species is improved.

Conclusion. Thus, recently there has been a sharp deterioration in the land resources of our planet. By using new and advanced technologies developed by scientists around the world, it is possible to reduce to a certain extent the global problem of desertification and soil pollution, since exposure to toxic substances through the soil leads, as through air and water, to the same diseases. This whole triad - air, water, soil - affects the same person, destroying his body.

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Rezyume: Maqolada insonning erga salbiy tasir etishining taxlili batafsil keltirilgan. Planetamizning er fondi turli toifali tuproq resurslari bilan belgilanishi, yani samarali qo'llaniladigan va qishloq xujaligi uchun yaroksiz bulganlari, muzliklar, cho'llarga toifalanishi ko'rsatilgan. Vaqt maboynida erning inson tomonidan ishlatilishi shudgorlanadigan erlarning salmog'ining ortishi evaziga borganiligi aniqlangan.

Резюме: В статье приведен анализ негативного воздействия человека на почву. Показан, что земельный фонд нашей планеты характеризуется сочетанием самых разнообразных категорий земель - от интенсивно используемых до непригодных для использования ледников и пустынь. Установлено, что использования земли человеком во времени свидетельствует о расширении до последнего времени пахотных земель, особенно в экономически слаборазвитых странах.

Kalit so'zlar: eroziya, tuproq, antropogen, chiqindi, qayta ishlash, rekuperatsiya, cho'llashish, ekosistema, o'simlik qatlami, arid xudud.

Ключевые слова: эрозия, почва, антропогенный, отход, переработка, рекуперация, опустынивание, экосистема, растительный покров, аридная зона.

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CONVERGENCE OF THE METHOD OF SUCCESSIVE APPROXIMATIONS FOR SOME BOUNDARY VALUE PROBLEMS

Baymuratova K.A.

Karakalpak state university named after Berdakh

Summary: This article considers the problem of constructing a solution to a system of differential equations in normal form, with periodic boundary conditions. The solution is constructed using a numerical-analytical method. It has been proven that the successive approximation constructed according to this method, uniformly converges in a given region to an exact solution of the problem under consideration.

Key words: differential equations, successive approximation, boundary conditions, sequence, parameter, integral equation, absolute value.

Let be $g(x(0), x(T)) = 0$ a non-linear boundary condition $x(T)$ in view of, $Ax(T) = \varphi(x(0))$ where is a square matrix with dimension $\det A \neq 0$, $x(0)$ and is a non-linear vector function of parameter. In this case the boundary value problem

$$\frac{dx}{dt} = f(t, x), \quad (1)$$

$$Ax(T) = \varphi(x(0)). \quad (2)$$

The right-hand side of the interval in the type becomes a non-linear boundary value problem [2.48].

For example, the differential equation is equivalent to the analytical method.

$$x(t) = x_0 + \int_0^t f(s, x(s))ds. \quad (3)$$

In the form of (1) an integral equation, (2) we use this integral equation to solve the boundary value problem

$$x(t) = x_0 + \int_0^t f(s, x(s))ds + \alpha t. \quad (4)$$

We will follow the description in which some -parameter of the type is entered, here

$$x_0 = (x_1(0), x_2(0), \dots, x_n(0)), \alpha = (\alpha_1, \alpha_2, \dots, \alpha_n).$$

Let's (4) put it in (2) the border box and select the α parameter:

$$A \left[x_0 + \int_0^t f(s, x(s))ds + \alpha t \right] = \varphi(x_0),$$

$$\alpha = \frac{1}{T} A^{-1} \varphi(x_0) - \frac{1}{T} x_0 - \frac{1}{T} \int_0^t f(s, x(s))ds \quad (5)$$

α put the meaning of this (4) instead

$$x(t) = x_0 + \int_0^t f(s, x(s))ds - \frac{t}{T} \int_0^T f(s, x(s))ds + \frac{t}{T} A^{-1} \varphi(x_0) - \frac{t}{T} x_0$$

or simplify

$$x(t) = x_0 + \int_0^t \left[f(s, x(s)) - \frac{1}{T} \int_0^T f(s, x(s)) ds \right] ds + \frac{t}{T} [A^{-1} \varphi(x_0) - x_0]. \quad (6)$$

We arrive at the integral equation. This integral equation is given as a parameter $x(0)$, then (1)-(2) the boundary conditions will be equivalent. Therefore, we replace the solution of these boundary value problem equivalent to zero with the solution of the integral equation(6). Applying the method of successive approximations to integral equations (6), we look for an approximate solution in the form of formula(7)

$$x_{m+1}(t, x_0) = x_0 + \int_0^t \left[f(s, x_m(s, x_0)) - \frac{1}{T} \int_0^T f(s, x_m(s, x_0)) ds \right] ds + \frac{t}{T} [A^{-1} \varphi(x_0) - x_0],$$

$$m = 0, 1, 2, 3, \dots, x_0(t) = x_0 \quad (7)$$

$x_m(t, x_0)$ approximative solution determined by this sequence for any parameter m and $x(0)$ satisfies boundary conditions (2). Therefore, the sequence of functions $x_m(t, x_0)$ defined by the (7) sequence, the function is defined $f(t, x)$

$$(t, x) \in [0, T] \times D, D \subset E_n.$$

In a domain not leaving the set D and when $m \rightarrow \infty$ the sequence of the function $\{x_m(t, x_0)\}$ is a convergent sequence [1.58].

Let $[0, T] \times D$ in the domain $f(t, x)$ the function is defined and continuous, then this functions unlimited in this domain and $\forall t \in [0, T]$, for x', x'' satisfies the Lipschitz conditions.

$$|f(t, x)| \leq M,$$

$$|f(t, x'') - f(t, x')| \leq K |x'' - x'|. \quad (8)$$

The inequalities hold, here M is a positive number is an n dimensional vector, and K $n \times n$ is a matrix.

Let the surroundings $\frac{MT}{2} + \beta(x_0)$ be located in the set D , $x_0 \in D_f$ the set is not an empty set, that is

$$D_f = D - \left(\frac{MT}{2} + \beta(x_0) \right) \neq \emptyset \quad (9)$$

$$\text{here } \beta(x_0) = \max_{x_0 \in D_f} |A^{-1} \varphi(x_0) - x_0|.$$

Let $Q = \frac{KT}{\pi}$ eigenvalues of matrices in absolute value be less than one, that is

$$|\lambda_j(Q)| < 1, \quad j = 1, 2, \dots, n \quad (10)$$

If (8),(10) conditions hold, for an approximative solution of the boundary value problem (1),(2), this (7) formula is used for any number, the approximate solution $\{x_m(t, x_0)\}$ when $m \rightarrow \infty$ the limit converges. We can see (7)-solution of the integral equation [4.36].

For this we take the approximation $x_m(t, x_0) = x_0$, then from (7) subtract (8)

$$\begin{aligned} |x_{m+1}(t, x_0) - x_0| &\leq \left| \int_0^t \left[f(s, x_m(s, x_0)) - \frac{1}{T} \int_0^T f(s, x_m(s, x_0)) ds \right] ds \right| + \\ &+ \frac{t}{T} |A^{-1}\varphi(x_0) - x_0| \leq \left(1 - \frac{t}{T} \right) \int_0^t |f(s, x_m(s, x_0))| ds + \frac{t}{T} \int_0^T |f(s, x_m(s, x_0))| ds + \\ &+ \frac{t}{T} |A^{-1}\varphi(x_0) - x_0| \leq M \left[\left(1 - \frac{t}{T} \right) \int_0^t ds + \frac{t}{T} \int_0^T ds \right] + \frac{t}{T} \beta = M\alpha_1(t) + \frac{t}{T} \beta \leq \frac{MT}{2} + \beta. \end{aligned} \quad (11)$$

This means $x_0 \in D_f$ $t \in [0, T]$, the functions do not leave the set D defined by formula (7), and this will help us when calculating subsequent approximations. Therefore, in the case when the condition is satisfied, the set D_f , given that the parameter x_0 belongs to this set, from formula (7) $\{x_m(t, x_0)\}$ you can take the required number, a sequence of approximate solutions.

Let us show the convergence of the sequence of approximate solutions.

For this purpose the difference $|x_{m+j}(t, x_0) - x_m(t, x_0)|$ estimating at $j \geq 1$ use at the difference using the Cauchy convergence test, based on (8) from (7) let us denote, and last inequality

$$r_{m+1} \leq K \left[\left(1 - \frac{t}{T} \right) \int_0^t r_m(s) ds + \frac{t}{T} \int_0^T r_m(s) ds \right] \quad (12)$$

from to (11) for $m = 0$

$$|x_1(t, x_0) - x_0| \leq M\alpha_1(t) + \frac{t}{T} \beta(x_0)$$

from (12)

$$r_1(t) \leq M\alpha_1(t) + \frac{t}{T} \beta(x_0)$$

Assessing $r_2(t)$:

$$\begin{aligned} r_2(t) &\leq K \left[\left(1 - \frac{t}{T} \right) \int_0^t r_1(s) ds + \frac{t}{T} \int_0^T r_1(s) ds \right] \leq \\ &\leq K \left[\left(1 - \frac{t}{T} \right) \int_0^t \left(M\alpha_1(s) + \frac{s}{T} \beta \right) ds + \frac{t}{T} \int_0^T \left(M\alpha_1(s) + \frac{s}{T} \beta \right) ds \right] \leq \\ &\leq KM\alpha_2(t) + K\beta\alpha_1(t) \end{aligned}$$

here

$$\alpha_2(t) \leq \left(1 - \frac{t}{T} \right) \int_0^t \alpha_1(s) ds + \frac{t}{T} \int_0^T \alpha_1(s) ds$$

and

$$\alpha_1(t) = \left(1 - \frac{t}{T} \right) \int_0^t ds + \frac{t}{T} \int_0^T ds$$

continuing the process, then (12) for $m = 2, 3, \dots$

$$r_3(t) \leq K^2 M \alpha_3(t) + K^2 \beta \alpha_2(t)$$

$$r_4(t) \leq K^3 M \alpha_4(t) + K^3 \beta \alpha_3(t)$$

.....

$$r_{m+1}(t) \leq K^m M \alpha_{m+1}(t) + K^m \beta \alpha_m(t)$$

here

$$a_{m+1} \leq \left(1 - \frac{t}{T}\right) \int_0^t \alpha_m(s) ds + \frac{t}{T} \int_t^T \alpha_m(s) ds$$

if considering

$$\alpha_{m+1}(t) \leq \frac{T^m}{\pi^m} \alpha_1(t), \quad \alpha_1(t) \leq \frac{\pi}{3} \alpha_1(t)$$

Then

$$\begin{aligned} r_{m+1}(t) &\leq K^m M \frac{T^m}{\pi^m} \alpha_1(t) + K^m \beta \frac{T^{m-1}}{\pi^{m-1}} \alpha_1(t) = K^m \frac{T^m}{\pi^m} \left(M + \beta \frac{\pi}{T} \right) \alpha_1(t) = \\ &= Q^m \left(M + \beta \frac{\pi}{T} \right) \alpha_1(t) \\ &\quad |x_{m+j} - x_m|, \\ |x_{m+j}(t, x_0) - x_m(t, x_0)| &\leq \sum_{i=1}^j |x_{m+i}(t, x_0) - x_{m+i-1}(t, x_0)| = \\ &= \sum_{i=1}^j r_{m+i}(t) \leq \sum_{i=0}^{j-1} Q^{m-i} \left(M + \beta \frac{\pi}{T} \right) \alpha_1(t) = \\ &= Q^m \sum_{i=0}^{j-1} Q^i \left(M + \beta \frac{\pi}{T} \right) \alpha_1(t) \end{aligned} \quad (13)$$

there is inequality

$$\sum_{i=0}^{j-1} Q^i \leq \sum_{i=0}^{\infty} Q^i = (E - Q)^{-1}$$

given the limit $\lim_{m \rightarrow \infty} x_m Q^m = 0$ at $m \rightarrow \infty$ the sequence of functions $\{x_m(t, x_0)\}$ in the set $(t, x_0) \in [0, T] \times D_f$ is a uniformly convergent sequence:

$$\lim_{m \rightarrow \infty} x_m(t, x_0) = x^*(t, x_0) \quad (14)$$

each of the functions $\{x_m(t, x_0)\}$ satisfies (2) boundary conditions, the limit of the function also satisfies the boundary conditions.

Now let's estimate the error between $\{x_m(t, x_0)\}$ function and $\{x_m^*(t, x_0)\}$. For this we take from (13) $j \rightarrow \infty$.

$$|x^*(t, x_0) - x_m(t, x_0)| \leq Q^m \sum_{i=0}^{\infty} Q^i \left(M + \beta \frac{\pi}{T} \right) \alpha_1(t) = Q^m (E - Q)^{-1} \left(M + \beta \frac{\pi}{T} \right) \alpha_1(t) \quad (15)$$

Now out of (7) with $m \rightarrow \infty$ and considering (14) then the function $\{x_m^*(t, x_0)\}$

$$x(t, x_0) = x_0 + \int_0^t \left[f(s, x(s, x_0)) - \frac{1}{T} \int_0^T f(s, x(s, x_0)) ds \right] ds + \frac{t}{T} [A^{-1} \varphi(x_0) - x_0].$$

You can see what is the solution to the integral equation.

$$x(t) = x_0 + \int_0^t f(s, x(s, x_0)) ds$$

but (1) the equation is equivalent to the integral equation, solve (1), (2) boundary value problems, x_0 parameter

$$\Delta x_0 = \frac{1}{T} \left[A^{-1} \varphi(x_0) - x_0 \right] - \frac{1}{T} \int_0^T f(s, x(s, x_0)) ds \quad (16)$$

You need to choose a vector function equal to zero. This means functions $\{x_m(t, x_0)\}$ at the limit $x^*(t, x_0)$ that is $\Delta(x_0) = 0$, if you choose a solution as in a system of algebraic equations, then the function $x^*(t, x_0)$ and (1), (2) coincides with the solution of the nonlinear boundary value problem. In conclusion we can state the theorem:

Theorem. Let in $x^*(t, x_0)$ function be defined and continuous in the domain $[0; T] \times D$ and conditions (8) – (10) are satisfied. If in the initial approximation x_0 we choose so that (16) is a zero vector of the function, then in formula (7) the limit is at $m \rightarrow \infty$, that as $x^*(t, x_0)$ function (1), (2) is a solution to the boundary value problem. The error between the solution and the approximate solution is estimated by the inequality (15):

$$|x^*(t, x_0) - x_m(t, x_0)| \leq Q^m (E - Q)^{-1} \left(M + \beta \frac{\pi}{T} \right) \alpha(t).$$

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Rezyume: Ushbu maqolada davriy chegara shartlariga ega, normal shakldagi differensial tenglamalar tizimini qurish masalasi ko'rib chiqiladi. Yechim sonli-analitik usul yordamida tuziladi. Ushbu usul bo'yicha tuzilgan ketma-ket yaqinlashish ma'lum bir mintaqada ko'rib chiqilayotgan muammoning aniq yechimiga bir xilda yaqinlashishi isbotlangan.

Резюме: В данной статье рассматривается задача построения решения системы дифференциальных уравнений в нормальной форме, с периодическими краевыми условиями. Решение строится с помощью численно-аналитического метода. Доказано, что последовательное приближение, построенное согласно этому методу, равномерно сходится в данной области к точному решению рассматриваемой задачи.

Kalit so'zlar: differensial tenglamalar, ketma-ket yaqinlashish, chegara shartlari, ketma-ketlik, parametr, integral tenglama, absolyut qiymat.

Ключевые слова: дифференциальные уравнения, последовательное приближение, краевые условия, последовательность, параметр, интегральное уравнение, абсолютная величина.

UDC 58

PLANT FORMATIONS OF SAND MASSIFS OF USTYURT

Khalmuratov P., Begzhanova G.T., Kurbaniyazov B.T.

Karakalpak State University named after Berdakh

Summary: *The article examines the plant formations of the sandy massifs of Ustyurt. During the study, sand massifs were identified in the areas of the Agyin and Barsakelmes, Assake-Audan, Karatyulei and Ilteje depressions. The sands surrounding Agyin from the northeast, west and southwest are characterized by the presence of a numerous complex of plant communities. The main formations present here are mixed juzgun, tamarix, black saxaul, janta and sarsazan.*

Key words: *formation, massif, Ustyurt Plateau, pastures, landscape, complex. Introduction*

The Ustyurt Plateau remains a system of highly productive pastures suitable for use in sheep breeding, horse breeding and camel breeding. Therefore, Ustyurt is of significant interest to the national economy.

Certain parts of this desert and some types of its landscapes have not yet been sufficiently studied. First of all, this should be attributed to the sandy massifs of Ustyurt. Areas of sandy desert in Ustyurt are scattered in the form of quite numerous areas, each of which is not very large. However, the importance of this type of landscape for the development of Ustyurt is very great, since it is here that the most valuable pastures are located, suitable for wintering livestock, and here there are the most favorable conditions for the formation of local accumulations of shallow fresh or slightly brackish waters, which can be used to create a network of watering places. Meanwhile, the sandy massifs of Ustyurt, due to their isolation, as well as due to the difficult working conditions in them, were almost not subjected to special study.

During the study, sand massifs were identified in the areas of the Agyin and Barsakelmes, Assake-Audan, Karatyulei and Ilteje depressions.

One of the large sand systems of this type is located on the outskirts of Agyin and Barsakelmes. These two interconnected depressions occupy the vast Barsakelmes trough, which makes up a significant part of the Karakalpak Ustyurt. The predominant type of landscape here is saline deserts.

The most sand-rich part of this peculiar environment of salt marsh depressions, to the north and northeast of Agyin, is called the Kartpaikum sand massif. Near the Barsakelmes depression in the northwest lies the small Tabyn-su massif; there are no sands on the rest of the periphery of the depression.

Materials and methods

The object of our research was the plant formation of the Ustyurt sand massif. The route research method was mainly used to study the composition and structure of plant populations through surveys along routes. Botanical descriptions of plants were made in all communities, according to generally accepted methods (Field Geobotany, 1964). When identifying plant species, we used the "Identifier of Plants of Central Asia" (1993). Geobotanical methods were also used during field research.

Results of the study and discussion

The sands surrounding Agyin from the northeast, west and southwest are characterized by the presence of a numerous (mostly five-membered) complex of plant communities, very nonsonoric in its components. The main formations present here are mixed juzgun, tamarix, black saxaul, jantak and sarsazan.

In some places, the complex includes separate communities from the Kuyansuyak formations (Kuyansuyak silver, and Karelin), the formation of curly grass, *Reomuria fruticosa*, *gypsophila parfolia* (Eichwald's *parfolia*, ovate, etc.) and potash.

For most of the area it occupies on the outskirts of the Agyin and Tyumryuk salt marshes, this complex is in contact, on the one hand, with sarsazan forests and litter at the bottom of the depression, and on the other with a peculiar landscape, called black saxaul clearings. This is a rare network of specimens or small groups of black saxaul, scattered across the surface of the plateau, against the backdrop of biyugunniks and white-earth wormwood and biurgu complexes typical of the Ustyurt plains.

He considers the black saxaul formations as a special formation that has hydroindicative values and indicates waters with moderate mineralization, which he traced directly on the open fields lying to the west of the complexes we describe, bordering the western side of Agyin.

The landscape structure of the complex is very complex. It is characterized by a variegated combination of fine hilly sands covered with psammophytes, chocolacs with tamarix, groups of black saxaul, small areas of herbaceous phreatophytes in depressions and quite significant areas of salt marshes with typical halophytes.

Typologically, it should be classified as ecotone landscapes, that is, landscapes occupying an intermediate position between the neighboring desert subtypes. This complex of communities varies quite widely in its character and, in particular, in the dominant plant associations in it. However, throughout it remains the five main components indicated in its name. It is not always easy to recognize this subtype of sand massifs on the ground, since it has been severely damaged by humans. The reason is that, located on the edge of the sands, areas of this subtype have long been noticed and appreciated by livestock farmers who used them for grazing. As a result, the natural landscape and physiognomic structure turned out to be severely disturbed due to the appearance in it of both thickets of pinned weeds and failures, that is, areas completely trampled by livestock and devoid of vegetation.

Its transitional nature is reflected in many ways, and primarily in the high gypsum-bearing sand, which probably arose from constant salt spraying from the bottom of the depressions, which turned the sandy substrate into the pseudo-sand formations that they have become at the present time. It also affects the combination of ecologically contrasting plant formations-psammophilic, hypostyle, and halophilic-in one complex. Finally, the transition of the complex is also reflected in assumptions about its evolution, since there is a point of view according to which the saline deserts of the drainless basins are currently undergoing a growth process due to the ongoing tectonic subsidence of the trough areas. If this hypothesis is correct, then the gradual spread of halophytes over the mounds is one of the indicators of this process and we should expect an even greater expansion of the area of halophilic communities. All this allows us to assert that, being in its initial aspects a transitional, intermediate ecosystem, this complex was brought to its current state by human activity and can be defined as an anthropogenic ecotone.

On the outskirts of Barsakelmes, only a small sandy massif was noted near the Tabyn-su well. These are fixed finely hummocky sands with a predominance of white earth-saxaul and eastern saltwort-saxaul communities with the participation of boyalych, cherkez, and ephemerals. They are combined with numerous takyr-like surfaces and partially overlap the latter. The gypsum content of the sand is significantly lower than at Agyn. In the sands lies a well with brackish water. The small size of the massif, its severe disturbance by grazing (it lies close to the old transhumance routes) deprives it of practical significance, and it can only be used as a temporary stopping place for herds during long-distance transhumance. The sand massifs lying on the outskirts of the Iltedzhe and Kara-Tulei depressions have a significant resemblance to the sands of the outskirts of Agyin. The gently sloping, weakly expressed Iltedzhe depression lies in the area of the Karabaur ridge, the leveling of its sides is so great and the transition from the surrounding plain is so gradual that the areas occupied by gypsum-bearing sands are not isolated from the saline areas, but are combined with them, forming a complex mosaic of halophytes and psammophytes.

On the profile laid from the Iltedzhe well, on the eastern edge of the depression, across the entire depression in the latitudinal direction, the following communities are noted: a) ass. small-leaved sveda (immediately near the well) b) ass. eastern solyanka-feather grass on slightly undulating low sandy ridges in a complex with small depressions with groups of biyurgun and bush reomuria, c)

ass. eastern saltwort-potash-black saxaul (in places with groups of Tamarix bristlecone) with lush development of ground yellow lichen, d) ass. eastern hodgepodge-black saxaul. In the second of the listed communities, a yellowish-gray loose mass is revealed from the surface, which is an almost parity mixture of sand and gypsum particles; further down to a depth of one and a half meters there is dense dusty sandy loam containing a layer of gypsum up to 5-10 cm; power.

Conclusions

Thus, the main plant formations of the sandy massifs of Ustyurt are the mixed juzgun, tamarix, black saxaul, jantak and sarsazan formations, and in some places the complex includes individual formations of curly grass, reomuria fruticosa, gypsophilic parfolia (Eichwald's parfolia, ovate, etc.), potash, and also Kuyansuyak formations (Kuyangsuyak silver, and Karelin). Along the outskirts of the Agyin and Tyumryuk salt marshes, this complex is in contact, on the one hand, with sarsazan forests and with the litters of the bottom of the depression, and on the other with a peculiar landscape, small groups of black saxaul scattered across the surface of the plateau, against the backdrop of biyugunniks and white-earth wormwood and biyurgu complexes typical of the plains Ustyurt.

The landscape structure of the complex is characterized by a motley combination of fine hilly sands covered with psammophytes, chocolacs with tamarix, groups of black saxaul, small areas of herbaceous phreatophytes in depressions and quite significant areas of salt marshes with typical halophytes. The plant formations of the Ustyurt sand massif were severely damaged by humans, who used them for grazing. As a result, the natural landscape and physiognomic structure turned out to be severely disturbed due to the appearance in it of both thickets of pinned weeds and failures, that is, areas completely trampled by livestock and devoid of vegetation.

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Rezyume: *Maqolada Ustyurtning qumli massivlarining o'simlik shakllari o'rganiladi. Tadqiqot davomida Agyin va Barsakelmes, Assake-Audan, Karatyuley va Ilteje chuqurliklari hududlarida qum massivlari aniqlangan. Agyinni shimoli-sharqdan, g'arbiy va janubi-g'arbdan o'rab turgan qumlar ko'plab o'simlik jamoalarining mavjudligi bilan ajralib turadi. Bu yerda mavjud bo'lgan asosiy tuzilmalar aralash juzgun, tamarix, qora saksovul, janta va sarsazandir.*

Резюме: *В статье рассмотрены растительные формации песчаных массивов Устюрта. В ходе исследования песчаные массивы были выявлены на участках Агынской и Барсакельмесской, Ассак-Ауданской, Каратюлейской и Ильтедже впадин. Пески, окружающие Адын с северо-востока, запада и юго-запада, характеризуются наличием многочисленного комплекса растительных сообществ. Основными формациями здесь являются смешанный джужгун, тамарикс, черный саксаул, джанта и сарсазан.*

Kalit so'zlar: *shakllanish, massiv, Ustyurt platosi, yaylovlar, landshaft, majmua. Kirish*

Ключевые слова: *формация, массив, плато Устюрт, пастбища, ландшафт, комплекс.*
Введение

UOT: 631.15:631.521:631.4:631.587

**IRRIGATION PERIODS, NUMBER, SYSTEM AND SEASONAL IRRIGATION NORMS
OF CORN VARIETIES IN CONDITIONS OF MEADOW-ALLUVIAL SOILS**

Kunnazarov U.B., Oteuliev J.B., Dosjanov K.J.
Karakalpak State University named after Berdakh

CONCLUSION. It can be concluded from the information obtained on irrigation procedures of corn varieties in relation to soil moisture field capacity in the conditions of meadow-alluvial soils that In the 60-60-60% irrigation system, the main crop was irrigated once during budding-flowering, and the repeated crop was not irrigated. Irrigation method 70-70-60% required irrigation in 1-2-0 system, one-time irrigation rate was in the range of 972-1047 m³/ha, and seasonal irrigation rate was equal to 3050; 2974; 2978 m³/ha. In the irrigation order of 80-80-60% soil moisture, the main crop was irrigated 5 times in the 1-4-0 system, the seasonal irrigation rate was 3431; 3287; 3407 m³/ha. In the experiment, according to the analysis of the biometric properties of corn varieties and the state of soil reclamation, taking into account that the best indicator was recorded in the irrigation regime, for this soil and climate, it is acceptable to irrigate corn varieties in the order of 70-70-60%, seasonal irrigation in the 1-2-0 system at the rate of 3050-2978 m³/ha.

Keywords: meadow-alluvial soils, irrigation methods, irrigation system, standard corn varieties, main crop, repeated crop.

Abstract. In the article, the results of the study on determining optimal irrigation procedures for "Uzbekistan-601 ESV", "Karasuv-350 AMV" and "Uzbekistan-300 MV" varieties of corn cultivated as a main and repeated crop in the conditions of moderately saline, meadow-alluvial soils of the southern Aral Sea region of the Republic of Karakalpakstan are presented.

Introduction. The main purpose of irrigation is to deliver the necessary moisture in the soil for agricultural crops, to ensure and manage the water, food, air temperature regimes of the soil necessary for the crops, as well as the optimal biological conditions in the irrigated areas.

Irrigation rate is the water rate (m³/ha) given to 1 ha irrigated area for one-time irrigation of agricultural crops.

Irrigation standards for cultivated crops should ensure that the active layer of the soil provides the moisture used by the plant in the layer where 90% of the plant's roots are located.

Corn grows slowly in the first period (germination). From the fertilization period, the development of corn is intensive, depending on the variety. Daily growth is 8-10 cm and more. Blue mass accumulates a lot, a yield is formed. During this period, soil moisture should not be less than 70-75% [1].

B.S. Mambetnazarov [2]'s long-term scientific research in the conditions of the Republic of Karakalpakstan shows that the use of groundwater by corn is much less than that of cotton and alfalfa, and the efficiency of use is 30-35% when the groundwater is 2-3 m deep, and when it is 1-2 m, it reaches 40-45%. Therefore, according to the author, soil moisture is also important in such lands.

According to V. I. Kuznetsov [3], the timing of irrigation should be based on weather conditions. For the calculated layer 0.4 m irrigation depth, it is necessary to irrigate 9 times in average wet years, and 2 times to increase the wetting depth to 0.8 m in dry years. According to him, the depth of the moistened soil layer and the stage of plant development have a decisive influence on the amount of water consumption during the harvesting process of corn. The main part of the water balance in the total water consumption is irrigation water. In the version with a moisture depth of 0.4 - 0.8 m, its share varies from 50 to 73.3%. This indicator decreases when the soil layer is wetted by 0.4 m (52.7 %) and increases as the depth of subsidence increases by 0.8 (59.9 %).

Also, in the research of M.S.Bhuiyan, M.S.R.Bhuiyan, T.P.Tiwari, M.A.Rahaman, S.K.Bhowal, R. Uddin and S.K.Paul [4], 3 different irrigations of hybrid corn varieties were selected

at 25, 50 and 75 days intervals and reported that the best performance was observed in BARI hybrid corn variety.

According to Dilip Chenoy [5], corn is considered as a potential crop for India to double the farmer's income. That is why agrotechnics of corn care (plowing, irrigation, feeding, etc.) are important in these conditions.

Therefore, it is one of the important tasks to determine the optimal irrigation procedures for corn as the main and repeated crop in different soil-climatic conditions, including moderately saline, meadow-alluvial soils of the southern Aral region.

Research methods. The researches were conducted in the experimental farm of the Karakalpakstan Agricultural Scientific Research Institute in 2020-2022 as the main and repeated crops of corn varieties "Uzbekistan-601 ESV", "Karasuv-350 AMV" and "Uzbekistan-300 MV". Before irrigation, each variety was irrigated in 60-60-60, 70-70-60 and 80-80-60% irrigation regimes compared to field capacity, and the number, rate and system of irrigation were studied. The analyzes were carried out on the basis of methodological guidelines "Methods for conducting field experiments" [6].

Corn irrigation was carried out in three periods. The first period is the germination period, the second period is the fruiting period, and the third period is the grain ripening period.

The experiment was carried out in 9 variants in the main and repeated crops. The area of each plot is 480 m² (row length 50 m, width 8 rows 0.6x8=480 m²), from which 240 m² is taken into account. The experiment was in 3 replications, and all variants were systematically placed in the same tier.

Analysis and results. Corn gets the moisture it needs (nutrients) from the active layer of the soil. Irrigations with high or low irrigation rates have different effects on corn. Therefore, it is appropriate to determine scientifically based irrigation periods, number, system, duration and seasonal irrigation norms.

We will analyze the obtained data in the example of 2022.

In the experimental fields, the number of irrigations, durations, annual and seasonal irrigation norms of the Uzbekistan 601 ESV, Karasuv 350 AMV and Uzbekistan 300 MV corn varieties differed from each other. According to the data obtained in field experiments, soil moisture before irrigation of Uzbekistan 601 ESV, Karasuv 350 AMV varieties planted as the main crop was carried out once according to the irrigation order 60-60-60% compared to field capacity, in options 1, 2 and 3 at 0-1-0 system and the irrigation rate was 1301, 1280, 1310 m³/ha. In options 4, 5 and 6, soil moisture before irrigation was 70-70-60% compared to field capacity, irrigation was required in the 1-2-0 system, the rate of one-time irrigation was in the range of 972-1047 m³/ha, and the rate of seasonal irrigation was equal to 3050; 2974; 2978 m³/ha. The interval between irrigations corresponded to the interval of 25-28 days. The complete data obtained are shown in Tables 1 and 2.

On the irrigation rate of 80-80-60 % soil moisture relative to field capacity Uzbekistan 601 ESV, Karasuv 350 AMV and Uzbekistan 300 MV corn varieties was irrigated in the 1-4-0 system. Periodic irrigation rate was in the range of 630-740 m³/ha and seasonal irrigation rate was 3431; 3287; 3407 m³/ha.

As a repeated crop, irrigation was not required in options 1, 2 and 3, where the soil moisture was set at 60% in all periods compared to field capacity, in the experiments conducted to determine the irrigation norms, system, and seasonal irrigation norms of varieties of corn Uzbekistan 601 ESV, Karasuv 350 AMV and Uzbekistan 300 MV.

Re-planted corn cultivars required a single irrigation when the soil moisture was 70-70-60% relative to field capacity. The rate of one-time and seasonal irrigation was 1008; 1070; 1084 m³/ha, respectively.

Re-planted Uzbekistan 601 ESV, Karasuv 350 AMV and Uzbekistan 300 MV corn varieties were irrigated 2 times in the 1-1-0 system in options 7, 8 and 9 with soil moisture of 80-80-60% according to field capacity. It was found that the daily irrigation rate was around 672-750 m³/ha and the seasonal irrigation rate was 1452; 1443; 1421 m³/ha.

Table 1.

**Irrigation regimes of corn varieties grown as main crops on meadow-alluvial soils,
(2022)**

V er · n	Irrigation procedure s in relation to field capacity, %	Corn varieties	Indicators	number of irrigation					Seasonal irrigatio n rate, m ³ /ha	Irrigatio n system
				1	2	3	4	5		
1	60-60-60	Uzbekistan 601 ESV	Irrigation period, date	6.07					1301	0-1-0
			Irrigation interval, date							
			Irrigation rate, m ³ /ha	1301						
2	60-60-60	Karasuv 350 AMV	Irrigation period, date	3.07					1280	0-1-0
			Irrigation interval, date							
			Irrigation rate, m ³ /ha	1280						
3	60-60-60	Uzbekistan 300 MW	Irrigation period, date	5.07					1310	0-1-0
			Irrigation interval, date							
			Irrigation rate, m ³ /ha	1310						
4	70-70-60	Uzbekistan 601 ESV	Irrigation period, date	13.06	11.07	14.08			3050	1-2-0
			Irrigation interval, date	28	35					
			Irrigation rate, m ³ /ha	972	1047	1031				
5	70-70-60	Karasuv 350 AMV	Irrigation period, date	11.06	10.07	15.08			2974	1-2-0
			Irrigation interval, date	29	35					
			Irrigation rate, m ³ /ha	986	972	1016				
6	70-70-60	Uzbekistan 300 MW	Irrigation period, date	9.06	11.07	16.08			2978	1-2-0
			Irrigation interval, date	32	35					
			Irrigation rate, m ³ /ha	986	990	1002				
7	80-80-60	Uzbekistan 601 ESV	Irrigation period, date	29.05	19.06	10.07	1.08	25.08	3431	1-4-0
			Irrigation interval, date	21	21	22	24			
			Irrigation rate, m ³ /ha	630	687	710	687	717		
8	80-80-80	Karasuv 350 AMV	Irrigation period, date	28.05	17.06	11.07	3.08	26.08	3287	1-4-0
			Irrigation interval, date	20	24	22	23			
			Irrigation rate, m ³ /ha	642	642	650	673	680		

9	80-80-80	Uzbekistan 300 MW	Irrigation period, date	30.05	18.06	10.07	30.07	20.08	3407	1-4-0
			Irrigation interval, date	19	22	20	21			
			Irrigation rate, m ³ /ha	702	673	642	650	740		

Table 2.

**Irrigation regimes of corn varieties planted as a repeated crop on meadow-alluvial
soils, (2022)**

Ver. n	Irrigation procedures in relation to field capacity, %	Corn varieties	Indicators	number of irrigation					Seasonal irrigation rate, m ³ /ha	Irrigation system
				1	2	3	4	5		
1	60-60-60	Uzbekistan 601 ESV	Irrigation period, date							0-0- 0
			Irrigation interval, date							
			Irrigation rate, m ³ /ha							
2	60-60-60	Karasuv 350 AMV	Irrigation period, date							0-0- 0
			Irrigation interval, date							
			Irrigation rate, m ³ /ha							
3	60-60-60	Uzbekistan 300 MW	Irrigation period, date							0-0- 0
			Irrigation interval, date							
			Irrigation rate, m ³ /ha							
4	70-70-60	Uzbekistan 601 ESV	Irrigation period, date	25.07					1008	0-1- 0
			Irrigation interval, date							
			Irrigation rate, m ³ /ha	1008						
5	70-70-60	Karasuv 350 AMV	Irrigation period, date	23.07					1070	0-1- 0
			Irrigation interval, date							
			Irrigation rate, m ³ /ha	1070						
6	70-70-60	Uzbekistan 300 MW	Irrigation period, date	21.07					1084	0-1- 0
			Irrigation interval, date							
			Irrigation rate, m ³ /ha	1084						
7	80-80-60	Uzbekistan 601 ESV	Irrigation period, date	17.07	20.08				1452	1-1- 0
			Irrigation interval, date	33						
			Irrigation rate, m ³ /ha	702	750					
8	80-80-80	Karasuv 350 AMV	Irrigation period, date	19.07	21.08				1443	1-1- 0
			Irrigation interval, date	32						
			Irrigation rate, m ³ /ha	733	710					
9	80-80-80	Uzbekistan 300 MW	Irrigation period, date	16.07	15.08				1421	1-1- 0

			Irrigation interval, date	29						
			Irrigation rate, m ³ /ha	749	672					

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Rezyume: Maqolada Qoraqalpog'iston Respublikasi janubiy orol bo'yi hududi o'rtacha sho'rlangan, o'tloqi-allyuvial tuproqlari sharoitida asosiy va takroriy ekin sifatida parvarishlangan makkajo'xorining “O'zbekiston-601 ESV”, “Karasuv-350 AMV” va “O'zbekiston-300 MV” navlarini maqbul sug'orish tartiblarini aniqlash bo'yicha tadqiqot natijalari keltirilgan.

Резюме: В статье приведены результаты исследования по определению оптимальных режимов орошения сортов кукурузы «Узбекистан-601 ЭСВ», «Карасув-350 АМВ» и «Узбекистан-300 МВ», возделываемых в качестве основной и повторной культуры, в условиях среднесоленых, лугово-аллювиальных почв южного Приаралья Республики Каракалпакстан.

Kalit so'zlar: o'tloqi-allyuvial tuproqlar, sug'orish tartiblari, sug'orish tizimi, me'yor makkajo'xori navlari, asosiy ekin, takroriy ekin.

Ключевые слова: лугово-аллювиальные почвы, способы орошения, оросительная система, стандартные сорта кукурузы, основная культура, повторная культура.

NEUTRON ENERGY CHARACTERISTICS WITH ANTINEUTRINO SPECTRA

Yuldoshev Z.¹, Tagaev M.B.²

¹ Tashkent state technical university named after Islam Karimov

²Karakalpak state university named after Berdakh

Summary: The neutron energy spectrum and antineutrino spectra are intricately linked through nuclear reactions, particularly beta decay processes. In nuclear reactors, understanding these spectra is crucial for reactor monitoring, neutrino physics experiments, and safeguarding nuclear materials. Accurate measurement and modeling of these spectra provide insights into the underlying nuclear processes and help detect and analyze antineutrinos, which have important implications for both fundamental physics and practical applications such as reactor monitoring. This study delves into how antineutrino production relates to the energy of fission neutrons. As neutron energy influences the types and quantities of fission products, it directly affects the resultant antineutrino spectra.

Key words: antineutrino flux, energy spectrum, thermal and fast neutron reactors.

Introduction

The study of reactor electron antineutrinos has led to several advances in particle physics. Recent advancements, such as determining the neutrino mixing parameter θ_{13} , have relied on comparing measured electron antineutrino fluxes at different locations. Despite significant uncertainties, direct comparisons between measured and predicted reactor electron antineutrino fluxes have also yielded important insights. Such direct model comparisons will remain crucial in upcoming efforts to achieve precise observations of Standard Model fluctuation characteristics and the neutrino mass structure in medium-baseline experiments. They will also be essential in investigating the reasons for different reactor antineutrino changes using short-baseline measurements. Recent advancements in the precision of electron antineutrino ($\bar{\nu}_e$) flux and spectrum measurements have revealed inconsistencies with existing beta-conversion models. Over several decades, measurements conducted at various reactors since the early 1980s consistently show around a 6% discrepancy between observed reactor $\bar{\nu}_e$ -induced inverse beta decays (IBDs) and newer beta-conversion reactor models' predictions. The phrase "reactor antineutrino flux anomaly" refers to this discrepancy. Experiments investigating the neutrino mixing parameter θ_{13} in reactors have confirmed the existence of this deficit in IBD yield. Additionally, they have unveiled discrepancies in the spectrum shape predicted by beta-conversion models, particularly detecting an excess of around 10% in the 5-7 MeV $\bar{\nu}_e$ energy region. This latter inconsistency has been dubbed the 'reactor spectrum anomaly'[1-2].

It has been proposed that differences in fission neutron energies between measurements of electron antineutrino ($\bar{\nu}_e$) fluxes and beta spectra could contribute to the observed discrepancies in both rate and spectrum. A significant portion of $\bar{\nu}_e$ measurements at ILL's thermal neutron beam line were generated solely from products of thermal-induced fission. This is crucial since fission product yields are known to depend on the incident neutron energy. Prior research has revealed notable variations in thermal and epithermal nuclear fission yields for particular isotopes and neutron energy ranges that surpass 10%. Nonetheless, more recent studies concentrating on differences from thermal fission mass-yield curves at certain resonance energies or throughout the epithermal range indicate only percent-level changes. Theoretical estimates of powered by energy fission product yields are not yet sufficiently thorough and provide further issues. Given these limitations, it is unsurprising that existing beta-conversion predictions do not account for the impact of non-thermal fissions[3].

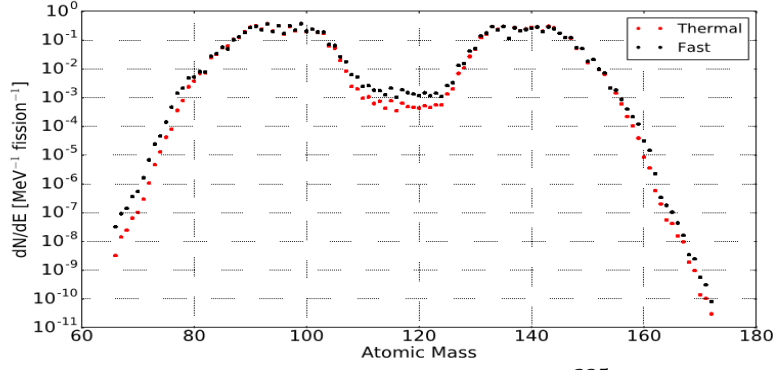


Figure 1: The cumulative fission product yields for (^{235}U) are depicted against the mass number for fission induced by thermal (red) and fast (black) neutrons. There is a noticeable increase in yield from fast neutrons within the valley between the peaks of maximum yield.

The current research aims to evaluate the impact of neutron energy on the production and detection of reactor electron antineutrinos ($\bar{\nu}_e$). We utilize the summation method to compare predicted $\bar{\nu}_e$ fluxes across various reactor scenarios, particularly emphasizing the role of fission neutron energy and its influence on fission yields. Initially, we conduct reactor core simulations to estimate the relative rates of actinide fission across different neutron energy ranges for three distinct reactor types. Subsequently, these simulation results are combined with the anticipated variations in fission daughter yields across neutron energies sourced from nuclear databases like JEFF and ENDF. This combination lets us estimate the $\bar{\nu}_e$ production changes. For three reactor core configurations—comprising low-enriched uranium (LEU) and two highly-enriched uranium (HEU) types—we compare the resulting $\bar{\nu}_e$ flux and spectrum with scenarios involving purely thermal neutron-induced fission. Furthermore, we compare $\bar{\nu}_e$ characteristics among these three reactor core types. Employing this methodology, we explore three potential scenarios outlined above. These scenarios are hypothesized to potentially account for the observed discrepancies in inverse beta decay (IBD) production and spectrum in comparison to forecasts for beta conversion. After considering the relative contributions of resonant and fast neutron-induced fissions in LEU reactors, which differ substantially between the dominant fission isotopes ^{235}U and ^{239}Pu , we find that differences in $\bar{\nu}_e$ production between thermal and non-thermal neutron-generated fissions appear to BLAH. In addition, differences in spectrum region in the 5-7 MeV region of antineutrino energy between the two neutron energy cases appear to be BLAH[4-5].

An explanation of the inputs and computation of the summation

The total amount (or *ab initio*) reactor $\bar{\nu}_e$ spectrum predictions for a given parent fission isotope are derived across a combination of beta spectra from every branch that produces fission products:

$$\frac{dS(E_\nu)}{dt} = \sum_i R_i \sum_j f_{ij} S_{ij}(E_\nu), \quad (1)$$

In simpler terms, R_i represents how quickly fission product i decays, while f_{ij} indicates the likelihood of its decay to excited state j of its beta decay daughter. The term $S_{ij}(E_\nu)$ describes the resulting beta spectrum from this decay, which is influenced by factors such as the energy released in the decay, the energy level of the excited state, and characteristics of both the parent and daughter nuclei. In a stable reactor system, the decay rate R_i of short-lived isotopes, which play a significant role in determining the overall flux of electron antineutrinos ($\bar{\nu}_e$), is proportional to the total fission rate R^f . This relationship is further influenced by the cumulative fission yield Y_i^c , representing the likelihood that a fission event will lead to the production of isotope i either directly through fission or via subsequent beta decay of other fission products. In summation calculations, key parameters

like cumulative fission yield Y_i^c , beta feedings f_{ij} , and the characteristics influencing $S_{ij}(E_\nu)$ are typically sourced from standardized nuclear data tables. The fission rates R^f can be accounted for either by analyzing the electron antineutrino ($\bar{\nu}_e$) flux and spectrum on a per-fission basis or by simulating the reactor core using widely-adopted reactor simulation software packages, as outlined in Section.

For this analysis, we aim to examine the fission rates induced by neutrons from the three primary energy categories: thermal, resonant, and fast. To incorporate this consideration, the Equation needs to be modified to include an additional summation over neutron energy categories:

$$\frac{dS(E_\nu)}{dt} = \sum_{k=t,r,f} R_k^f \sum_i Y_{ik}^c \sum_j f_{ij} S_{ij}(E_\nu). \quad (2)$$

Nuclear databases again give total fission yields Y_{ik}^c , beta feedings f_{ij} , and $S_{ij}(E_\nu)$; R_k^f may be found using reactor simulations[5-6].

There are distinct quantities for thermal and fast fissions in each of the three fission yield databases but no particular information for resonant fissions. We think the yields of resonant fission daughters are equal to those from fast fission to close this gap. The purpose of this technique is to provide a cautious assessment of the relative differences between scenarios using just thermal and non-thermal reactors in terms of electron antineutrino ($\bar{\nu}_e$) spectrum and flux.

Result Cross-Checks

"Up to this point, we have not accounted for systematic uncertainties in our summation calculation. In the following section, we will examine how limitations in database-reported fission yields, nuclear structure data for certain fission products, and using fast fission yields for resonant fission impact our results. The JEFF database reports fission yield measurements with significant systematic uncertainties. Due to the challenge of appropriately handling correlations among fission yield database entries, we did not fully propagate these uncertainties in our summation calculations. Instead, we compare JEFF's reported fission yields with those from other standard nuclear databases." Discrepancies between the fission yield data reported by ENDF and JEFF naturally result in variations in the reported $\bar{\nu}_e$ fluxes and spectra for each fissioning isotope. Figure illustrates the LEU/thermal spectrum ratios for ^{235}U and ^{239}Pu , comparing the default (JEFF) case with the scenario using ENDF yields instead. While JEFF yields indicate a positive ratio at high energies, suggesting an increase in the $\bar{\nu}_e$ spectrum for the LEU case, the ENDF-derived ratio remains relatively constant across the spectrum, indicating minimal change in the $\bar{\nu}_e$ spectrum between LEU and thermal conditions. The differences in $Y_t^c - Y_f^c$ values are reflected in the consistent pattern in the spectrum ratio generated by the ENDF. For isotopes that contribute to most of the high-energy neutrino flux, the JEFF database tends to prefer larger fast fission yields; this leads to a negative $Y_t^c - Y_f^c$. By comparison, the distribution of fast and heat cases is more evenly distributed in ENDF.

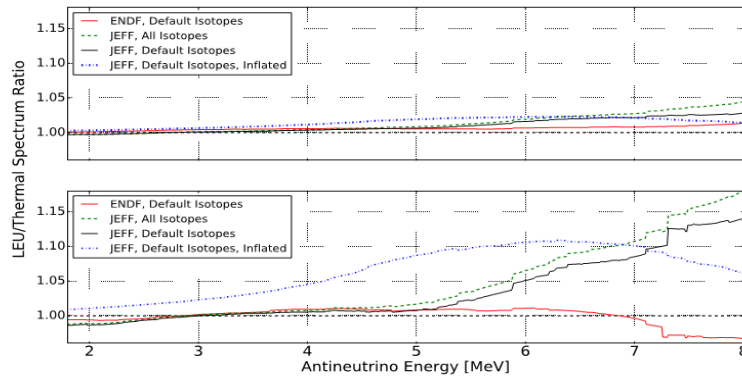


Figure 3: We provide reactor antineutrino energy spectrum ratios between summation $\bar{\nu}_e$ models that take into account fission neutron energies similar to the thermal neutron beamline at ILL

and those similar to those in an LEU pressurized water reactor. The ratios show the default situations for ^{235}U (top) and ^{239}Pu (bottom) that are mentioned in the text, along with ratios for many other circumstances."

The default case's conclusions are predicated on the idea that fission yields for fast and resonant fissions of the same isotope are often comparable. Still, the findings do not clearly suggest a better method, because the completeness and accuracy of current resonant fission yield measurements are limited. This assumption is used to give a cautious estimate of the impact of non-thermal fission, notwithstanding the likelihood of its errors. We also compute LEU/thermal spectrum and flux ratios using a different method of resonant fission yields to confirm these findings. According to the reference, variations of up to 20% from thermal yields are possible in the data on resonant fission yields for high-yield isotopes. We thus investigate an extreme case where the resonant fission yields of the 20 biggest contributors to the 5-7 MeV $\bar{\nu}_e$ flux for thermal ^{235}U and ^{239}Pu are systematically greater by 20% than in the thermal case. We assume identical thermal and resonant fissions for all other isotopes. This assumption, however implausible, provides an extra measure to evaluate the possible effect of non-thermal fissions on the $\bar{\nu}_e$ spectrum measured at reactors. Note that we do not account for fluctuations in IBD yields arising from this scenario, as this adjustment does not conserve the total number of fission daughters per fission. The 'Inflated' instance in Figure also displays this situation's spectral LEU/thermal ratios. Variations from constant in this proportion are 2.5% for ^{235}U and 11% for ^{239}Pu , even if all top-producing isotopes are assigned exaggerated resonant fission yields. These aberrations cannot produce the observed 10% spike in the spectrum at 5-7 MeV, given the dominant role of ^{235}U in the total spectrum. As a result, the extreme method likewise yields the same result as the one discussed in the preceding section. Our knowledge of the nuclear composition of many fission offspring is severely limited because of limitations in fission yields. Comprehensive descriptions of daughter state of excitement and beta feedings f_{ij} are missing for many isotopes reported in the ENDF and JEFF databases. This makes the computation of an average $\bar{\nu}_e$ spectrum for those specific isotopes impractical. As a result, these isotopes are not included in the summing computation under the default situation.

Summary

In this work, we estimated the contribution of fission neutron energy to $\bar{\nu}_e$ production through ^{235}U , ^{239}Pu , and ^{241}Pu fission using summation calculations. We initially investigated what differences in atomic neutron energies exist across reactors, appropriate for $\bar{\nu}_e$ measurements using reactor core models. It was discovered that 6–18% of all ^{235}U fissions for the various LEU and HEU core types under consideration were caused by non-thermal neutrons. On the other hand, the majority of fissions for ^{239}Pu and ^{241}Pu , which make up a significant portion of fissions in PWR reactors, were non-thermal: for ^{239}Pu , and ^{241}Pu , respectively, 70% and 62% of all fissions are non-thermal. Non-thermal fissions are particularly prevalent for ^{239}Pu and ^{241}Pu isotopes due to a significant low-energy fission cross-section resonance. Nevertheless, current estimates of $\bar{\nu}_e$ spectra for beta-conversion, which depend on beta spectrum measures from thermal neutron beamlines, do not account for possible variations in $\bar{\nu}_e$ flux and spectrum caused by these significant contributions from non-thermal fissions.

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Rezyume: Neytron energiya spektri va antineytrino spektrlari yadro reaksiyalari, xususan, beta-parchalanish jarayonlari orqali chambarchas bog'langan. Yadro reaktorlarida ushbu spektrlarni tushunish reaktor monitoringi, neytrino fizikasi tajribalari va yadroviy materiallarni himoya qilish uchun juda muhimdir. Ushbu spektrlarni aniq o'lchash va modellashtirish asosiy yadro jarayonlari haqida tushuncha beradi va asosiy fizika va reaktor monitoringi kabi amaliy dasturlar uchun muhim ahamiyatga ega bo'lgan antineytrinolarni aniqlash va tahlil qilishga yordam beradi. Ushbu tadqiqot antineytrino ishlab chiqarish bo'linish neytronlarining energiyasi bilan qanday bog'liqligini o'rganadi. Neytron energiyasi bo'linish mahsulotlarining turlari va miqdoriga tasir qilganligi sababli, antineytrino spektrlariga bevosita tasir qiladi.

Резюме: Спектр энергии нейтронов и спектры антинейтрино тесно связаны через ядерные реакции, в частности процессы бета-распада. В ядерных реакторах понимание этих спектров имеет решающее значение для мониторинга реакторов, экспериментов по физике нейтрино и защиты ядерных материалов. Точное измерение и моделирование этих спектров дает представление о базовых ядерных процессах и помогает обнаруживать и анализировать антинейтрино, которые имеют важные последствия как для фундаментальной физики, так и для практических приложений, таких как мониторинг реакторов. Это исследование углубляется в то, как производство антинейтрино связано с энергией нейтронов деления. Поскольку энергия нейтронов влияет на типы и количество продуктов деления, она напрямую влияет на результирующие спектры антинейтрино.

Kalit so'zlar: antineytrino oqimi, energiya spektri, issiq va tez neytron reaktorlar

Ключевые слова: поток антинейтрино, энергетический спектр, тепловой и быстрый нейтрон реакторы

UDK 911.5/9

SCIENTIFIC AND THEORETICAL ISSUES OF URBOEKOLOGICAL RESEARCH

Khamroev M.O¹., Khodjaeva G.A².

¹Urgench state university, ²Karakalpak State University name after Berdakh

Summary: *The article describes urban-ecological problems and the general scientific and theoretical issues of their study. In particular, along with social development, urban planning, urban ecology, and the directions of their development are analyzed. In the course of the development of urban ecology, changes in urban-ecological tasks and views, the strengthening of ecological principles in urban planning, the functions of cities and urban planning activities, and gradual changes in the organization of the living environment are described. The problems of urban energy, transport, and waste disposal, the concept of "smart city," "eco-city," and the world experience in their implementation are analyzed. The problems of implementing the programs for the development of the urban ecosystem adopted by the world community and its leading organizations and some scientific views on their solutions are described.*

Keywords: *city project, urban ecology, urban environmental research, environmentally sustainable development.*

Introduction and problem statement.

Cities are the managing and developing link of this area. Their development is directly synchronized with the development of society. As the region's economy grows and the elements of post-industrial society become stronger, cities become larger and more important. In cities - the dense living of people in a small place creates unique urbo-ecological problems. Therefore, the search for solutions to urban planning and related issues has always been considered one of the most urgent issues.

The aim and objectives of the work.

The main purpose of the research work is to describe the formation and development of urboecological studies, modern issues and problems.

To achieve this goal, the following tasks were defined in the research work:

- definition of ecology, including urboecology;
- stages of development of urban planning and urboecology;
- analysis of today's issues and directions of urboecological research and views of leading figures.

Materials and methods.

The work employed systematic scientific material composition, analysis, and synthesis as well as sophisticated visual approaches, methodologies, and techniques. Scientific theories in the field are organized and categorized based on scientific materials.

Main part.

Although urbo-ecological study has origins in more recent history, studies on urban growth and the design of ideal city plans are regarded as its primary pillars. Hippodamius (498–408 BC), Hippocrates (460–370 BC), Plato (428–348 BC), Aristotle (384–322 BC), Vitruvius (460–370 BC), and others in antiquity wrote a number of works on urban planning, the ideal size of settlements, and how to improve them, as well as on various issues relating to building and architecture. Urban ecology's applicability, even in the Middle Ages T. More, J. Vazari, T. Urban planning has been the subject of a number of utopian "ideal" proposals made by Campanella and other writers.

Urboecological issues grew more severe during the industrial era, which was the second part of the 19th century and the first half of the 20th century. The works of E. Howard ("Future City-Parks," 1898) and Tony Garne ("Industrial Cities," 1911") stand out in this age of urbo-ecological research.

In the 1950s and 1960s, the "optimal city" (Le Corbusier, V.G. Davidovich, G.M. Lappo, etc.), the companion city (Avercrombie), I. Friedman's "city-content", the "spatial city" of the group of Japanese metabolists (Kenzo Tange and others), J. Fizion's "suspended city", "cybernetic city" by N. Sheffer, "biotechnical city" by P. Soleri, "skyscraper city" by F. L. Wright, J. Bernard et al.'s "labyrinth city" or "total city" by K. Doxiadis developed utopian, semi-fantastic projects for his time, such as "ecumenopolis".

In the 1970s, a new age in urban planning and urban ecological practices started. The ecopolis (1987) by R. Register, the "biotic city" (1992) by A.N. Tetior, the "sustainable settlement," and V.A. Many initiatives were proposed, including Kolyasnikov's "noosphere city" (2000). Studies on urban ecology are becoming more popular today.

The main concepts and methodological foundations of urboecology were formed in the 1970s and 1980s of the last century. Conceptual approaches (principles) forming the basis of urboecological studies are based on structural-ecological, landscape-ecological, architectural-ecological, and social-ecological principles.

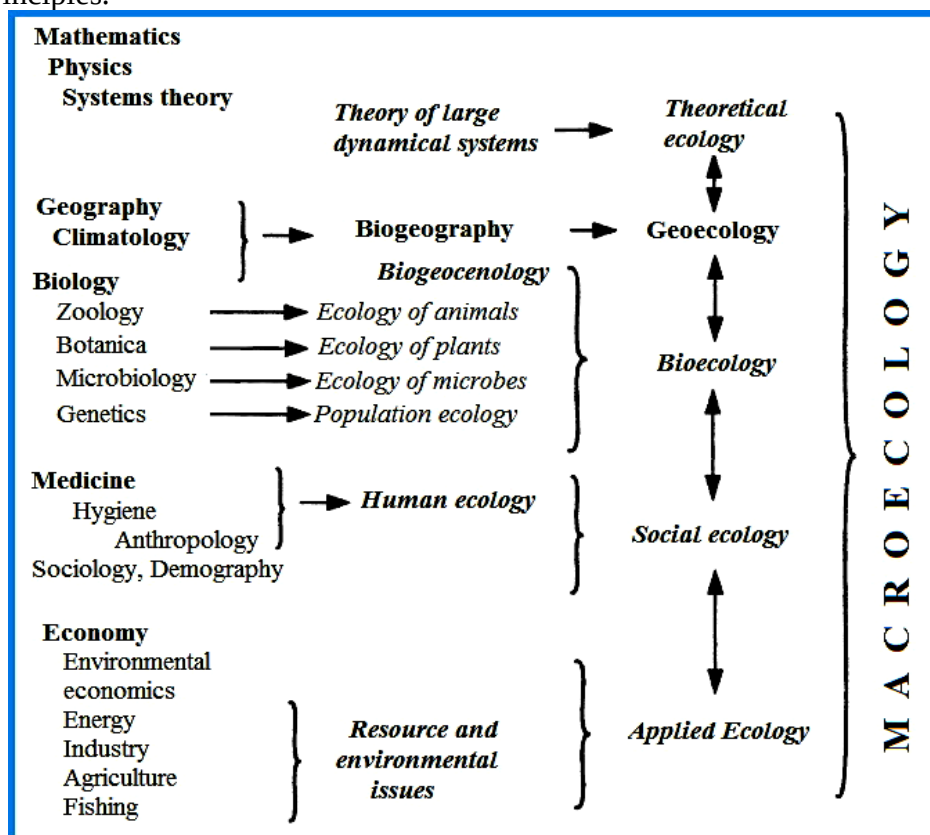


Figure 1. Sources and components of modern ecology in the process of ecologicalization of science and practice.

Source: T.A. Akimova, V.V. Haskin Ecology.-M.: "Unit", 1999.- S. 18. (edited by the authors)

The concept of systemic ecology or ecosystem was introduced by A. Tensley, and then the concept of biogeocenosis, a synonym, was introduced by V. Sukachev [1]. A systematic approach to the use of matter and energy in the environment was formed in the middle stages of the transformation of ecology into macroecology (biogeocenology) (Fig. 1). The landscape-ecological approach (biogeography) has a similar aspect, and the eco-city or eco-architectural views put forward in the 20s of the last century are similar to them.

At the initial stage, the basis of urboecological views is the construction of a city in a way that is convenient for the economic and social life of a person. Since the 1970s of the last century, social-ecological projects promoting the symbiosis of the urban system with the environment have been formed as a concept that forms the main scientific and theoretical basis of urboecology [2, 3, 5].

Corbuse and his followers designed city projects not according to the ecological balance but according to the household and socio-ecological conditions of the population [2, 8].

Literally, the principles of an eco-city, that is, a city in harmony with nature, as we have seen above, began to be developed in the 70-80s of the last century, and based on the tradition of urban development, it can be said that it will take several centuries to "trace" all cities on Earth in harmony with nature.

The issues of urban planning are naturally closely related to the socio-economic development of countries around the world and their achievements in this field. In particular, in developed countries of the world, eco-cities and houses are being built taking into account the criteria of ecological programs in newly built cities and urban areas [7], but in developing countries, the main focus is on meeting the needs of the population for housing, and naturally, such cities in most cases have a technological solution from the middle of the 20th century. In small towns, centralized sewage, water supply, and centralized disposal of waste are lagging behind.

As noted, many projects have been proposed to design the cities of the future (Figure 2). However, most of them are currently not economically feasible, technically feasible, or have a utopian appearance.

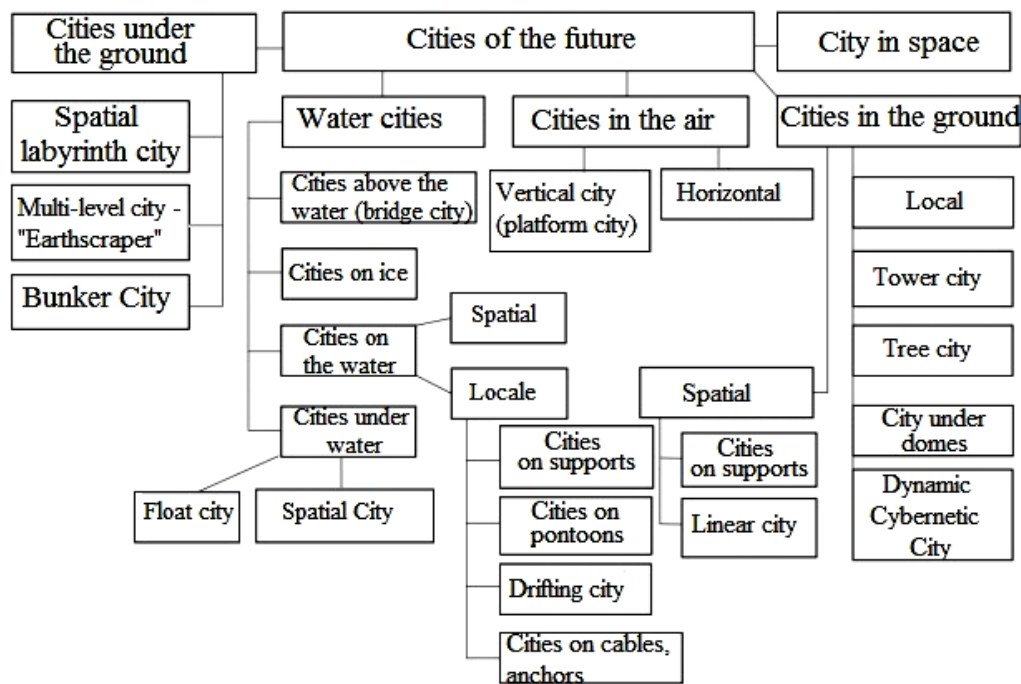


Figure 2. Conceptual classification of "Cities of the Future".

Source: Romanova A.Yu. Transformation of idea: "the ideal city" to "the city of the future"

// AMIT, No. 1 (30), 2015. (electronic magazine) // <https://marhi.ru/AMIT/2015/1kvart15/romanova/abstract.php> (edited by the authors).

In general, the tradition of continuous urbanization in countries around the world will be preserved. By 2025, about 75% of the world's population will live in cities. Urbanization is the evolutionary development of population settlements, which is further enhanced by the development of industrial production and service sectors. Therefore, the main task of urban planning, including urboecology, is to rationally organize the living and social activities of the population in a compact area while maintaining the stability of the environment as much as possible and reducing the anthropogenic impact on it.

Due to the constant growth of cities and their population (mainly due to migration), proper scientific organization of urban planning is important. It is important not only to divide the city into functional and residential areas (Fig. 3), but also to properly organize recreation and service areas.

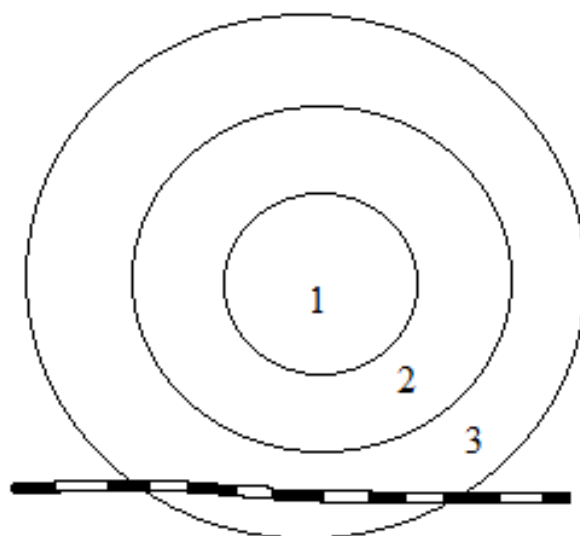


Figure 3. General scheme of the city plan: 1st management; 2-residential buildings; 3rd industry, transport logistics part.

Image courtesy of the authors.

Urboecological studies pay great attention to urban transport issues [6, 8, 9]. Establishing traffic-free zones in the city or studying the technical and technological possibilities of increasing movement zones for bicycles and electric vehicles (scooters, gyroscoters, vehicles for the disabled, etc.) are among the main issues.

In the 1960s and 1970s of the last century, ecological principles have been promoted in Europe and the USA, and the concepts of environmentally sustainable development have been included in the development programs of the UN.

Issues of environmentally sustainable development are included in the "Millennium Development Program" (2000) and the "Development Program" announced by the UN. In particular, in the sub-items of these items, improvement of the conditions of city dwellers living in dilapidated huts, and in the items containing social development, there are various directions for improvement of living places and the health of the population [9]. In the "Millennium Development Program," a number of issues were set to be completed by 2015, but they have not been fully completed yet. In general, urboecological research is currently being conducted in the following directions:

- correct division of the city into functional parts;
- proper organization of city transport routes and logistics and the introduction of digital technologies to its management;
- "greening" of city energy;
- "greening" of city quarters, taking into account climatic and landscape factors;
- increase of green zones in the city, zones free from transportation that destroy the city's ecology;
- reducing the impact of city buildings on soil and water layers;
- bringing the social service cluster in the city as close to the population as possible and facilitating it;
- improvement of the waste disposal system, minimization of the impact on the environment, etc.

At the beginning of the 21st century, a contradictory problem situation was formed, which included, firstly, the issue of providing new economic opportunities to humanity and reducing social inequality, and secondly, reducing the man-made pressure on the environment. In order to solve this conflict, the concept of sustainable development was put forward by the UN, which envisages connecting the economic development of countries with the possibilities and productivity of the ecosystem that surrounds us without harming nature or future generations of people.

As some authors have pointed out, the concept of sustainable development has been received differently by the public.

In particular, scientists and the public who do not support this principle have criticized it by interpreting it as a myth, utopia, or metaphor. They point out that the issues of creating and developing a sustainable social ecosystem are not sufficiently scientifically based. As we have mentioned, in developed countries, while the programs that envisage the sustainable development of man with nature are being implemented, the problems of housing, food, epidemic diseases, and ending poverty are considered to be the first priority. Therefore, the American scientist D.R. Winner considers the idea of achieving absolute environmental sustainability a myth [4, 9].

Other scientists consider the concept from a general philosophical point of view (V.A. Koptyug, N.P. Leverov, V.M. Matrosov, A.D. Ursul), including from an architectural point of view (V. N. Belousov, Vladimirov, A. V Ikonnikov, G. V. Mazaev, T. A. Savarenskaya, I. M. Smolyar, V. A. Kolyasnikov and others) [4].

Some researchers rightly argue that recognizing the idea of sustainable development as a utopia, myth, or metaphor does not exclude its use in urban planning. As we have seen above, these visions have started to be implemented in urban planning in the form of creating green balconies and roofs, independent houses using alternative energy, and buildings with unusual but energy-saving designs. These approaches gave rise to views on the possibility of interpreting the concept of sustainable urban development as an ideal system; "sustainable city" projects were put forward [5].

Conclusions.

Thus, in our opinion, the concept of sustainable development and sustainable cities should not be promoted by some experts as ideal or utopian projects, but their useful elements should be introduced into projects of sustainable eco-cities through scientific research. Because in a short period of history, man seriously damaged the ecology of our planet, and its scale threw us into a vortex of extremely complex social and ecological problems. Excessive densification of the social environment, increased migration processes related to poverty, food, housing, and other problems, and various epidemic diseases are on the rise. Their solution first of all requires solving the problem of human development in harmony with the natural landscape.

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Rezyume: Ushbu maqolada shahar-ekologik muammolari va ularni o'rganishning umumiy ilmiy-nazariy masalalari yoritilgan. Xususan, ijtimoiy taraqqiyot bilan bir qatorda shaharsozlik, shahar ekologiyasi, ularning rivojlanish yo'nalishlari tahlil qilinadi. Shahar ekologiyasining rivojlanishi jarayonida shahar-ekologik vazifalar va qarashlarning o'zgarishi, shaharsozlikda ekologik tamoyillarning mustahkamlanishi, shaharlar va shaharsozlik faoliyatining vazifalari, yashash muhitini tashkil etishning bosqichma-bosqich o'zgarishi bayon etilgan. Shahar energetikasi, transporti, chiqindilarni utilizatsiya qilish muammolari, "aqlli shahar", "ekologik shahar" tushunchalari hamda ularni amalga oshirishda jahon tajribasi tahlil qilingan. Jahon hamjamiyati va uning yetakchi tashkilotlari tomonidan qabul qilingan shahar ekotizimini rivojlantirish dasturlarini amalga oshirish muammolari va ularni hal etish bo'yicha ayrim ilmiy qarashlar bayon etilgan.

Резюме: В данной статье рассмотрены урбано-экологические проблемы и общенаучные, а также теоретические вопросы их изучения. В частности, наряду с социальным развитием анализируются градостроительство, городская экология и направления их развития. В ходе развития городской экологии описываются изменения урбано-экологических задач и взглядов, усиление экологических принципов в градостроительстве, функции городов и градостроительной деятельности, постепенные изменения в организации среды обитания. Анализируются проблемы городской энергетики, транспорта и утилизации отходов, концепции «умного города», «экогорода», мировой опыт их реализации. Описаны проблемы реализации программ развития городской экосистемы, принятых мировым сообществом и его ведущими организациями, и некоторые научные взгляды на их решение.

Kalit so'zlar: shahar loyihasi, shahar ekologiyasi, shahar atrof-muhit tadqiqotlari, ekologik barqaror rivojlanish.

Ключевые слова: городской проект, городская экология, исследование, городская среда, экологически устойчивое развитие.

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ENSURING FINANCIAL STABILITY OF INSURANCE COMPANIES AND ITS MANAGEMENT

Allanazarova B.K.

Karakalpak State University name after Berdakh

Summary: *This article examines strategies and practices aimed at ensuring the financial stability of insurance companies in Uzbekistan. Through statistical analysis of key financial indicators such as solvency ratios and profitability measures, it evaluates current management approaches and their effectiveness in maintaining stability within the Uzbek insurance sector. The findings underscore the significance of robust regulatory frameworks and proactive risk management strategies in sustaining financial health amidst evolving economic conditions.*

Keywords: *Insurance companies, financial stability, management, solvency ratios, risk management, regulatory framework.*

Introduction. The financial stability of insurance companies is a critical component in the overall health of any economy. In Uzbekistan, a country transitioning towards a more market-oriented economy, the stability and effective management of its insurance sector are particularly vital. As the insurance industry serves as a cornerstone for risk management and financial planning for both individuals and businesses, ensuring its robustness directly impacts the economic resilience and growth prospects of the nation.

The insurance market in Uzbekistan has been evolving rapidly, influenced by regulatory reforms, economic policies, and an increasing awareness of the importance of insurance among the populace. However, this growth also brings challenges, including the need for improved regulatory frameworks, enhanced risk management practices, and the development of financial strategies that can withstand economic fluctuations[5, 3].

This study aims to explore the mechanisms that underpin the financial stability of insurance companies in Uzbekistan. It will delve into the regulatory landscape, assess the financial health of key players in the market, and identify best practices in risk management and financial oversight. By examining these factors, the research seeks to provide insights and recommendations that can help policymakers, industry leaders, and stakeholders to fortify the insurance sector against potential instabilities.

Through a comprehensive analysis, this study will contribute to the ongoing efforts to build a resilient and well-managed insurance industry in Uzbekistan, ensuring it can effectively support the country's economic development and provide security to its citizens [1].

Methods. *Quantitative Analysis*

- Financial Ratio Analysis: Examine key financial ratios such as the solvency ratio, liquidity ratio, claims ratio, and combined ratio. These ratios provide insights into the financial health and stability of insurance companies.

- Trend Analysis: Analyze historical financial data to identify trends in profitability, capital adequacy, and claims management. This can highlight patterns and predict future stability.

- Stress Testing: Conduct stress tests to evaluate the resilience of insurance companies under various economic scenarios. This involves simulating adverse conditions, such as economic downturns or high claim events, to assess their impact on financial stability.

Regulatory and Compliance Review

- Regulatory Compliance Assessment: Review the extent to which insurance companies comply with regulatory requirements set by Uzbekistan's insurance regulatory authority. This includes capital requirements, solvency margins, and reporting standards.

- Policy and Framework Analysis: Examine the regulatory framework governing the insurance industry in Uzbekistan. Evaluate the effectiveness of existing policies in promoting financial stability and protecting policyholders.

Risk Management Evaluation

- Risk Assessment Practices: Investigate the risk assessment and management practices of insurance companies. This includes evaluating underwriting standards, claims management processes, and reinsurance strategies.

- Enterprise Risk Management (ERM): Assess the implementation of ERM frameworks within insurance companies. ERM involves identifying, assessing, and managing all types of risks across the organization.

Market and Industry Analysis

- Market Structure Analysis: Analyze the structure of the insurance market in Uzbekistan, including market concentration, competition levels, and market share distribution. Understand how these factors impact financial stability.

- Industry Benchmarking: Compare the performance of Uzbek insurance companies with regional and international benchmarks. This can provide insights into their relative stability and competitiveness.

By employing a combination of these methods, researchers can gain a comprehensive understanding of the factors influencing the financial stability of insurance companies in Uzbekistan. This multi-faceted approach allows for a thorough analysis of both quantitative and qualitative aspects, leading to more informed recommendations for improving the sector's stability and management[5].

Results. 1. Market Size and Growth

- Total Gross Written Premiums (GWP): An increase in total GWP indicates market expansion. For example, in recent years, the total GWP in Uzbekistan's insurance market has shown significant growth, reaching approximately \$90,8 billion in 2023 [7].

- Annual Growth Rate: The insurance sector has been growing at an average annual rate of 15-20%, reflecting both increased penetration and expansion of insurance products.

2. Insurance Penetration Rate

- Penetration Rate: The ratio of total insurance premiums to GDP. In Uzbekistan, the insurance penetration rate has been relatively low, at about 0.4% in recent years, compared to the global average of around 6%. This highlights the potential for market expansion.

3. Capital Adequacy

- Solvency Ratio: This measures the financial health of insurance companies. A solvency ratio above 100% is generally considered healthy. In Uzbekistan, major insurers have maintained solvency ratios in the range of 120-150%, indicating strong capital adequacy.

4. Claims Ratio

- Claims Ratio: The ratio of claims paid to premiums earned. A lower claims ratio indicates profitability and financial stability. In Uzbekistan, the average claims ratio for the industry has been around 40-50%, suggesting efficient risk management and underwriting practices.

5. Investment Performance

- Investment Income as a Percentage of Total Income: Investment performance significantly impacts the financial stability of insurers. In Uzbekistan, investment income constitutes about 10-15% of total income for insurance companies, highlighting the importance of prudent investment strategies.

6. Regulatory Compliance

- Compliance Rate: The percentage of insurance companies meeting regulatory requirements, such as capital requirements, reporting standards, and solvency margins. In Uzbekistan, regulatory compliance rates are high, with over 90% of companies adhering to the established guidelines.

7. Market Concentration

- Market Share of Top 5 Insurers: The top five insurance companies in Uzbekistan hold approximately 70% of the market share, indicating a moderately concentrated market. This concentration can impact competition and financial stability.

8. Customer Satisfaction and Retention Rates

- Customer Retention Rate: The percentage of policyholders renewing their policies annually. A high retention rate, above 80%, indicates customer satisfaction and trust in the financial stability of insurers.

- Customer Satisfaction Scores: Surveys and feedback mechanisms often show an increasing trend in customer satisfaction, reflecting improvements in service quality and financial management.

9. Risk Management Practices

- Risk-Based Capital (RBC) Ratio: This measures the adequacy of an insurer's capital in relation to its risk exposure. Uzbek insurance companies typically maintain RBC ratios well above the minimum required, demonstrating sound risk management practices.

10. International Credit Ratings

- Credit Ratings of Major Insurers: International credit rating agencies such as Moody's and Standard & Poor's often rate major Uzbek insurers. Higher credit ratings (e.g., BBB and above) indicate strong financial stability and management [4].

These statistics collectively provide a comprehensive overview of the financial stability and management effectiveness of insurance companies in Uzbekistan. They highlight the sector's growth potential, current financial health, and areas needing improvement to ensure long-term stability and resilience.

Discussion. *Regulatory Framework and Compliance.* The regulatory environment in Uzbekistan plays a crucial role in maintaining the financial stability of insurance companies. The Insurance Market Supervisory Board oversees compliance with financial regulations, capital adequacy, and solvency requirements. Recent reforms have aimed to align local regulations with international standards, enhancing transparency and robustness. However, further improvements are needed to ensure that regulations are adaptive to emerging risks and market dynamics. The effectiveness of these regulations depends significantly on the enforcement mechanisms and the capacity of regulatory bodies to monitor and respond to financial vulnerabilities [3].

Financial Health and Performance Metrics. Analyzing financial ratios such as solvency, liquidity, and claims ratios provides a clear picture of the industry's health. Most Uzbek insurance companies have maintained solvency ratios above 100%, indicating strong capital buffers. However, the low insurance penetration rate, currently around 0.4%, suggests that there is substantial room for market growth. Increasing awareness and expanding insurance products to underserved segments can boost this rate, contributing to financial stability through a broader premium base.

Risk Management Practices. Effective risk management is essential for the stability of insurance companies. In Uzbekistan, companies are gradually adopting more sophisticated risk management frameworks, including Enterprise Risk Management (ERM). However, the adoption rate varies widely among companies, and there is a need for more comprehensive training and capacity building in this area. Stress testing and scenario analysis should become standard practices to prepare companies for potential economic shocks or large-scale claims events.

Market Dynamics and Competition. The insurance market in Uzbekistan is moderately concentrated, with the top five insurers holding about 70% of the market share. While this concentration can lead to stability through stronger, well-capitalized firms, it may also stifle competition and innovation. Encouraging the entry of new players and fostering a competitive environment can lead to better services and products, ultimately strengthening the market. Additionally, enhancing market transparency and reducing barriers to entry can stimulate healthy competition[6].

Conclusion. Ensuring the financial stability of insurance companies in Uzbekistan is crucial for economic resilience and growth. Key strategies include strengthening the regulatory framework to align with international standards, adopting comprehensive risk management practices, and

encouraging market competition and growth. Technological integration, such as big data analytics and insurtech solutions, can enhance operational efficiency and risk assessment. Prudent investment strategies and maintaining macroeconomic stability through sound fiscal and monetary policies are also essential. Building consumer trust through transparency and excellent customer service will increase market penetration, contributing to the overall stability and robustness of the insurance sector in Uzbekistan. Collaborative efforts among policymakers, regulators, and industry stakeholders are vital to achieving these goals.

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Rezyume: Ushbu maqolada O'zbekistondagi sug'urta kompaniyalarining moliyaviy barqarorligini ta'minlashga qaratilgan strategiya va amaliyotlar muhokama qilinadi. To'lov qobiliyati koeffitsientlari va rentabellik koeffitsientlari kabi asosiy moliyaviy ko'rsatkichlarning statistik tahlilidan foydalanib, joriy boshqaruv yondashuvlari va ularning O'zbekiston sug'urta sektorida barqarorlikni saqlashdagi samaradorligi baholanadi. Natijalar o'zgaruvchan iqtisodiy sharoitlarda moliyaviy salomatlikni saqlash uchun kuchli me'yoriy-huquqiy baza va proaktiv risklarni boshqarish strategiyasining muhimligini ta'kidlaydi.

Резюме: В данной статье рассматриваются стратегии и практика, направленные на обеспечение финансовой устойчивости страховых компаний Узбекистана. С помощью статистического анализа ключевых финансовых показателей, таких как коэффициенты платежеспособности и коэффициенты рентабельности, оцениваются текущие подходы к управлению и их эффективность в поддержании стабильности в страховом секторе Узбекистана. Результаты подчеркивают важность сильной нормативно-правовой базы и активной стратегии управления рисками для поддержания финансового здоровья в меняющейся экономической среде.

Kalit so'zlar: Sug'urta kompaniyalari, moliyaviy barqarorlik, menejment, to'lov qobiliyati koeffitsientlari, risklarni boshqarish, huquqiy asos.

Ключевые слова: Страховые компании, финансовая устойчивость, менеджмент, коэффициенты платежеспособности, риск-менеджмент, правовые основы

**INFLUENCE OF PHYSICAL ACTIVITY ON MORPHOLOGICAL STATUS OF
ATHLETES OF KARAKALPAKSTAN**

Rozumbetov K.U¹., Kdyrbaeva N.B².

*¹Acting Associate Professor of the Department of Veterinary Diagnostics and Food Safety, Nukus
Branch of Samarkand State University of Veterinary Medicine, Animal Husbandry and
Biotechnology*

²Basic doctoral student of Karakalpak State University

Summary: *In this article, an attempt was made to determine the anthropometric profile and body type (somatotype) of athletes 20-22 years old living in the Republic of Karakalpakstan. The assessment of somatotype by the Heath-Carter measurement method showed that athletes have predominantly types with significant mesomorphy.*

Key words: *somatotype, sports training, athletes, anthropometric indicators, Republic of Karakalpakstan*

1. Introduction. Most researchers believe that constitution is determined by hereditary factors. However, external factors, both biological and social, also influence it and cause its change. Consequently, according to a large number of researchers, somatotype is a marker of temporal indicators of ontogenesis. A number of authors propose to distinguish somatic types among athletes and assess their morphofunctional compliance with the type of sport [2]. This, in their opinion, makes it possible to conduct early selection and orientation in sports activities. Somatotype has high prognostic and practical significance, determines the pace of human ontogenesis, is widely used in sports practice and physical education of children, adolescents and adults [5].

At present, the most famous, especially abroad, is the quantitative method of determining somatotypes according to Sheldon, who first applied quantitative assessment of the three so-called primary components of physique - endomorphy, mesomorphy and ectomorphy, which are sufficiently genetically determined, but at the same time reflect the influence of external (physical and social) factors on the body. All of the above, despite the ongoing discussions among researchers about the choice of approach and methodology of somatotyping, gives reason to consider somatotype as a rather integrative characteristic of functional, adaptive and working capabilities of the organism. Most authors agree that the basic principles of rational technology of training process are based on the consideration of type-specific features of the child, when each somatotypic group is characterized by its own specific mechanisms of physiological adaptation, its own way to achieve the typological norm.

In this regard, it was interesting to see to what extent the type-specific approach to individual-group rationing of training loads can be applied in game sports in the process of sports training of young athletes. A positive solution to this issue will allow us to approach the most individualized model of sports training, preventing the onset of negative effects in the health of young athletes, to put the regulatory requirements in line with the functional characteristics and adaptive capabilities of children and adolescents engaged in sports.

2. Methods.

2.1. Participants and study area. The study was conducted in the spring of 2024. The study involved 64 student-athletes of Karakalpak State University aged 20-22 years old living in the Republic of Karakalpakstan. All volunteers gave verbal consent to participate in the study.

2.2. Anthropometrics. Anthropometric parameters were measured according to the procedures recommended at the Airlie Conference on the Standardization of anthropometric measurements [16]. They were assessed by two experienced researchers in the morning under comfortable environmental conditions (temperature 18-20°C, humidity 50-60%) in a separate medical room with artificial lighting.

Stature and sitting height were assessed using a mobile stadiometer SECA 217, Germany with a measurement accuracy of 0.1 cm. For standing height (StH) assessment subject positioned in the standard erect posture: erect with the heels together and the upper limbs hanging at the sides, head position required Frankfort Horizontal Plane. To measure sitting height (SiH) subject sits erect on a bench 50 cm high with the head in the Frankfort Horizontal Plane, the thighs placed horizontal and hands resting on the thighs in a cross-handed position. The examiner's left hand is placed under the subject's chin to maintain the correct position of the head, and the right hand moves the head slider of the anthropometer to the highest point of the head in the sagittal plane. The subject takes a deep breath, the examiner takes a position to observe the stadiometer scale without parallax, the SiH value is recorded. Stature minus SiH is used to provide an estimate of lower extremity (subischial leg length, LL) height.

To measure body weight (BW), the subject stands still over the center of the platform with the body weight evenly distributed between both feet. BW was assessed using electronic flat scales SECA 876, Germany with measurement accuracy up to 100 g. Body mass index (BMI) was calculated using the Quetelet formula.

To measure the diameters (breadth) of large joints, a sliding caliper (KAFA, Russia) was used, with measurement accuracy up to 0.1 cm. Knee breadth (KB) is defined as the distance between the medial and lateral femoral epicondyles with sitting subject at flexed leg 90°. The epicondyle is palpated and caliper tips are placed on these points, and the breadth is recorded. Elbow breadth (EB) measurement requires to define the distance between the epicondyles of the humerus.

Non-elastic ergonomic circumference measuring tape SECA 203, Germany was used to measure limb circumference with an accuracy of 0.01 cm. For measurement Upper-Arm circumference (U-AC) the subject stands erect, with the arms hanging freely at the sides of the trunk and with the palms facing the thighs. The researcher located the midpoint of the upper arm on which the tape was placed. Calf circumference (CC) measurements were taken in a standing position with the feet approximately 20 cm apart with an even distribution of body weight. An inelastic tape measure is positioned horizontally around the calf so that the zero mark is visible. Waist circumference (WC) was measured by applying the tape in a horizontal plane, at the level of the natural waist, which is the narrowest part of the torso. To measure Hip circumference (HC), the subject should stand erect with arms at the sides and feet together. The anthropometrist squats at the side of the subject so that the level of maximum extension of the buttocks can be seen. An inelastic tape is placed around the buttocks in a horizontal plane at this level without compressing the skin with the help an assistant is needed to help position the tape on the opposite side of the subject's body. The zero end of the tape should be below the measurement value. The measurement is recorded using a tape scale.

The inclusion of overweight subjects in the sample, especially if they were overweight in one of the experimental groups, could have significantly limited the results of this study. Therefore, in addition to BMI, measurements of the skin-fat fold, we assessed the waist-to-hip ratio. Waist-to-hip ratio is well known as an indicator of metabolic syndrome, obesity and a predictor of cardiovascular disease not only in adults, but also in children [15, 17]. According to WHO recommendations, the «threshold» waist-to-hip ratio value for diagnosing obesity in men is 0.90 [20]. Therefore, in this work we were guided by the given Waist-to-hip ratio values.

The skinfolds were measured using a professional caliper ET MEASURE model SK-101, China, with spring calibrated to produce equal pressure (0.01 kg/mm²) on both sides of the fold, and the accuracy of the measurement was 0.2 mm.

The subscapular skinfold (SubSS) is picked up on a diagonal, inclined infero-laterally approximately 45° to the margo medialis scapulae just inferior to its inferior angle. The subject stands comfortably erect, with the upper extremities relaxed at the sides of the body. The suprailiac skinfold (SupraIS) is measured in the midaxillary line immediately superior to the iliac crest. The subject stands with feet together and in an erect position, the arms hang by the sides. ASupraIS is grabbed obliquely (at 45° to the horizontal) just posterior to the midaxillary line following the natural cleavage

lines of the skin. The triceps skinfold (TS) is measured standing in the midline of the posterior aspect of the arm, over the triceps muscle, at a point midway between the lateral projection of the acromion process of the scapula and the inferior margin of the olecranon process of the ulna. The skinfold is measured with the arm hanging loosely and comfortably at the subject's side. The anthropometrist stands behind the subject and places the palm of his or her left hand on the subject's arm and picked up with the left thumb and index finger and applies the caliper jaws. For the measurement of the medial calf skinfold (CS), the subject sits with the knee on the side to be measured flexed to about 90°, with the sole of the corresponding foot on the floor. The skinfold is measured medially at the level of maximum development of the calf muscles.

2.3. Somatotyping. Somatotyping was performed by the Heath–Carter method, and based on Sheldon's physical taxonomy, which assumes all possible body types are categorized on three somatotypes [11]. Pure ectomorph is characterized as skinny, tall subject with long limbs and a short body; pure mesomorph – hard and strong, with even weight distribution, muscular, thick-skinned; pure endomorph – usually short, with a high content of body fat, and a subject with a long body and short limbs [11]. In 1960, Heath and Carter proposed a formulaic approach based on a series of equations that allows one to calculate the degree of involvement of ectomorphic (ECTO (1)), mesomorphic (MESO (2)) and endomorphic (ENDO (3)) components in the total body shape of a particular subject [11]. Application of the Heath–Carter formula requires the measurement of the 10 anthropometric parameters: StH, BW, KB, EB, U-AC, CC, SubSS, SupraIS, TS, CS [11]:

$$\text{ECTO (HWR, height-to-weight ratio)} = \frac{\text{StH,cm}}{\sqrt[3]{\text{BW,kg}}}; (1)$$

$$\text{If HWR} \geq 40,75, \text{ then ECTO} = 0,732 * \text{HWR} - 28,58$$

$$\text{If HWR from } 38,25 \text{ to } 40,75 \text{ then ECTO} = 0,463 * \text{HWR} - 17,63$$

$$\text{If HWR} \leq 38,25 \text{ then ECTO} = 0,5$$

$$\text{MESO} = (0,858 * \text{EB, cm} + 0,601 * \text{KB, cm} + 0,188 * (\text{U} - \text{AC, cm} - \frac{\text{TS,mm}}{10}) + 0,161 * (\text{CC, cm} - \frac{\text{CS,mm}}{10}) - (0,131 * \text{StH, cm}) + 4,5; (2)$$

$$\text{ENDO} = - 0,7182 + 0,1451 * X - 0,00068 * X^2 + 0,0000014 * X^3; (3)$$

$$X = (\text{TS, mm} + \text{SubSS, mm} + \text{SupraIS, mm}) * (\frac{170,18}{\text{StH, cm}})$$

2.4. Statistical Analysis. The results were considered statistically significant at $p < 0.05$. All results were performed using Excel program functions installed in Microsoft Office 2010 application package; using MicroCAL OriginPro 8.5.0 statistical data processing program. All data are presented as mean (μ) values and lower (LL) and upper limit (UL) of the 95% confidence interval (μ ; (LL; UL 95% CI)) of the anthropometric parameter.

3. Results.

Features of anthropometric indicators of athletes living in the Republic of Karakalpakstan (South Prearalie) are shown in Table 1.

Table 1. Anthropometric parameters for athletes living in the Aral Sea region (μ ; 95% CI) (n=64)

Parameter	Values
Standing height (StH), cm	174,55 (173,15; 175,95)
Body weight (BW), kg	70,77 (68,73; 72,81)
Body mass index (BMI), kg/m ²	23,26 (22,57; 23,94)
Sitting height (SiH), cm	79,45 (78,59; 80,32)
Leg length (LL), cm	95,35 (94,24; 96,47)
Knee breadth (KB), cm	8,05 (7,95; 8,15)

Elbow breadth (EB), cm	7,11 (7,02; 7,19)
Upper-Arm circumference (U-AC), cm	31,33 (30,74; 31,93)
Calf circumference (CC), cm	35,94 (35,35; 36,52)
Subscapular skinfold (SubSS), cm	0,94 (0,86; 1,02)
Suprailiac skinfold (SupraIS), cm	0,80 (0,72; 0,88)
Triceps skinfold (TS), cm	0,71 (0,64; 0,77)
Calf skinfold (CS), cm	0,87 (0,79; 0,96)
Ectomorphic (ECTO), value	2,39 (2,06; 2,71)
Mesomorphic (MESO), value	3,97 (3,68; 4,27)
Endomorphic (ENDO), value	2,41 (2,18; 2,65)
Waist circumference (WC), cm	78,29 (76,84; 79,73)
Hip circumference (HC), cm	91,65 (90,45; 92,85)
Waist-to-hip ratio	0,85 (0,84; 0,86)

When assessing the somatotype using the Heath-Carter measurement method [11], it was revealed that athletes have predominantly types with significant mesomorphy (over 50%) (Fig. 1).

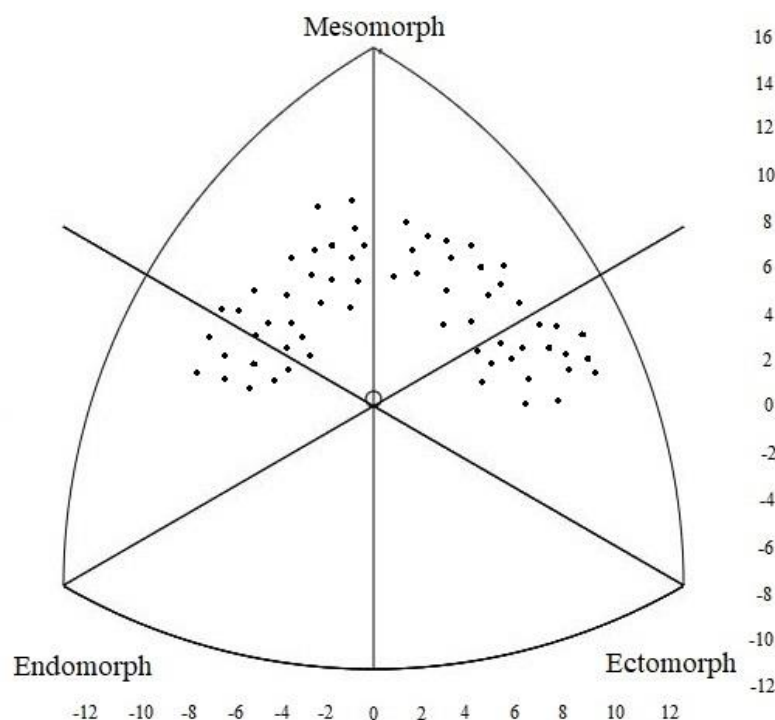


Figure 1. Individual athlete somatotype values on the Heath-Carter diagram

4. Discussion.

The analysis of average values of somatotype components of the Heath-Carter scheme allows us to conclude that young athletes have a significant increase in mesomorphy mainly due to the muscular component of body mass and a decrease in ectomorphy. According to the literature, athletes older than 15 years of age have an increased process of ectomorphy, while mesomorphy and endomorphy have a decreased process. Since this process contradicts the usual age-related growth dynamics, it can be assumed that the somatotype of highly qualified athletes is formed to a large

extent due to selection. Undoubtedly, the most important morphological criterion of sports selection and individualization of the training process should be the somatotype as a morphological manifestation of the constitution, which determines the rate of growth, aging, direction of development and reactivity of the organism to external influences [6]. There are also indications in the literature that young athletes of different somatotypes differ not only in their success in performing exercises of different orientations, but also in their success in performing different physical exercises of the same orientation [19].

According to V.N. Dorokhov (2000), in speed and power sports (throwing, shot put) the main mass is made up of athletes of megalosomal type. Among the sports where technical skill comes first, micromesosomal and mesosomal types with differently expressed muscle mass of upper and lower limbs depending on the sport prevail [3]. In sports games at different stages of athletes' training the factor weight of morphological indices changes significantly, only the tendency to macrosomia remains unchanged.

There are a number of studies in the literature that allow us to speak about the positive influence of the system of motor fitness assessment based on the identification of the typological affiliation of young athletes [10]. Thus, the studies show differences between representatives of different constitutional types in the structure of motor capabilities and in the dynamics of adaptive restructuring under the influence of a standard training regimen. In this case, the use of type-specific physical training gave the greatest training effect [9, 14].

In the literature, looking at the links of body structure with the endocrine situation in the body of adolescents, determined an increase in growth hormone in adolescents of muscular physique and a significant decrease in hormone in adolescents of digestive somatotype [13]. It has also been shown in studies that the greatest adaptive potential of the cardiovascular system is possessed by representatives of the digestive somatotype, and the least by representatives of the asthenic type [4, 8].

In the study by S.D. Runenko (2010), the dependencies of physical performance indicators (PWC₁₇₀) and total body endurance (MOC) in girls of different somatic types were revealed [7]. Thus, work capacity increased in the series: Thoracic > Asthenoid > Muscular > Digestive. Whereas the indices of total endurance in the series of somatotypes increased in a slightly different way: Asthenoid > Thoracic > Muscular > Digestive.

Previously, the authors showed that the highest performance on the PWC₁₇₀ test was registered in boys of muscular type, the lowest - in representatives of digestive and digestive-muscular types, respectively [1].

In addition to hereditary predisposition, the role of environmental factors and socio-economic conditions in the formation of human physique is great. A number of studies have established that, in accordance with the general ecological rules of Bergman Allen, human body length varies depending on the remoteness of the place of residence from the equator [6]. *Using multivariate analysis of morphological traits, A. Froment (1999) showed that climate is an important factor in morphological differentiation [12]. At the same time, somatometric parameters react differently to changing environmental conditions. Thus, K. Sharma (1997) revealed that the most stable to the influence of external factors are the dimensions of the head and face, the least stable are fat folds [18].*

5. Conclusion.

The body of athletes has higher functional characteristics, which, in turn, can contribute not only to the improvement of sports results, but also to better resistance to unfavorable climatic conditions of the Southern Priaralie. Sports activities of the Aral Sea region residents stimulate the development of functional reserves of the organism, improve adaptation mechanisms, which undoubtedly positively affects the vitality of the organism.

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Rezyume: *Ushbu maqolada Qoraqalpog‘iston Respublikasida yashovchi 20-22 yoshli sportchilarning antropometrik profili va tana tipini (somatotipini) aniqlashga harakat qilindi. Heath-Carter o'lchov usuli yordamida somatotipni baholash muhim mezomorfiyasi bo'lgan sportchilarning ustunligini ko'rsatdi.*

Резюме: *В данной статье была сделана попытка определить антропометрический профиль и тип телосложения (соматотип) спортсменов 20-22 лет, проживающих в Республике Каракалпакстан. Оценка соматотипа по методу измерения Хит-Картера показала, что у спортсменов преобладают виды со значительной мезоморфией.*

Kalit so'zlar: somatotip, sport mashg'ulotlari, sportchilar, antropometrik ko'rsatkichlar, Qoraqalpog'iston Respublikasi

Ключевые слова: соматотип, спортивная подготовка, спортсмены, антропометрические показатели, Республика Каракалпакстан

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INFLUENCE OF MIXING VALENCE BAND STATES TO THE CONDUCTION BAND STATES ON TWO-QUANTUM LINEAR-CIRCULAR DICROISM IN SEMICONDUCTORS

Rasulov R.Ya., Rasulov V.R., Mamatova M.A., Kodirov N.U.

Fergana State University

Summary: A quantitative theory of two-photon linear-circular dichroism caused between the subbands of light and heavy holes of the valence band and conduction band is constructed, which takes into account the admixture of valence band states to the conduction band states and the temperature dependence of the band gap ($E_g(T)$) in semiconductors of tetrahedral symmetry in the approximation of the Kane model. It is shown that the type of oscillatory angular dependence or the amplitude values of the probabilities of two-photon optical transitions depend on the state of light polarization. This is due to the fact that, under the influence of linearly polarized light, alignment along the pulse occurs, and under the action of circularly polarized light, the moments of current carriers are oriented. It has been determined that the probability of two-photon optical transitions from the heavy hole subband to the conduction band of semiconductors at a fixed temperature increases with increasing frequency and passes through a maximum and sharply decreases regardless of the degree of polarization of light, as well as the band gap.

Keywords: Probability of two-photon absorption of light, frequency, temperature, oscillation dependence, degree of polarization of light, linear-circular dichroism, semiconductor, multiband Kane model.

Introduction

Currently, the main research in the field of multiphoton (multi-quantum) absorption of light is carried out in wide-band semiconductors, since a number of their physical and chemical properties have been studied deeply and in more detail. In this regard, multi-quantum effects occurring in narrow-band crystals have been little studied in both theoretical and experimental aspects. The main reason for this is that the theoretical study of a number of optical phenomena in narrow-band crystals requires the use of not only the Luttinger-Kohn approximation, but also the multiband Kane approach.

The first works on two-quantum interband transitions in crystals were carried out in the early 1960s shortly after the advent of lasers [1-3]. When calculating the matrix elements of two-quantum transitions in crystals, perturbation theories were used for the field of an unpolarized electromagnetic wave [2, 3], where the two-band Kane model was used.

In [4-11] the linear-circular dichroism (LCD) of two- and three-quantum absorption of light in crystals was investigated both theoretically and experimentally. Nonlinear interband single-quantum absorption of polarized light in Weyl semimetals was investigated in [12]. However, the question of the polarization and frequency-polarization dependence of the two-quantum interband linear-circular dichroism (LCD) in zinc blende crystals caused between the subbands of light and heavy holes of the valence band and conduction band in the Kane approximation taking into account the admixture of valence band states to the states of the conduction band remained open, and this work is devoted to its study.

Basic relationships

It is known [4] that the coefficient of multi-quantum absorption of light is determined by the probability of a N -quantum optical transition from state $|n, \vec{k}\rangle$ to state $|n', \vec{k}'\rangle$, determined by the relation

$$W^{(N)} = \frac{2\pi}{\hbar} \left\langle \sum_{n, n', \vec{k}} \left| M_{n\vec{k}, n'\vec{k}'}^{(N)} \right|^2 \right\rangle (f_{n\vec{k}} - f_{n'\vec{k}'}) \delta(E_{n'}(\vec{k}') - E_n(\vec{k}) - N\hbar\omega), \quad (1)$$

where $(f_{n'\vec{k}})$ is the equilibrium distribution function of current carriers in the initial (final) state, $M_{n\vec{k},n'\vec{k}}^{(N)}$ is the composite matrix element of the N quantum optical transition.

From (1) it is evident that $W^{(N)}$, in turn, is determined by the value of $M_{n\vec{k},n'\vec{k}}^{(N)}$. In particular, to calculate the $M_{n\vec{k},n'\vec{k}}^{(N=1)}$ - composite matrix element of the single-quantum optical transition from the subband of light holes to the conduction band, it is necessary to know the Hamiltonian, since [13, 14]

$$M_{c,s;V,\Gamma_8,m}^{(1)} = \left(\frac{eA_0}{cm_0}\right) \vec{e} \cdot \vec{p}_{c,s;V,\Gamma_8,m}, \quad (2)$$

where $\vec{e} \cdot \vec{p}_{c,s;V,\Gamma_8,m} = \left(\frac{eA_0}{cm_0}\right) \frac{m_0}{\hbar} \frac{\partial}{\partial \vec{k}} [\hat{H}(\vec{k})]_{c,s;V,\Gamma_8,m}$ is the matrix elements of the momentum operator, $\vec{e}$ (A_0) is the polarization vector (amplitude value of the potential vector) of the light wave, $\hat{H}(\vec{k})$ is the Hamiltonian of the current carriers, and the remaining quantities are well known. Note here that $\hat{H}(\vec{k})$ is a quadratic matrix whose dimension depends on the choice of model. For example, in the Kane approximation, $\hat{H}(\vec{k})$ can be represented as an 8x8 matrix, the form of which is given in [13, 14] in the Luttinger-Kohn approximation. However, in [13, 14], when calculating the band matrix elements, the substitution of the states of the valence band (Γ_8) for the states of the conduction band (Γ_6) is not taken into account, taking this into account yields the following matrix elements of the momentum operator, presented in Tables 1 and 2.

Table 1. Interband matrix elements $\frac{m_0}{\hbar^2 k} \vec{e} \cdot \vec{p}_{m',m}^{(\Gamma_8)}$, calculated according to $m', m = 3/2, +1/2, -1/2, -3/2$ taking into account the displacement of the states of the valence band to the states of the conduction band, where $p_{c,v} = \langle S | p_z | Z \rangle$, $e'_\pm = e'_x \pm ie'_y$, e'_x, e'_y, e'_z are projections $\vec{e}$ relative to the coordinate system x', y', z' , dependent on the direction of the wave vector of current carriers $\vec{k}(\vec{k}||z')$.

	$\langle hh, +3/2 $	$\langle lh, +1/2 $	$\langle lh, -1/2 $	$\langle hh, -3/2 $
$\langle c, +1/2 $	$-\frac{e'_+}{\sqrt{2}}$	$e'_z \sqrt{2/3}$	$\frac{e'_-}{\sqrt{6}}$	0
$\langle c, -1/2 $	0	$-\frac{e'_+}{\sqrt{6}}$	$e'_z \sqrt{2/3}$	$\frac{e'_-}{\sqrt{2}}$

Table 2. Intraband matrix elements of the momentum operator $\left[\frac{\vec{e} \cdot \vec{p}_{m',m}^{(\Gamma_8)}}{(\hbar k)} \right]$ for crystals of cubic symmetry. Here $\zeta_g = \frac{|p_{c,v}|^2}{(m_0 E_g)}$, E_g is the band gap width.

	$\langle hh, +3/2 $	$\langle lh, +1/2 $	$\langle lh, -1/2 $	$\langle hh, -3/2 $
$\langle hh, +3/2 $	e'_z	$\zeta_g \frac{e'_-}{\sqrt{3}}$	0	0
$\langle lh, +1/2 $	$\zeta_g \frac{e'_+}{\sqrt{3}}$	$\left(1 - \frac{4}{3} \zeta_g\right) e'_z$	0	0
$\langle lh, -1/2 $	0	0	$\left(1 - \frac{4}{3} \zeta_g\right) e'_z$	$-\frac{\zeta_g e'_-}{\sqrt{3}}$
$\langle hh, -3/2 $	0	0	$-\frac{\zeta_g e'_+}{\sqrt{3}}$	e'_z

Let us note here that taking into account the substitution of valence band states for conduction band states leads to the following hole Hamiltonian:

$$H^{(\Gamma_8)} = E_{\Gamma_8}^0 + \frac{\hbar^2 k^2}{2m_0} - \frac{\hbar^2 |p_{eV}|^2}{m_0^2 E_g} \begin{bmatrix} \frac{k_+^2}{2} & -\frac{k_z k_-}{\sqrt{3}} & -\frac{k_-^2}{\sqrt{12}} & 0 \\ -\frac{k_z k_+}{\sqrt{3}} & \frac{2}{3} k_z^2 + \frac{k_+^2}{6} & 0 & -\frac{k_-^2}{\sqrt{12}} \\ -\frac{k_+^2}{\sqrt{12}} & 0 & \frac{2}{3} k_z^2 + \frac{k_-^2}{6} & \frac{k_z k_-}{\sqrt{3}} \\ 0 & -\frac{k_+^2}{\sqrt{12}} & \frac{k_z k_+}{\sqrt{3}} & \frac{k_-^2}{2} \end{bmatrix}, \quad (3)$$

which differs from the Luttinger-Kohn Hamiltonian (see, for example, formula (26.12) of the monograph [13]).

Then the effective mass of electrons in the conduction band is expressed as

$$\frac{1}{m_c} = \frac{1}{m_0} + \frac{2}{3m_0^2} |p_{c,V}|^2 \left(\frac{2}{E_g} + \frac{1}{E_g + \Delta_{SO}} \right), \quad (4)$$

and the Kane parameter is determined by the relation

$$|p_{c,V}|^2 = \frac{3}{2} m_0 \frac{m_0 - m_c}{m_c} \frac{E_g(E_g + \Delta_{SO})}{2(E_g + \Delta_{SO}) + E_g}, \quad (5)$$

Δ_{SO} - the width of the spin-orbit splitting of the valence band. In this case, the value describing the substitution of valence band states to conduction band states $\zeta_g = \frac{3m_0(m_{hh} - m_{lh})}{(4m_{hh}m_{lh})} \gg 1$ for a number of semiconductors (see Table 3), where $m_{hh}(m_{lh})$ - heavy (light) holes. This means that taking into account the substitution of valence band states to conduction band states should lead to a significant contribution to the coefficient of both single- and multi-quantum absorption of light depending on the frequency of light and temperature, the study of which is devoted to this work.

Table 3. Numerical values of the quantity ζ_g .

	<i>InSb</i>	<i>InAs</i>	<i>GaAs</i>
$\zeta_g = \frac{3m_0}{4} \frac{m_{hh} - m_{lh}}{m_{hh}m_{lh}}$	46,5	25,5	6,18

For the sake of completeness of the problem, in further calculations we will take into account the dependence of the band parameters, for example, the width of the forbidden zone on the temperature $[E_g(T)]$, since the Kane parameter $p_{c,V} = (3Bm_0^2 E_g \hbar^{-2})^{1/2}$ and the effective masses of current carriers (see formulas (5) and (6)) also depend on $E_g(T)$. In particular, the $E_g(T)$ dependence is expressed by the Varshni formula [15]

$$E_g(T) = E_g(T = 0) - \gamma_T \frac{T^2}{T + T_V} \quad (6)$$

and Passler's formula [16]

$$E_g(T) = E_g(T = 0) - \frac{\alpha \theta_p}{2} \left[\left(1 + \left(\frac{2T}{\theta_p} \right)^p \right)^{1/p} - 1 \right]. \quad (7)$$

Here γ_T , T_V , α , θ_p are constant values depending on the physical and chemical properties of the semiconductor, the numerical values of which are given in the tables [15, 16].

$E_g(T)$ dependencies, determined by relations (6) and (7), it is evident that with increasing temperature the width of the forbidden zone, described by the Varshni formula, changes very slowly, while that determined by the Passler formula noticeably decreases.

In particular, the temperature dependences of the effective masses of electrons $m_c(T)$ in the conduction band and holes $m_{SO}(T)$ in the spin-orbit splitting zone can be represented as [15]:

$$\frac{m_0}{m_{SO}(T)} = \gamma_1 - \frac{E_P \Delta_{SO}}{3E_g(E_g + \Delta_{SO})}, \quad \frac{m_0}{m_c(T)} = 1 + 2F + \frac{E_P(E_g + 2\Delta_{SO}/3)}{3E_g(E_g + \Delta_{SO})} \quad (8)$$

Calculations show that with increasing temperature $m_c(T)$ for narrow (wide) bandgap semiconductors decreases (increases), and $m_{SO}(T)$ - increases in semiconductors with an arbitrary band structure, where the calculation is carried out using the Varshni formula. Such temperature behavior of the effective masses leads to a noticeable change in the temperature and frequency

dependence of the optical properties of semiconductors, for example, the light absorption coefficient. We will consider the analysis of this case further.

Frequency, angular and temperature dependences of the probabilities of two-quantum interband optical transitions in diamond-like semiconductors

Since the probability of optical transitions (see formula (1)) is determined by the composite matrix element, we will further calculate the matrix elements of the following two quantum optical transitions (without taking into account coherent saturation): a) the initial states of holes are in the heavy-hole subband, where the conservation law is written as $\delta(E_{cond} - E_{hh} - 2\hbar\omega)$, then the matrix elements of optical transitions of type $|V, \pm 3/2\rangle \rightarrow |m\rangle \rightarrow |c, \pm 1/2\rangle$ have the form $\left(\frac{eA_0}{ch}\right)^2 \frac{1}{\sqrt{2}} p_{c,V}^* \hbar k \frac{e'_\pm e'_z}{(\pm\hbar\omega)} \left[1 + \frac{2}{3} \frac{\hbar\omega\zeta_g}{(E_{lh}-E_{hh}-\hbar\omega)}\right]$, and optical transitions of type $|V, \pm 3/2\rangle \rightarrow |m\rangle \rightarrow |c, \mp 1/2\rangle$ are forbidden; b) the initial states of holes are in the light-hole subband, where the conservation law is written as $\delta(E_{cond} - E_{lh} - 2\hbar\omega)$, then the matrix elements of optical transitions of type $|V, \pm 1/2\rangle \rightarrow |m\rangle \rightarrow |c, \pm 1/2\rangle$ have the form $\left(\frac{eA_0}{ch}\right)^2 \hbar \frac{k}{\sqrt{6}(-\hbar\omega)} \left[\left(1 - \frac{4}{3}\zeta_g\right) e_z'^2 \pm \frac{\hbar\omega\zeta_g |e'_\perp|^2}{(E_{hh}-E_{lh}-\hbar\omega)}\right]$, and optical transitions of type $|V, \pm 1/2\rangle \rightarrow |m\rangle \rightarrow |c, \mp 1/2\rangle$ are forbidden. Here $E_{cond} = \frac{\hbar^2 k^2}{2m_c} + E_g$ is the energy spectrum of electrons in the conduction band, $E_L = -\frac{\hbar^2 k^2}{2m_L}$ is the energy spectrum of holes in the valence band, $L = lh (L = hh)$ corresponds to light (heavy) holes, the symbol $\rightarrow$ describes a single-quantum optical transition. Then the composite matrix of the two-quantum interband optical transition $M_{L,\vec{k};SO,\vec{k}}^{(2)}$, taking into account the admixture of the valence states Γ_8 (valence band) and Γ_7 (spin-orbit splitting band) to the states Γ_6 (conduction band), is described by the following expression

$$M_{lh,\vec{k};c,\vec{k}}^{(2)} = \frac{1}{3} \left(\frac{eA_0}{ch}\right)^4 \frac{|p_{c,V}^*|^2 \hbar^2 k^2}{(\hbar\omega)^2} \left[\left(1 - \frac{4}{3}\zeta_g\right)^2 e_z'^4 - \left(\frac{\hbar\omega\zeta_g}{E_{hh}-E_{lh}-\hbar\omega}\right)^2 |e'_\perp|^4\right], \quad (9)$$

$$M_{hh,\vec{k};c,\vec{k}}^{(2)} = 3 \left(\frac{eA_0}{ch}\right)^4 \frac{|p_{c,V}^*|^2 \hbar^2 k^2}{(\hbar\omega)^2} \left(1 + \frac{2}{3} \frac{\hbar\omega\zeta_g}{E_{lh}-E_{hh}-\hbar\omega}\right)^2 e_z'^2 e_\perp'^2, \quad (10)$$

where $\left(\frac{eA_0}{ch}\right)^2 = \frac{2\pi e^2}{n_\omega c} \frac{I}{(\hbar\omega)^2}$, $I(\omega)$ is the intensity (frequency) of light, n_ω is the refractive index of light at frequency ω , $p_{c,V} = \left(\frac{3Bm_0^2 E_g}{\hbar^2}\right)^{1/2}$ is the Kane parameter, $B = \frac{\hbar^2(m_{hh}-m_{lh})}{(4m_{hh}m_{lh})}$, $m_{hh}(m_{lh})$ is the effective mass of light (heavy) holes.

Note here that if we do not take into account the admixture of valence states Γ_8 and Γ_7 to the states Γ_6 , then we obtain the results [14, 15]. Since the probabilities of intersubband two-quantum interband optical transitions are determined by the relationship (9) and (10), therefore, based on this expression, it is possible to calculate the frequency-temperature dependences of both the coefficients of two-quantum absorption of light and its LCD taking into account the temperature dependence of $m_c(T)$, $m_{SO}(T)$ and $E_g(T)$ [15]. Then, substituting (9) and (10) into (1), we can determine the frequency and polarization dependences of the probability of a two-quantum optical transition, where it is taken into account that for calculating the angular dependences of the optical parameters of a semiconductor, it is convenient to use the following relationships [4]: for linearly polarized light

$$|e'_z|^2 = \cos^2(\vec{e} \cdot \vec{k}), |e'_\pm|^2 = 1 - |e'_z|^2 = 1 - \cos^2(\vec{e} \cdot \vec{k}), \quad (11)$$

and for circularly polarized light

$$|e'_z|^2 = \frac{1}{2} \sin^2(\vec{q} \cdot \vec{k}), |e'_\pm|^2 = \frac{1}{2} [1 + \cos^2(\vec{q} \cdot \vec{k})] \mp P_{circ} \cos(\vec{q} \cdot \vec{k}), \quad (12)$$

and also $\left(\frac{eA_0}{c\hbar}\right)^2 = \frac{I}{\hbar\omega} \frac{e^2}{c\hbar} \frac{2\pi}{n_\omega\omega}$, where $\vec{q}$ – is the wave vector of the photon, P_{circ} – is the degree of circular polarization, I is the light intensity, n_ω is the refractive index of the semiconductor at a frequency of ω .

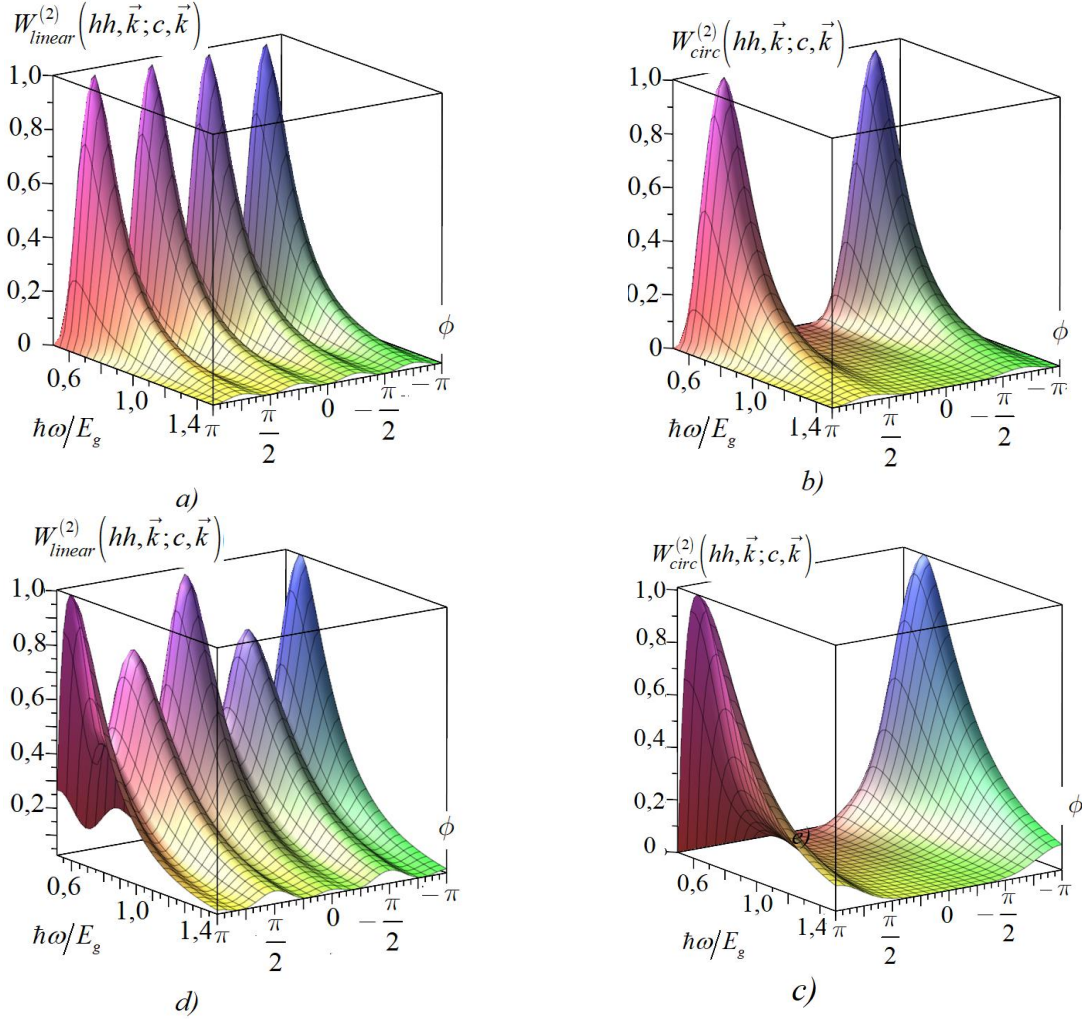


Fig. 1. Frequency-angular dependences $W^{(2)}$ for light of linear $W_{linear}^{(2)}$ (a, d) and circular $W_{circ}^{(2)}$ (b, c) polarization for optical transitions from the heavy-hole subband to the conduction band in GaAs. In figures a, b it was assumed that $E_g(T = 0K)$, and in d, e - $E_g(T = 330K)$.

Figure 1 shows the frequency-angular dependences $W_{linear}^{(2)}$ and $W_{circ}^{(2)}$ for linear (a, d) and circular (b, e) polarization light for optical transitions from the heavy-hole subband to the conduction band in GaAs. The results shown in Figure 1 a, b were obtained for $E_g(T = 0K)$, and the results in Figure 1 d, e – for $E_g(T = 330K)$. These figures show that the appearance of the graph, for example, the symmetry of the oscillations of the angular dependence or the change in the amplitude values $W_{linear}^{(2)}$ and $W_{circ}^{(2)}$ depends on the polarization state of the light. This is due to the fact that since linearly polarized light causes pulse alignment, and circularly polarized light causes the orientation of the moments of the current carriers, and taking into account dependences $m_c(T)$, $m_{so}(T)$ and $E_g(T)$ leads to a temperature dependence of the wave vector of photoexcited current carriers. Calculations show that taking into account $E_g(T)$ leads to a sharp increase in $W_{circ}^{(2)}$ in low frequency regions and a transition through the maximum, then a hump-shaped dependence with increasing

frequency at arbitrary temperatures. Note that the depth of the hump is greater, the greater the width of the forbidden zone.

It should be noted that the probability of two-quantum optical transitions under the action of linearly polarized light $W_{linear}^{(2)}$ exactly repeats the frequency-temperature dependence $W_{circ}^{(2)}$, but the amplitude value is four times smaller.

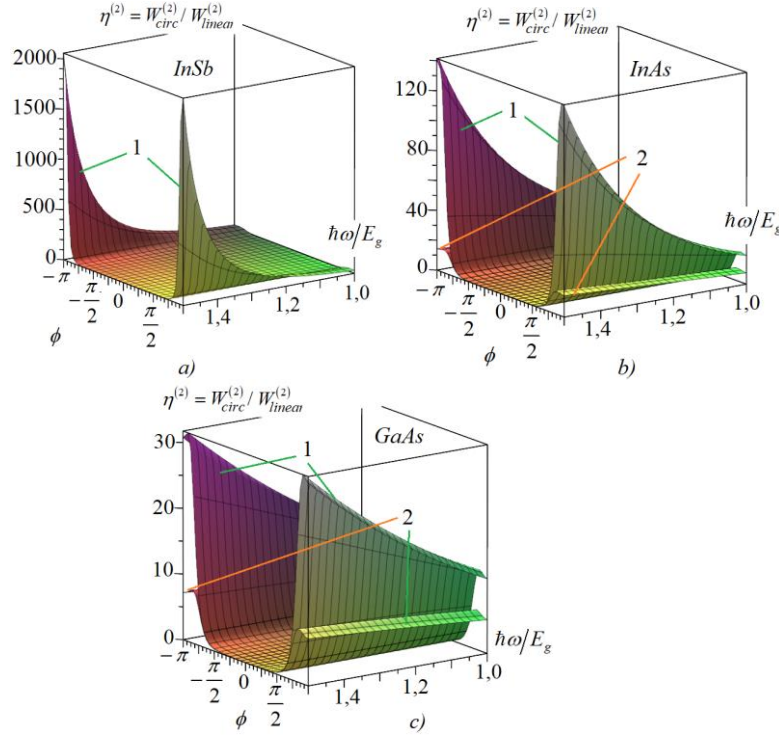


Fig. 2. Frequency-angular dependence of the two-quantum coefficient of linear-circular dichroism $\eta^{(2)}$, caused by optical transitions from the branch of light holes to the conduction band of semiconductors *InSb* (a), *InAs* (b), *GaAs* (c), where graphs 1 correspond to $E_g(T = 0K)$, and graphs 2 to $E_g(T = 30K)$ (graphs 2). The contribution of the coherent saturation effect to $\eta^{(2)}$ is not taken into account in the calculations.

It is known [4-10] that the coefficient of two-quantum linear dichroism of light absorption is determined by the ratio of probability $W_{circ}^{(2)}$ to $W_{linear}^{(2)}$, i.e. by the ratio $\eta^{(2)} = \frac{W_{circ}^{(2)}}{W_{linear}^{(2)}}$. Figure 2 shows the frequency-angular dependences of $\eta^{(2)}$, caused by optical transitions from the branch of light holes to the conduction band of semiconductors *InSb* (a), *InAs* (b), *GaAs* (c), where graphs 1 correspond to $E_g(T = 0K)$, and graphs 2 - $E_g(T = 30K)$ (graphs 2). From Figure 2 it is evident that at certain values of the angle $\eta^{(2)}$, regardless of the width of the forbidden zone, it takes on a very large value, which, firstly, is due to the fact that at these angles $W_{linear}^{(2)}$ are small values, and secondly, such an anomalous value decreases sharply at $\zeta_g = \frac{|p_{c,v}|^2}{(m_0 E_g)} = 0$, i.e. when we do not take into account the admixture of the states of the valence band to the states of the conduction band.

Conclusions

In conclusion, we note that in the three-band Kane approximation: a) a quantitative theory of two-quantum interband linear-circular dichroism in *InSb*, *InAs* and *GaAs* semiconductors was constructed, where the admixture of valence band states to the conduction band states and the temperature dependence of the band gap in the multiband Kane model were taken into account; b) it was shown that the probabilities of interband two-quantum optical transitions in both narrow- and

wide-gap semiconductors with a frequency rostrum at a fixed temperature first increase, then, passing through a maximum, decrease regardless of the degree of light polarization; c) the frequency and temperature dependence of the probability of two-quantum optical transitions $W_{circ}^{(2)}$ from the light hole branch to the conduction band of *InSb* (a), *InAs* (b), *GaAs* (c) semiconductors under the action of circularly polarized light.

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Rezyume: Valent zonasining yengil va og'ir kovaklari tarmoqlari o'rtasida yuzaga keladigan ikki fotonli chiziqli sirkulyar dikhroizmning miqdoriy nazariyasi qurilgan bo'lib, bu holda valent zonasi holatlarning o'tkazuvchanlik zonasi holatlariga ralashuvi (kirishib ketishi) hamda ta'qiqlangan zona kengligining haroratga bog'liqligini hisobga oladi. Hisoblashlar Keyn yaqinlashishda olib borildi

Ikki fotonli optik o'tish ehtimoligining elektron va foto to'lqin vektori orasiga burchakka nisbatan ostsillyalanishi hamda uning amplitudaviy qiymati yorug'likning qutblanish holatiga bog'liq ekanligi ko'rsatildi. Bu holni chiziqli qutblangan yorug'lik ta'sirida elektronlar impulsining

tizgignlashish, tsirkulyar qutblangan yorug'lik ta'sirida esa tok tashuvchilar momentlarining oriyentatsiyalanishi bilan bog'liqligi ko'rsatilgan.

Резюме: Построена количественная теория двухфотонного линейно-циркулярного дихроизма, обусловленного между подзонами легких и тяжелых дырок валентной зоны и зоны проводимости, где учтено подмешивание к состояниям зоны проводимости состояний валентной зоны и температурной зависимости ширины запрещенной зоны ($E_g(T)$) в полупроводниках тетраэдрической симметрии в приближении модели кейна

Показано, что вид осцилляционной угловой зависимости или амплитудные значения вероятностей двухфотонных оптических переходов зависят от состояния поляризации света. Это связано с тем, что так как под действием света линейной поляризации происходит выстраивание по импульсу, а под действием циркулярно поляризованного света происходит ориентация моментов носителей тока.

Определено, что вероятности двухфотонных оптических переходов из подзоны тяжелых дырок в зону проводимости полупроводников при фиксированной температуре с ростом частоты увеличивается и проходит через максимум, резко уменьшается независимо от степени поляризации света, а также от ширины запрещенной зоны.

Kalit so'zlar: Yorug'likning ikki fotonli yutilish ehtimoli, chastotasi, harorati, tebranishga bog'liqligi, yorug'likning qutblanish darajasi, chiziqli-dumaloq dikroizm, yarim o'tkazgich, ko'p tarmoqli Keyn modeli.

Ключевые слова: Вероятность двухфотонного поглощения света, частота, температура, осцилляционная зависимость, степень поляризации света, линейно-циркулярный дихроизм, полупроводник, многозонный модель Кейна.

THEORY OF SINGLE-PHOTON INTRA-BAND LINEAR CIRCULAR DICROISM IN DIAMOND-LIKE SEMICONDUCTORS

Rasulov R.Ya¹, Rasulov V.R¹, Kosimov F.U², Muminov I.A¹, Isomaddinova U.M³.

¹Fergana State University

²Andijan State University

³Kokand State Pedagogical Institute

Summary: A theoretical analysis of optical transitions occurring from the branch of light and heavy holes of the valence band into the spin-orbit splitting subband of a zinc blende type semiconductor upon absorption of polarized light has been carried out.

Expressions are obtained for the polarization dependence of the coefficient of single-photon intraband linear-circular dichroism, taking into account the effect of coherent saturation. An oscillatory behavior of the polarization dependence of linear-circular dichroism, caused by single-photon optical transitions from the branch of light and heavy holes to the spin-orbit splitting subband of the valence band, was discovered, regardless of the value of the Rabi parameter. It is shown that linear-circular dichroism of single-photon intraband light absorption is not observed without taking into account the effect of coherent saturation.

Keywords: Branches of light and heavy holes of the valence band, subband of spin-orbit splitting, probability of single-photon transitions, coefficients of single-photon absorption and linear-circular dichroism, coherent saturation effect.

Introduction

In [1–9], single- and multiphoton absorption caused by both interband and intraband optical transitions were theoretically investigated: in [8], multiphoton intraband linear-circular dichroism (LCD) was investigated in p-Ge in the developed nonlinearity regime, when multiphoton processes make a comparable contribution to absorption, and in [4, 6–9], the spectral and temperature dependences of the coefficient of multiphoton absorption of light and LCD were studied in semiconductors with a complex band structure. In [10, 11], photocurrent saturation was discovered in three-dimensional topological insulators. In [12], a microscopic theory of nonlinear edge photocurrent in graphene was developed, and in [13], single- and multiphoton interband optical transitions in monomolecular layers of transition metal dichalcogenides were analyzed.

The analysis of the calculations of the coefficient of the LCD $\eta = \frac{W_{lin}}{W_{circ}}$ (W_{lin} , W_{circ} probabilities of absorption of light of linear and circular polarization) carried out by us indicates that taking into account the effect of coherent saturation will lead to a peculiar polarization dependence. Therefore, it is of interest to theoretically investigate the coefficient η depending on the angle between the wave vectors of the current carriers and the photon during absorption of light of linear and circular polarization, associated with optical transitions from the subbands of light and heavy holes to the subband of spin-orbit splitting of the valence band and the contribution of the phenomenon of coherent saturation to them [5-9], the study of which is devoted to this work.

Polarization dependence of the probability of intraband optical transitions in diamond-like semiconductors

It is known [2] that the absorption coefficient of N -photon light $K^{(N)}$ is determined in the following form

$$K^{(N)} = N\hbar\omega \frac{W^{(N)}}{I}, \quad (1)$$

where $W^{(N)}$ is the probability of N -photon absorption per unit volume of light, defined as [2, 5-9]

$$W^{(N)} = \frac{2\pi}{\hbar} \sum_{n,n',\vec{k}} \left\langle \sum_{m,m'} \left| M_{n,m;n',m'}^{(N)}(\vec{k}) \right|^2 \right\rangle (f_{n\vec{k}} - f_{n'\vec{k}}) \delta(E_{n'\vec{k}} - E_{n\vec{k}} - N\hbar\omega), \quad (2)$$

where $m, m' = \pm 1/2$ is for states in the subbands of light holes and spin-orbit splitting, $m, m' = \pm 3/2$ is for states in the subband of heavy holes [18, 19], $\left\langle \sum_{m,m'} \left| M_{n,m,n',m'}^{(N)}(\vec{k}) \right|^2 \right\rangle$ - averaged over the solid angles of the wave vector of holes ($\vec{k}$) squares of the modulus of the composite matrix element of the optical transition from state $|n\vec{k}\rangle$ to $|n'\vec{k}\rangle$ ($|n\vec{k}\rangle \rightarrow |n'\vec{k}\rangle$), $E_{n'\vec{k}}(E_{n\vec{k}})$ and $f_{n'\vec{k}}(f_{n\vec{k}})$ - energy and distribution function of current carriers in the initial (final) state, $\vec{A}$ - potential of the electromagnetic wave vector:

$$\vec{A}(\vec{x}, t) = A_0 \vec{e} e^{-i\omega t + i\vec{q}\vec{x}} + A_0 \vec{e}^* e^{i\omega t - i\vec{q}\vec{x}}, \quad (3)$$

$\hbar\omega$ ($\hbar\vec{q}$) is the energy (momentum) of a photon, $\vec{e}$ and A_0 are the polarization vector and the amplitude of the vector potential, $\left(\frac{eA_0}{m_0 c}\right)^2 = \frac{2\pi e^2 I}{(c\omega^2 m_0^2 n_\omega)}$, I is the intensity of light, $n_\omega = \frac{c q}{\omega}$ is the refractive index of the semiconductor, the remaining quantities are well known.

Note that when calculating, for example, the frequency or temperature dependence of $W^{(N)}$ for both intraband and interband N photonic optical transitions, the choice of the type of electron-photon interaction operator that is part of the composite matrix element of the transition is essential [5-9]. Depending on the chosen operator, the relative contribution to $W^{(N)}$ different channels of optical transitions that differ from each other in their virtual states can increase or decrease.

Next, we will analyze the optical transitions occurring from the subbands of light and holes to the subband of spin-orbit splitting, where the energy dispersion of light and heavy holes is represented as: $E_{lh}(\vec{k}) = -\frac{\hbar^2 k^2}{(2m_{lh})}$ and $E_{hh}(\vec{k}) = -\frac{\hbar^2 k^2}{(2m_{hh})}$, and in the subband of spin-orbit splitting as: $E_{SO}(\vec{k}) = -\Delta_{SO} - \frac{\hbar^2 k^2}{(2m_{SO})}$, where m_{lh} (m_{hh}) is the effective mass of light (heavy) holes, Δ_{SO} is the energy of spin-orbit splitting, the numerical values of which for a number of semiconductors are given in [14].

As can be seen from (1) and (2), the light absorption coefficient is determined by the square of the modulus of the composite matrix element, the polarization dependence of which is determined by the type of optical transitions. In particular, according to the Luttinger-Kohn Hamiltonian approximation [18, 19], the composite matrix elements for single-photon transitions $|V, \pm 1/2\rangle \rightarrow |SO, \pm 1/2\rangle$ and $|V, \pm 1/2\rangle \rightarrow |SO, \mp 1/2\rangle$, originating from the light hole branch to the spin-orbit splitting subband, are determined by the relation

$$\left| M_{SO,+1/2;V,+1/2}^{(1)} + M_{SO,-1/2;V,+1/2}^{(1)} \right|^2 = \left(\frac{eA_0}{\hbar c} \right)^2 2B^2 k^2 \left[\frac{9}{4} e'_- e'_+ + e'_z \frac{3}{2} (e'_+ + e'_-) + e'^2_z \right], \quad (4)$$

$$\left| M_{SO,-1/2;V,-1/2}^{(1)} + M_{SO,+1/2;V,-1/2}^{(1)} \right|^2 = \left(\frac{eA_0}{\hbar c} \right)^2 2B^2 k^2 \left[\frac{9}{4} e'^2_{\perp} - \frac{3}{2} (e'_+ + e'_-) e'_z + e'^2_z \right], \quad (5)$$

where $e'_{\pm} = e_{x'} \pm e_{y'}$, $e_{x'}, e_{y'}$ - $\vec{e}$ are projections of the polarization vector onto the axis Ox', Oy' , perpendicular to the wave vector of holes $\vec{k}$, $4B = \frac{\hbar^2 m_{lh} m_{hh}}{(m_{hh} - m_{lh})}$.

In this case, the sum of the squares of the modules of the constituent matrix elements is determined as:

$$\left| M_{SO,-\frac{1}{2};V,-\frac{1}{2}}^{(1)} + M_{SO,+\frac{1}{2};V,-\frac{1}{2}}^{(1)} \right|^2 + \left| M_{SO,+\frac{1}{2};V,+\frac{1}{2}}^{(1)} + M_{SO,-\frac{1}{2};V,+\frac{1}{2}}^{(1)} \right|^2 = \left(\frac{eA_0}{\hbar c} \right)^2 2B^2 k^2 \left(\frac{9}{2} e'^2_{\perp} + 2e'^2_z \right), \quad (6)$$

The constituent matrix elements of single-photon transitions $|V, \pm 3/2\rangle \rightarrow |SO, \pm 1/2\rangle$, i.e. optical transitions from the heavy-hole branch to the spin-orbit splitting subband, are written as follows:

$$\hat{M}_{SO;V,hh}^{(1)} = \left(\frac{eA_0}{\hbar c} \right) \sqrt{\frac{3}{2}} B k \begin{bmatrix} e'_- & 0 \\ 0 & -e'_+ \end{bmatrix}. \quad (7)$$

where:

$$\left| M_{SO, \pm 1/2; V, \pm 3/2}^{(1)} \right|^2 = \left(\frac{eA_0}{\hbar c} \right)^2 \frac{3}{2} B^2 |e'_\mp|^2. \quad (8)$$

Since the average value of $(|e'_\perp|^2 + |e'_z|^2)$ and $(4.5e'^2_\perp + 2e'^2_z)$ is the same for linearly and circularly polarized light, the transition probabilities do not depend on the degree of light polarization. As a result, with single-photon absorption caused between the branches of light and heavy holes and the spin-orbit splitting subband, single-photon LCD is not observed in diamond-like semiconductors and zinc blende semiconductors.

Let us note here that for single-photon LCD it is necessary to take into account the contribution of the coherent saturation effect to the transition probability, which we will analyze further.

Linear-circular dichroism of single-photon optical transitions from the branch of light and heavy holes to the spin-orbit splitting subband

In general, the probability of single-photon optical transitions is determined using the following relation (see, for example, [5-9] and references cited therein)

$$W^{(1)} = \frac{2\pi}{\hbar} \left(\frac{eA_0}{m_0 c} \right)^2 \left\langle \sum_{n, n', \vec{k}} |\vec{e} \vec{p}_{nn'}(\vec{k})|^2 \sum_{n, n', \vec{k}} \left[1 + \frac{\alpha_\omega}{\hbar^2 \omega^2} \left(\frac{eA_0}{m_0 c} \right)^2 |\vec{e} \vec{p}_{nn'}(\vec{k})|^2 \right]^{-1/2} \right\rangle \times \\ \times (f_{n\vec{k}} - f_{n'\vec{k}}) \delta(E_{n'\vec{k}} - E_{n\vec{k}} - \hbar\omega), \quad (9)$$

where the value of $\frac{\alpha_\omega}{\hbar^2 \omega^2} \left(\frac{eA_0}{m_0 c} \right)^2 |\vec{e} \vec{p}_{nn'}(\vec{k})|^2$ arises due to the effect of coherent saturation [15], $\alpha_\omega = \frac{6\omega^2 T_n^{(1)} T_{n'}^{(1)} I}{I_0}$, $T_n^{(1)}$ are the residence time of photoexcited current carriers in state $|n, \vec{k}\rangle$, $\vec{p}_{nn'}(\vec{k}) = m_0 \hbar^{-1} \vec{\nabla}_{\vec{k}} H(\vec{k})$ is the matrix element of the momentum operator, $H(\vec{k})$ is the Hamiltonian of current carriers, which for intraband single-photon optical transitions is determined by the Luttinger-Kohn Hamiltonian, and for interband absorption of light – by the Kane Hamiltonian [18, 19], $I_0 = \frac{cn_\omega \hbar^3 \omega^3}{2\pi |B|}$ is a parameter that for zinc blende semiconductors takes a value of several Gigawatts/cm² [3]. In cases where it is impossible to analytically solve, for example, the polarization, frequency or temperature dependence of multiphoton absorption or LCD, then the approximation can be used, where $\frac{I}{I_0} \ll 1$. In this case, it is possible to expand the radical in a series of $\frac{I}{I_0}$ and limit ourselves to the first few terms of the series.

Then, substituting (7, 8) into (9), it is easy to obtain that the angular dependence of the probability of single-photon absorption of light of linear polarization ($W_{lin}^{(1)}$) for the first type transition: $|V, \pm 1/2\rangle \rightarrow |SO, \pm 1/2\rangle$ and $|V, \pm 1/2\rangle \rightarrow |SO, \mp 1/2\rangle$ is described as:

$$\mathfrak{J}_{lin}^{(2)} = (2 + 2.5 \sin^2 \phi) [1 + \zeta_\omega (4 + 5 \sin^2 \phi)]^{-1/2}, \quad (11)$$

and for transitions of the second type: $|V, \pm 3/2\rangle \rightarrow |SO, \pm 1/2\rangle$ and is described as

$$\mathfrak{J}_{lin}^{(1)} = \frac{2 \sin^2 \phi}{[1 + 3\zeta_\omega \sin^2 \phi]}^{-1/2}, \quad (12)$$

where ϕ is the angle between the wave vector of holes and the polarization vector of light, $\zeta_\omega = \alpha_\omega \left(\frac{eA_0}{\hbar c} \right)^2 B^2 k^2$ is the Rabi parameter and the wave vector k , as indicated above, depends on the frequency of light and the band parameters of the semiconductor.

For circularly polarized light, the angular dependence of the probability of optical transitions ($W_{circ}^{(1)}$) from the heavy hole branch to the spin-orbit splitting subband is determined by the expression

$$\mathfrak{Z}_{circ}^{(1)} = \frac{2 \left[\frac{1}{2} (1 + \cos^2 \phi') \mp P_{circ} \cos \phi' \right]}{\sqrt{1 + 3\zeta_\omega \left[\frac{1}{2} (1 + \cos^2 \phi') \mp P_{circ} \cos \phi' \right]}}, \quad (13)$$

and the angular dependence of the probability of optical transitions from the light hole branch to the spin-orbit splitting subband ($W_{circ}^{(2)}$) will be written as

$$\mathfrak{Z}_{circ}^{(2)} = \frac{1}{2} \frac{9 \left[\frac{1}{2} (1 + \cos^2 \phi') \mp P_{circ} \cos \phi' \right] + 2 \sin^2 \phi'}{\sqrt{1 + 3\zeta_\omega \left(9 \left[\frac{1}{2} (1 + \cos^2 \phi') \mp P_{circ} \cos \phi' \right] + 2 \sin^2 \phi' \right)}}. \quad (14)$$

where ϕ' is the angle between the wave vectors of holes and photons, P_{circ} is the degree of circular polarization of light.

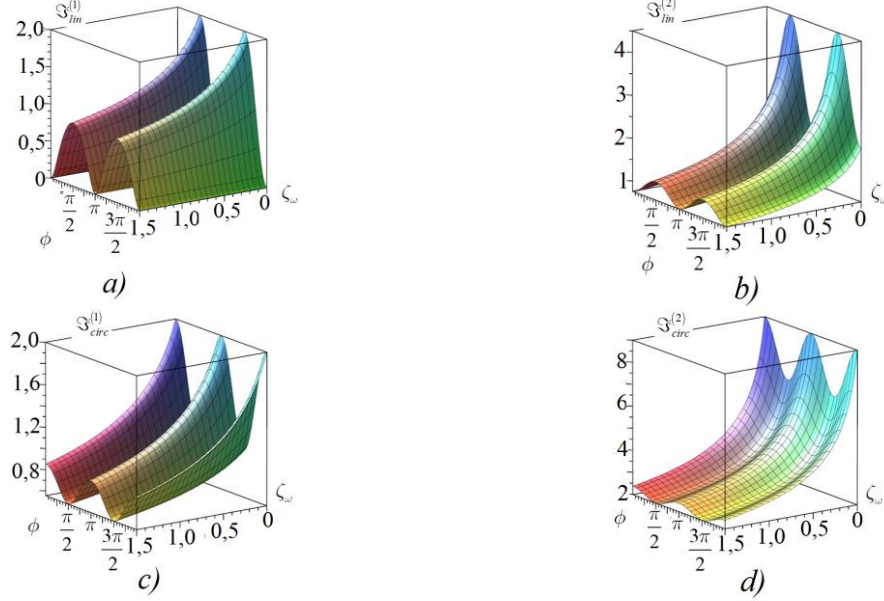


Fig. 1. Graphs of the quantities $\mathfrak{Z}_{lin}^{(1)}$ (a), $\mathfrak{Z}_{lin}^{(2)}$ (b), $\mathfrak{Z}_{circ}^{(1)}$ (c) and $\mathfrak{Z}_{circ}^{(2)}$ (d), with the help of which the contribution to the angular dependences and dependences on the Rabi parameter of the probabilities of single-photon optical transitions from the branch of heavy (a, c) and light (b, d) holes to the subband of spin-orbit splitting of the valence band for light of linear (a, b) and circular (c, d) polarization are determined.

It is evident from Fig. 1 that the angular dependences of the quantities $\mathfrak{Z}_{lin}^{(1)}$, $\mathfrak{Z}_{lin}^{(2)}$, $\mathfrak{Z}_{circ}^{(1)}$ and $\mathfrak{Z}_{circ}^{(2)}$, i.e. the corresponding probabilities of single-photon absorption of light, oscillate, where the minimum values of the quantities $\mathfrak{Z}_{lin}^{(1)}$ and $\mathfrak{Z}_{lin}^{(2)}$, as well as $\mathfrak{Z}_{circ}^{(1)}$ and $\mathfrak{Z}_{circ}^{(2)}$ in the angular dependence coincide, and their maximum values depend on the type of optical transitions. In particular: a) the probabilities of optical transitions occurring from the light hole branch are approximately 2.5 (4.5) times greater than the probabilities of transitions from the heavy hole branch for light of linear (circular) polarization; b) the maximum value of the probability of the second type of transition is always greater than the first, regardless of the degree of polarization or the value of the Rabi parameter (ζ_ω).

Thus, we were convinced that taking into account the effect of coherent saturation significantly changes the polarization dependence of the LCD coefficient.

Conclusions

It is shown that when taking into account the contribution of the coherent saturation effect, the angular dependences of the probabilities of single-photon optical transitions from the branch of heavy and light holes to the subband of spin-orbit splitting of the valence band for light of both linear and circular polarization have an oscillatory character, regardless of the values of the Rabi parameter (ζ_ω).

The maximum values of the angular dependence of the LCD coefficients for both the first and second type optical transitions decrease with increasing ζ_ω regardless of the angle between the wave vectors of holes and the photon, and their minimum value for the first type transitions is non-zero in the region of low values, and for the second type optical transitions is equal to zero regardless of the values of ζ_ω .

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Rezyume: Olmossimon yarimo`tkazgichning valent zonasining yengil va og`ir kovaklari tarmog`idan spin orbital ajragan zonachasiga optik o`tishlarning nazariy tahlili bajarildi.

Kogerentli to`yinish hodisasining ta'sirini hisobga olgan holda bir fotonli tarmoqlararo chiziqli tsirkulyar dixroizm koeffitsiyentining yorug`likning qutblanish darajasiga bog`liqligiga tegishli ifodalar olindi. Rabi parametrining qiymatidan qat'i nazar, yengil va og`ir kovaklar tarmog`idan spin orbital ajragan zonasiga bir fotonli optik o`tishlar natijasida yuzaga keladigan chiziqli tsirkulyar dixroizmining qutblanishga bog`liqligining oststsilyanishi aniqlandi. Kogerentli to`yinish hldisasining ta'sirini hisobga olmagan holda bir fotonli tarmoqlararo yorug`lik yutilishida chiziqli tsirkulyar dixroizmning kuzatilmasligi ko`rsatilgan.

Резюме: Проведен теоретический анализ оптических переходов, происходящих из ветви легких и тяжелых дырок валентной зоны в подзону спин-орбитального расщепления полупроводника типа цинковой обманки при поглощении поляризованного света.

Получены выражения для поляризационной зависимости коэффициента однофотонного внутризонного линейно-циркулярного дихроизма с учетом эффекта когерентного насыщения. Обнаружена осцилляционный ход поляризационной зависимости линейно-циркулярного дихроизма, обусловленного однофотонными оптическими переходами из ветви легких и тяжелых дырок в подзону спин-орбитального расщепления валентной зоны независимо от значения параметра Раби. Показано, что линейно-циркулярный дихроизм однофотонного внутризонного поглощения света не наблюдается без учета эффекта когерентного насыщения.

Kalit so'zlar: Valent zonasining yengil va og`ir kovaklari tarmoqlari, spin orbital ajragan zona, bir fotonli o`tishlar ehtimolligi, bir fotonli yutilish va chiziqli tsirkulyar dixroizm koeffitsiyentlari, kogerent to`yinish hodisasi.

Ключевые слова: Ветви легких и тяжелых дырок валентной зоны, подзона спин-орбитального расщепления, вероятность однофотонных переходов, коэффициенты однофотонного поглощения и линейно-циркулярного дихроизма, эффект когерентного насыщения.

**SOMATOTYPOLOGICAL CHARACTERISTICS OF ADOLESCENTS LIVING IN
DIFFERENT ECOLOGICAL ZONES OF THE ARAL SEA REGION**

Rozumbetov K.U¹., Shamuratova G.K²., Esimbetov A.T¹.

*¹Nukus Branch of Samarkand State University of Veterinary Medicine, Animal Husbandry and
Biotechnology*

² Karakalpak State University named after Berdakh

Summary: *In this article, an attempt was made to determine the anthropometric profile and body type (somatotype) of 14-15 years old adolescents living in different ecological areas of the Aral Sea region. The assessment of somatotype by the Heath-Carter measurement method showed that the frequency of occurrence of boys and girls with mesomorphic somatotype increases in the following sequence: Turtkul < Muynak < Nukus. There were no statistically significant differences by regions of endomorphic and ectomorphic somatotype.*

Key words: *environmental status, heavy metals, somatotype, anthropometric indicators, Aral Sea regions*

1. Introduction

The type of human physique, being a conditional genetic marker, can inform about the type and amount of physical activity comfortable for a person, predict somatotypological possibilities of occurrence and peculiarities of disease course in a particular patient. The objective principle of studying the human constitution is based on the identification of correlations between various features of his individuality [4, 11]. The study of human somatotype is among the interests of both theoretical and practical biology and medicine. Traditional methods of somatometry are perfectly complemented by new technologies (bioimpedanceometry, computer tomography, etc.), which make it possible to study the composition of the human body at a higher level and in a better quality. Based on practice, somatotypological assessment helps to establish the relationship of body constitution with different reactivity of the organism. Thus, many works show correlation between the features of somatotype and metabolism, endocrine indicators, individual psychological qualities of personality [9, 14]. The development of somatotype in the process of ontogenesis is one of the most controversial issues at all stages of formation of the doctrine of constitution, which is constantly changing and being supplemented.

One of the most urgent problems of modern medicine is the health of the population, especially the most exposed to unfavorable environmental factors of its part – adolescents [12]. It has been established that the state of human health in different periods of ontogenesis is largely determined by the degree of interrelation of morphofunctional systems that characterize the constitutional integrity of the organism. In this regard, the constitutional-typological approach is the most adequate for assessing the state of human health.

Adolescence is a period of rapid growth and development, and the physical maturation of the body. During this period, somatotype changes may occur depending on various factors such as genetic characteristics, nutrition, physical activity habits, and sporting activities [27]. Somatotype is a classification system that morphologically categorizes the human body into three different components: endomorphy (relative obesity), mesomorphy (relative musculoskeletal development) and ectomorphy (relative linearity) [17]. Endomorphy is characterized by the predominance of the digestive organs, and soft and rounded body contours. Low endomorphy indicates a weak physique with minimal subcutaneous fat, whereas high endomorphy values are indicative of obesity. Mesomorphy is characterized by the dominance of muscle, bone and connective tissue and sharply delineated muscles. Low mesomorphy is an indication of narrow bone diameter and low muscle weight compared to physical structure. High mesomorphy is indicative of large bone diameter and high muscle weight. Ectomorphy is characterized by a linear and fragile structure with limited muscle development. While low ectomorphy means more weight compared to the structure, high ectomorphy

values are indicative of low weight relative to the build and relatively long limbs. Ectomorphy values correlate with endomorphy and mesomorphy values. For example, low ectomorphy values are associated with increased endomorphy and/or mesomorphy values [16]. With the above in mind, with the help of our study we aimed to identify and compare the somatotype of adolescents living in different unfavorable ecological zones of the Southern Aral Sea.

2. Methods

2.1. Participants and study area. Since the 2nd half of the 20th century, a global environmental situation has developed in the Aral Sea region. The economy of this region, named Aral Sea region, was traditionally based on the agricultural sector, and from 1960 to 2012, water consumption from the Amu Darya and Syr Darya rivers, which feed the Aral Sea for agricultural needs, exceeded 200% [26]. By 2020, more than 90% of the Aral Sea's water volume and 75% of its former area had been lost [13, 26], and a new desert was formed in its place. As a result, an ambiguous ecological situation has developed in 3 "territorial units" adjacent to the Aral Sea coast. The 3 zones of the Republic of Karakalpakstan include: Zone 1 (Muynak district) - is considered to be a zone of ecological disaster (0-200 km – up to 200 km from the Aral Sea coast). Zone 2 (Nukus city) – an area under the threat of ecological disaster, about 200 km south of Muynak district. Zone 3 (Turtkul district) – this zone is located 400 km away from Muynak district and is considered to be an ecologically favorable settlement of the republic (fig. 1).



Figure 1. Representation of the Muynak, Turtkul districts and Nukus cities in Uzbekistan, Central Asia

Thus, there is no doubt that residents of the northern regions of the Aral Sea region, that is, in the territory adjacent to the former Aral Sea, are in less environmentally favorable conditions than residents of Nukus. In Nukus, pollution is significantly less than in Muynak, where a significant excess of permissible concentrations of heavy metals in the soil was found [26]. Research in recent years shows that the content of organochlorine compounds (OCs) in the blood plasma and heavy metals in the hair of subjects living in the environmentally unfavorable part of the Aral Sea region exceeds the concentration of these substances in residents of the Central and Southern parts: dichlorodiphenyltrichloroethane (DDT) by 1.5-2 times and hexachlorocyclohexane by 4 times, and polychlorinated biphenyls (PCB) – 20 times, calcium, chromium and mercury – 1.8-2.5 times [18,

20]. Therefore, our study sampled adolescents living in the above 3 ecologically different regions. The study was conducted in the spring of 2024. A total of 1855 adolescents (including 983 boys and 872 girls) aged 14-15 years living in different regions of the Republic of Karakalpakstan participated in the study. All volunteers gave verbal consent to participate in the study.

2.2. Anthropometrics. Anthropometric parameters were measured according to the procedures recommended at the Airlie Conference on the Standardization of anthropometric measurements [24]. They were assessed by two experienced researchers in the morning under comfortable environmental conditions (temperature 18-20°C, humidity 50-60%) in a separate medical room with artificial lighting.

Stature and sitting height were assessed using a mobile stadiometer SECA 217, Germany with a measurement accuracy of 0.1 cm. For standing height (StH) assessment subject positioned in the standard erect posture: erect with the heels together and the upper limbs hanging at the sides, head position required Frankfort Horizontal Plane. To measure sitting height (SiH) subject sits erect on a bench 50 cm high with the head in the Frankfort Horizontal Plane, the thighs placed horizontal and hands resting on the thighs in a cross-handed position. The examiner's left hand is placed under the subject's chin to maintain the correct position of the head, and the right hand moves the head slider of the anthropometer to the highest point of the head in the sagittal plane. The subject takes a deep breath, the examiner takes a position to observe the stadiometer scale without parallax, the SiH value is recorded. Stature minus SiH is used to provide an estimate of lower extremity (subischial leg length, LL) height.

To measure body weight (BW), the subject stands still over the center of the platform with the body weight evenly distributed between both feet. BW was assessed using electronic flat scales SECA 876, Germany with measurement accuracy up to 100 g. Body mass index (BMI) was calculated using the Quetelet formula.

To measure the diameters (breadth) of large joints, a sliding caliper (KAFA, Russia) was used, with measurement accuracy up to 0.1 cm. Knee breadth (KB) is defined as the distance between the medial and lateral femoral epicondyles with sitting subject at flexed leg 90°. The epicondyle is palpated and caliper tips are placed on these points, and the breadth is recorded. Elbow breadth (EB) measurement requires to define the distance between the epicondyles of the humerus.

Non-elastic ergonomic circumference measuring tape SECA 203, Germany was used to measure limb circumference with an accuracy of 0.01 cm. For measurement Upper-Arm circumference (U-AC) the subject stands erect, with the arms hanging freely at the sides of the trunk and with the palms facing the thighs. The researcher located the midpoint of the upper arm on which the tape was placed. Calf circumference (CC) measurements were taken in a standing position with the feet approximately 20 cm apart with an even distribution of body weight. An inelastic tape measure is positioned horizontally around the calf so that the zero mark is visible. Waist circumference (WC) was measured by applying the tape in a horizontal plane, at the level of the natural waist, which is the narrowest part of the torso. To measure Hip circumference (HC), the subject should stand erect with arms at the sides and feet together. The anthropometrist squats at the side of the subject so that the level of maximum extension of the buttocks can be seen. An inelastic tape is placed around the buttocks in a horizontal plane at this level without compressing the skin with the help an assistant is needed to help position the tape on the opposite side of the subject's body. The zero end of the tape should be below the measurement value. The measurement is recorded using a tape scale.

The inclusion of overweight subjects in the sample, especially if they were overweight in one of the experimental groups, could have significantly limited the results of this study. Therefore, in addition to BMI, measurements of the skin-fat fold, we assessed the waist-to-hip ratio. Waist-to-hip ratio is well known as an indicator of metabolic syndrome, obesity and a predictor of cardiovascular disease not only in adults, but also in children [23, 25]. According to WHO recommendations, the «threshold» waist-to-hip ratio value for diagnosing obesity in men is 0.90 [28]. Therefore, in this work we were guided by the given Waist-to-hip ratio values.

The skinfolds were measured using a professional caliper ET MEASURE model SK-101, China, with spring calibrated to produce equal pressure (0.01 kg/mm²) on both sides of the fold, and the accuracy of the measurement was 0.2 mm.

The subscapular skinfold (SubSS) is picked up on a diagonal, inclined infero-laterally approximately 45° to the margo medialis scapulae just inferior to its inferior angle. The subject stands comfortably erect, with the upper extremities relaxed at the sides of the body. The suprailiac skinfold (SupraIS) is measured in the midaxillary line immediately superior to the iliac crest. The subject stands with feet together and in an erect position, the arms hang by the sides. ASupraIS is grabbed obliquely (at 45° to the horizontal) just posterior to the midaxillary line following the natural cleavage lines of the skin. The triceps skinfold (TS) is measured standing in the midline of the posterior aspect of the arm, over the triceps muscle, at a point midway between the lateral projection of the acromion process of the scapula and the inferior margin of the olecranon process of the ulna. The skinfold is measured with the arm hanging loosely and comfortably at the subject's side. The anthropometrist stands behind the subject and places the palm of his or her left hand on the subject's arm and picked up with the left thumb and index finger and applies the caliper jaws. For the measurement of the medial calf skinfold (CS), the subject sits with the knee on the side to be measured flexed to about 90°, with the sole of the corresponding foot on the floor. The skinfold is measured medially at the level of maximum development of the calf muscles.

2.3. Somatotyping. Somatotyping was performed by the Heath-Carter method, and based on Sheldon's physical taxonomy, which assumes all possible body types are categorized on three somatotypes [16]. Pure ectomorph is characterized as skinny, tall subject with long limbs and a short body; pure mesomorph – hard and strong, with even weight distribution, muscular, thick-skinned; pure endomorph – usually short, with a high content of body fat, and a subject with a long body and short limbs [16]. In 1960, Heath and Carter proposed a formulaic approach based on a series of equations that allows one to calculate the degree of involvement of ectomorphic (ECTO (1)), mesomorphic (MESO (2)) and endomorphic (ENDO (3)) components in the total body shape of a particular subject [16]. Application of the Heath-Carter formula requires the measurement of the 10 anthropometric parameters: StH, BW, KB, EB, U-AC, CC, SubSS, SupraIS, TS, CS [16]:

$$\text{ECTO (HWR, height-to-weight ratio)} = \frac{\text{StH,cm}}{\sqrt[3]{\text{BW,kg}}}; (1)$$

$$\text{If HWR} \geq 40,75, \text{ then ECTO} = 0,732 * \text{HWR} - 28,58$$

$$\text{If HWR from } 38,25 \text{ to } 40,75 \text{ then ECTO} = 0,463 * \text{HWR} - 17,63$$

$$\text{If HWR} \leq 38,25 \text{ then ECTO} = 0,5$$

$$\text{MESO} = (0,858 * \text{EB, cm} + 0,601 * \text{KB, cm} + 0,188 * (\text{U} - \text{AC, cm} - \frac{\text{TS,mm}}{10}) + 0,161 * (\text{CC, cm} - \frac{\text{CS,mm}}{10}) - (0,131 * \text{StH, cm}) + 4,5); (2)$$

$$\text{ENDO} = -0,7182 + 0,1451 * X - 0,00068 * X^2 + 0,0000014 * X^3; (3)$$

$$X = (\text{TS, mm} + \text{SubSS, mm} + \text{SupraIS, mm}) * (\frac{170,18}{\text{StH, cm}})$$

2.4. Statistical Analysis. The statistical hypotheses about the difference of central tendencies in the three groups were tested for quantitative variables using the Kraskell-Wallis criterion. When statistically significant differences were identified, a posteriori comparisons were performed using the Mann-Whitney criterion with Bonferroni correction to correct for inflation of the 1st kind of error. The results were considered statistically significant at $p < 0.05$. All results were performed using Excel program functions installed in Microsoft Office 2010 application package; using Past (version 2.17, Norway, Oslo, 2012) and MicroCAL OriginPro 8.5.0 (EULA, Northampton, MA 01060-4401, USA) statistical data processing program. All data are presented as mean (μ) values and lower (LL) and upper limit (UL) of the 95% confidence interval (μ ; (LL; UL 95% CI)) of the anthropometric parameter.

3. Results

The peculiarities of anthropometric indicators of adolescents living in different ecological areas of the Southern Aral Sea region (Republic of Karakalpakstan) and the results of their comparison are shown in tables 1 and 2.

Among adolescent boys living in areas with different environmental status, statistically significant differences were found in standing height, leg length, knee breadth and elbow breadth, upper-arm circumference, suprailiac skinfold, triceps skinfold, calf skinfold, mesomorphic somatotype and WHR (Table 1). In pairwise comparisons, it was observed that standing height, knee breadth, elbow breadth and WHR of boys living in Nukus were statistically higher than their peers living in Muynak and Turtkul. Turtkul boys outperformed their peers in upper-arm circumference, suprailiac skinfold, triceps skinfold and calf skinfold (Table 1).

Statistically significant differences were found in standing height, body weight, knee breadth and elbow breadth, suprailiac skinfold, triceps skinfold, calf skinfold and mesomorphic somatotype in girls living in areas with different ecological status (Table 2). In pairwise comparisons, it was observed that standing height, body weight, knee breadth and elbow breadth of girls living in Nukus were statistically higher than those of their peers living in Muynak and Turtkul. The girls from Turtkul outperformed their peers (from Muynak and Nukus) by the values of suprailiac skinfold, triceps skinfold and calf skinfold (Table 2).

The frequency of boys with mesomorphic somatotype increases in the following sequence: Turtkul < Muynak < Nukus. There were no statistically significant differences by regions of endomorphic and ectomorphic somatotype (fig. 2).

By somatotype, the same results were observed in girls as in boys. In particular, the frequency of occurrence of girls with mesomorphic somatotype increases in the following sequence: Turtkul < Muynak < Nukus. No statistically significant differences by regions of endomorphic and ectomorphic somatotype were found (fig. 3)

Table 1. Anthropometric parameters and their comparison for adolescent boys living in different regions of the Aral Sea region (μ ; 96% CI)

Parameter	Muynak (n=302)	Nukus (n=345)	Turtkul (n=336)	P values*	P for pairwise comparisons**		
					Muynak- Nukus	Muynak- Turtkul	Nukus- Turtkul
Standing height (StH), cm	162.95 (161.33; 163.96)	165.44 (164.59; ; 166.28)	163.54 (162.61; ; 164.46)	0.002284	0.003093	1	0.02944
Body weight (BW), kg	53.33 (52.19; 54.47)	54.79 (53.63; 55.95)	54.32 (52.82; 55.83)	0.111	0.1472	1	0.3091
Body mass index (BMI), kg/m ²	20.04 (19.67; 20.41)	19.89 (19.58; 20.21)	20.15 (19.69; 20.61)	0.7324	1	1	1
Sitting height (SiH), cm	74.33 (72.07; 76.59)	75.23 (74.32; 76.79)	74.66 (72.00; 76.81)	0.1248	0.0872	1	0.1191
Leg length (LL), cm	85.07 (83.11; 87.03)	86.89 (84.06; 88.02)	85.22 (83.14; 87.36)	0.00258	0.00957	0.2745	0.07233
Knee breadth (KB), cm	7.81 (7.69; 7.92)	8.28 (7.81; 8.75)	7.14 (6.75; 7.53)	2.278×10 ⁻⁴⁸	1.925×10 ⁻⁵	6.17×10 ⁻²⁵	4.387×10 ⁻⁴⁴

Elbow breadth (EB), cm	6.85 (6.42; 7.29)	6.89 (6.82; 6.96)	5.96 (5.85; 6.07)	1.792×10^{-42}	3.492×10^{-5}	4.192×10^{-20}	3.505×10^{-40}
Upper-Arm circumference (U-AC), cm	24.64 (24.31; 24.98)	24.52 (24.17; 24.87)	26.39 (25.02; 27.77)	7.192×10^{-6}	1	0.000249	3.28×10^{-5}
Calf circumference (CC), cm	30.87 (30.52; 31.23)	30.96 (30.62; 31.30)	30.95 (30.51; 31.40)	0.6344	1	1	1
Subscapular skinfold (SubSS), cm	5.22 (5.11; 5.32)	5.21 (5.12; 5.30)	5.37 (5.17; 5.56)	0.06262	1	0.2525	0.08444
Suprailiac skinfold (SupraIS), cm	5.20 (5.10; 5.30)	5.06 (4.97; 5.15)	5.60 (5.42; 5.78)	0.003849	0.3662	0.2108	0.003364
Triceps skinfold (TS), cm	3.98 (3.92; 4.04)	3.83 (3.78; 3.89)	4.48 (4.33; 4.63)	2.599×10^{-16}	0.003848	4.415×10^{-7}	3.794×10^{-15}
Calf skinfold (CS), cm	5.83 (5.71; 5.95)	5.45 (5.35; 5.56)	6.30 (6.07; 6.52)	1.069×10^{-8}	1.106×10^{-6}	1	2.906×10^{-7}
Ectomorphic (ECTO), value	3.28 (3.09; 3.47)	3.50 (3.35; 3.66)	3.36 (3.16; 3.56)	0.5263	0.7608	1	1
Mesomorphic (MESO), value	2.98 (2.75; 3.21)	4.34 (1.71; 6.98)	2.36 (1.89; 2.84)	1.988×10^{-16}	0.6434	1.359×10^{-10}	9.151×10^{-15}
Endomorphic (ENDO), value	1.23 (1.20; 1.26)	1.19 (1.17; 1.22)	1.35 (1.29; 1.41)	0.1268	0.4451	1	0.1836
Waist circumference (WC), cm	63.76 (61.75; 65.77)	64.15 (62.37; 65.94)	64.22 (62.33; 65.96)	0.6623	1	1	1
Hip circumference (HC), cm	77.63 (75.26; 80.00)	77.84 (75.37; 80.64)	77.80 (75.48; 80.53)	0.7746	1	1	1
Waist-to-hip ratio	0.82 (0.81; 0.84)	0.84 (0.83; 0.86)	0.83 (0.82; 0.86)	0.002231	0.00012	0.02641	0.006564

Note. Calculated using * - Kraskell-Wallis criterion; ** - Mann-Whitney criterion.

Table 2. Anthropometric parameters and their comparison for adolescent girls living in different regions of the Aral Sea region (μ ; 96% CI)

Parameter	Muynak (n=299)	Nukus (n=264)	Turtkul (n=309)	P values*	P for pairwise comparisons**		
					Muynak-Nukus	Muynak-Turtkul	Nukus-Turtkul
Standing height (StH), cm	158.76 (157.98; 159.54)	159.94 (158.89; 161.01)	157.25 (156.60; 157.90)	2.15×10^{-7}	0.01145	0.0461	3.956×10^{-8}

Body weight (BW), kg	50.89 (49.80; 51.99)	51.55 (50.27; 52.82)	49.52 (48.35; 50.69)	0.01496	1	0.09294	0.0162
Body mass index (BMI), kg/m ²	20.16 (19.77; 20.54)	20.51 (19.46; 21.55)	19.98 (19.56; 20.41)	0.4427	1	0.7182	1
Sitting height (SiH), cm	72.21 (70.17; 74.54)	72.63 (70.32; 74.79)	72.03 (70.00; 74.11)	0.6456	0.4552	1	0.4193
Leg length (LL), cm	82.12 (80.11; 84.03)	82.89 (80.14; 85.09)	82.22 (80.18; 84.77)	0.8558	0.3957	1	0.7564
Knee breadth (KB), cm	7.76 (7.65; 7.87)	8.10 (8.00; 8.20)	6.70 (6.58; 6.83)	1.124×10^{-57}	5.434×10^{-6}	6.202×10^{-33}	5.055×10^{-50}
Elbow breadth (EB), cm	6.41 (6.32; 6.50)	6.60 (6.51; 6.67)	5.67 (5.57; 5.77)	4.038×10^{-44}	0.009613	6.88×10^{-26}	1.314×10^{-39}
Upper-Arm circumference (U-AC), cm	22.78 (22.46; 23.11)	22.85 (22.49; 23.22)	23.13 (22.78; 23.49)	0.3439	1	0.5632	0.7088
Calf circumference (CC), cm	31.40 (29.46; 33.34)	30.65 (30.20; 31.11)	30.74 (30.37; 31.11)	0.5659	1	0.9842	1
Subscapular skinfold (SubSS), cm	5.01 (4.90; 5.12)	5.09 (4.99; 5.20)	5.13 (4.85; 5.39)	0.005219	0.4635	0.1941	0.003833
Suprailiac skinfold (SupraIS), cm	4.97 (4.87; 5.08)	5.03 (4.92; 5.14)	5.35 (5.00; 5.70)	0.6034	1	1	1
Triceps skinfold (TS), cm	3.86 (3.79; 3.92)	3.89 (3.83; 3.95)	4.22 (3.99; 4.45)	0.02946	0.7308	0.03567	0.3765
Calf skinfold (CS), cm	5.57 (5.43; 5.71)	5.32 (5.20; 5.45)	5.82 (5.44; 6.21)	0.001161	0.001146	1	0.01499
Ectomorphic (ECTO), value	2.97 (2.77; 3.17)	3.17 (2.96; 3.38)	3.00 (2.80; 3.21)	0.267	0.3401	1	0.731
Mesomorphic (MESO), value	2.86 (2.65; 3.08)	3.10 (2.87; 3.32)	1.93 (1.70; 2.16)	3.84×10^{-15}	0.5435	1.112×10^{-9}	9.844×10^{-14}
Endomorphic (ENDO), value	1.16 (1.12; 1.19)	1.18 (1.15; 1.21)	1.24 (1.17; 1.32)	0.6388	1	1	1
Waist circumference (WC), cm	61.86 (59.75; 63.45)	62.23 (60.37; 65.22)	61.46 (59.73; 64.78)	0.7021	1	1	1

Hip circumference (HC), cm	74.57 (72.26; 78.04)	74.99 (72.11; 79.29)	74.56 (72.48; 78.84)	0.7936	1	1	1
Waist-to-hip ratio	0.83 (0.82; 0.86)	0.84 (0.83; 0.86)	0.83 (0.82; 0.86)	0.2458	0.3126	1	0.3465

Note. Calculated using * - Kraskell-Wallis criterion; ** - Mann-Whitney criterion.

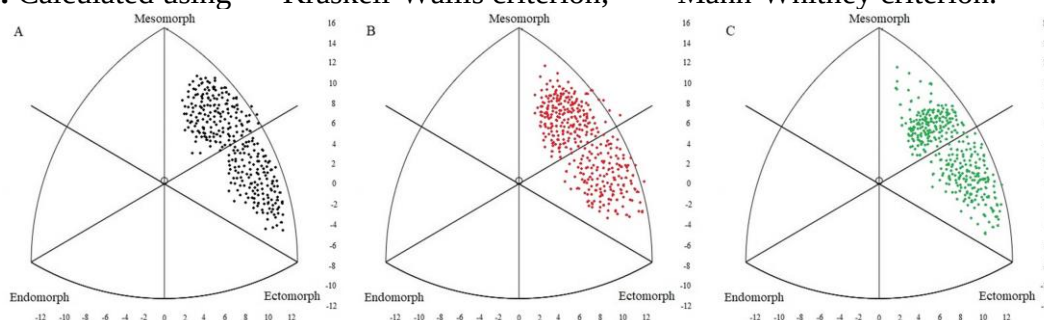


Figure 2. Distribution of somatotype profile of boys living in different districts of Aral Sea region (A-Muynak district; B-Nukus city; C-Turtkul district)

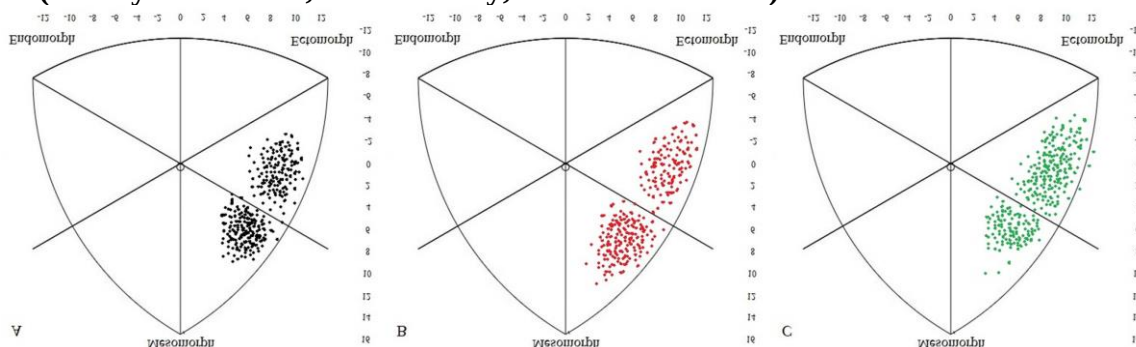


Figure 3. Distribution of somatotype profile of girls living in different districts of Aral Sea region (A-Muynak district; B-Nukus city; C-Turtkul district)

4. Discussion

As a result of the observations, an attempt was made to characterize the negative impact of the ecologically unfavorable environment of the Aral Sea region on the self-totype of modern pubertal adolescents. To the best of our knowledge, this is the first such study involving adolescents from Karakalpakstan, combining the assessment of anthropometric profile and self-totype status of residents of the Aral Sea regions located at different distances from the epicenter of the Aral Sea ecological disaster.

Studies have investigated the effect of multidirectional loads on changes in central hemodynamic parameters in schoolchildren 11-14 years old [3]. It was also established that schoolchildren with astheno-thoracic somatotype should devote at least 30% of time to the development of endurance. Representatives of muscular and training somatypes require the same amount of training loads for the development of speed motor qualities [3]. 3450 schoolchildren aged 7 to 17 years in Gomel underwent morphofunctional examination [7]. The examination of urban schoolchildren in the age range from 7 to 17 years showed that the age dynamics of body weight and thickness of the skin-fat layer of the studied individuals depends on the constitutional features of their physical condition. The earliest maximum increase in body weight was observed in boys and girls with hypersomnia at the age of 9 to 10 years. Among mesosomal and leptosomal boys, the maximum increase in the index was noted at the age of 14 to 15 years, and among girls of these types of physique - from 12 to 13 years [7]. The most important periods of skin-fat fold growth were registered in hypersomal boys (9-10 years old) and slightly later in meso- and leptosomal boys. Among girls of all body types, the maximum growth of all skin-fat folds was registered at the age of 12 to 14 years.

Decrease in fat deposits was found in boys of all somatotypes at the age of 13 to 14 years, and in girls at the age of 16 to 17 years. During puberty, increased fat layer is observed in girls of all somatotypes, and its decrease in boys [7].

The age dynamics of hormonal status can be traced in a comparative assessment of the results of studies of observed adolescents and young people living in Kirov [5]. 18-year-old boys, in contrast to 15- and 16-year-olds and 17-year-olds, had the highest level of hormones in blood serum. However, studies have revealed a dependence of hormonal status on body type, which is particularly pronounced in 16-year-old adolescents and 17- and 18-year-olds. Adolescents and young adults with microsomatic body type had lower serum hormone levels compared to mesosomatic and macrosomatic body types. Therefore, scientific sources also contain data that when analyzing the results of studies of hormone content in serum in young people, it is necessary to take into account the peculiarities of the hormonal status of different somatotypes [5].

The total growth of body segments at the age of 7 to 17 years is higher in leptosomal boys and girls. Sexual dimorphism of skeletal body parameters in representatives of all somatotypes in the process of ontogenesis gradually increases in favor of boys due to high growth rates of indicators during puberty ($p < 0.05-0.001$) [8]. The study found that there are significant sex differences in the dominant somatotypes of adolescent bodies: girls are significantly endomorphic and boys are mesomorphic. The study suggests that this is due to the fact that females have more body fat than males, possibly due to the slightly less physical life that students lead in school [21]. The time and rate of development of secondary sexual characteristics in boys depend on the type of physique of the person under study [6]. The first stages of development of secondary sexual characteristics in urban boys begin to appear in adolescents with statistically significant ($P < 0.05-0.001$) previously hypersomal variants of physique (fat hypersomia, hypersomia, mesohypersomia) [6].

Constitutional type is an integral index characterizing physical and functional capabilities of the human organism. Somatotype is a morphological expression of constitution. Based on its knowledge, it is possible to predict quite accurately the rates of maturation and aging of the organism, peculiarities of reactivity to various environmental influences [10]. The environment together with heredity has a form-forming influence on all structures of the organism and on the features of its constitution. The increase in the degree of anthropogenic load on the human body today is proven in all countries of the world. This fact determines the high interest in studying not only population, but also somatotype (individual and constitutional) features of human body adaptation to various combinations of environmental and socio-ecological factors [1, 2, 22]. The somatotype approach makes it possible to assess more accurately the constitutional specificity of the organism's reactions to environmental disadvantage and reasonably distinguish risk groups with respect to damaging factors, in order to timely implement preventive measures before the onset of disease symptoms. There are a number of factors that influence changes in body type during ontogenesis with age. One of the leading among them is the neuroendocrine status of a person, which in the periods of pre-puberty, puberty and post-puberty undergoes significant changes and, as a consequence, has a great impact on the formation of a certain type of physique. There is also a whole complex of external environmental factors that can influence the human constitution to different degrees. First of all, these are nutrition, climatic and geographical factors, the level of motor activity, family composition, etc. [15, 19].

The existence of a connection between somatotype and endocrine status is undeniable. When monitoring the somatic and hormonal status of boys, it was found that they have earlier formation of digestive-muscular and muscular types of constitution. It is statistically proved that it is connected with earlier and higher saturation of their organism with male sex hormones. At the same time in the process of growth and development there are periods during which a person experiences significant hormonal instability, which, on the other hand, is physiologically conditioned. In particular, these are prepubertal and pubertal age in adolescents, and in women - also the period of pregnancy. Scientists believe that it is these periods that play a key role for the stability of the somatotype.

The modern human population, including children and adolescents, is characterized by hypodynamia and consumption of excessive amounts of food, which undoubtedly leads to an increase in the number of people with excess body weight. However, a significant increase in body weight occurs, perhaps, only against the background of a certain somatotype predisposition. Consequently, external influence is able to strengthen the manifestation of the constitutional type.

5. Conclusion

Thus, the analysis of experimental and literary sources on the issue of somatotypological features of human morphogenesis in puberty, living in conditions of high impact of negative anthropogenic factors in combination with the ever-increasing pressure of socio-economic and psychological factors, allowed us to draw the following conclusions:

1. The data on morphometric indices of physical development of children and adolescents living in different urban-ecological conditions obtained by various authors are scattered and ambiguous, and the revealed trends are often contradictory. Despite the fact that the general regularities of the implementation of the genetic program during human ontogenesis have been studied in detail at the individual and population levels, the specifics of the combined influence of various environmental factors on the formation of phenotypic diversity in different ecological niches should be studied.

2. The majority of scientific publications point out that the deterioration of the living environment causes significant changes in morphometric indicators of the human body and, therefore, it is necessary to constantly monitor their condition in the child population, which is the most ecosensitive group of the population. There are few generalizing data characterizing the somatotic status of schoolchildren in Karakalpakstan in representatives of different somatotypes, although they are important for assessing the state of health of children's contingents and are necessary for the development of criteria for individual assessment of physical development indicators of adolescents.

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Rezyume: *Ushbu maqolada Orolbo'yining turli ekologik hududlarida yashovchi 14-15 yoshli o'smirlarning antropometrik profili va tana turini (somatotip) aniqlashga harakat qilindi. Xit-Karter o'lchash usuli bo'yicha somatotipni baholash shuni ko'rsatdiki, mezomorf somatotipli o'g'il va qiz bolalarning paydo bo'lish chastotasi quyidagi ketma-ketlikda ortadi: Turtkul < Muynak < Nukus. Hududlar bo'yicha endomorf va ektomorf somatotiplarda statistik jihatdan ahamiyatli farqlar aniqlanmadi.*

Резюме: *В данной статье была сделана попытка определить антропометрический профиль и тип телосложения (соматотип) подростков 14-15 лет, проживающих в разных экологических районах Приаралья. Оценка соматотипа по методу измерения Хит-Картера показала, что частота встречаемости мальчиков и девочек с мезоморфным соматотипом увеличивается в следующей последовательности: Турткуль < Муынак < Нукус. Не было статистически значимых различий по регионам эндоморфного и эктоморфного соматотипа.*

Kalit so'zlar: *ekologik holat, og'ir metallar, somatotip, antropometrik ko'rsatkichlar, Orolbo'yi hududlari*

Ключевые слова: *экологическое состояние, тяжелые металлы, соматотип, антропометрические показатели, районы Приаралья*

COMPARISON OF FEATURES OF BODY STRUCTURE AND SOME FUNCTIONAL INDICES IN THE GROUPS OF ADOLESCENTS WITH DIFFERENT PHYSICAL ENDURANCE

Rozumbetov K.U¹., Shamuratova G.K²., Esimbetov A.T³.

¹ *Acting Associate Professor of the Department of Veterinary Diagnostics and Food Safety, Nukus Branch of Samarkand State University of Veterinary Medicine, Animal Husbandry and Biotechnology*

² *Basic doctoral student of Karakalpak State University*

³ *Director of Nukus Branch of Samarkand State University of Veterinary Medicine, Animal Husbandry and Biotechnology*

Summary: Using a multi-stage fitness test, an attempt was made to compare the level of physical endurance of schoolchildren not regularly engaged in sports and the subjects' physique parameters and some functional indices according to these levels. 131 adolescents aged 14-15 years participated in the study. The participants were divided into 2 groups according to their physical endurance. In particular, the first group included adolescents with "poor" physical endurance, and the second group included adolescents with "good" physical endurance. In adolescents, higher values of total body size, LVC, VO₂ max and wrist muscle strength are associated with higher physical endurance. It is shown that adolescents with mesomorphic somatotype have comparatively higher physical endurance than their ectomorphic peers, which is consistent with the data from the literature.

Keywords: physical endurance, maximum oxygen consumption, multistage fitness test, somatotype, anthropometric indices

1. Introduction

Functional-adaptive abilities of the organism are also inextricably linked to physical development. The speed and volume of adaptation are related to its efficiency, functional readiness of the organism and endurance. The processes of growth and development lead to the emergence of qualitative differences in the morphological structure and, consequently, in the organization of the functioning of physiological systems, resulting in the creation of structures with high functional capabilities. According to the age and physical endurance of children, the magnitude and rate of change in functional fitness can be judged on the training effect and functional capabilities of the organism [3, 14].

Determination of physical indicators, along with the assessment of somatic development, allows using these indicators to determine the level of training, highlight predisposing and borderline conditions within normal values. This is the main task of physiological control of healthy children engaged in sports [20]. Such an integrated approach to the characterization of functional and physical endurance allows not only to study the basic regularities of growth and development, to identify functional features, flexibility and aerobic capacity of children of different ages under conditions of sports physical activity, but also to develop practical aspects of children's sports physiology, to justify technologies and methods of training from a physiological point of view. When performing any physical exercise or load, the duration and intensity of this exercise will depend on the aerobic capacity of the organism [14, 23].

A person's aerobic capacity is determined primarily by his or her maximum oxygen consumption. The higher the maximum oxygen consumption (MOC), the higher the absolute power of maximal aerobic exercise [13]. In addition, the higher the MOC, the easier and therefore longer it is to perform aerobic work. The level of MOC depends on the maximal capacity of two functional systems: 1) oxygen transport, absorbing oxygen from the surrounding air and transporting it to the working muscles and other active organs and tissues of the body; and 2) the oxygen recycling system, that is, the muscular system that excretes and removes oxygen delivered by the blood.

One of the aforementioned aerobic exercises is the Multi - Stage Fitness test – MSFT, which requires running 20 meters. There is no age limit in performing the Multi - Stage Fitness test and increasing the body's endurance with it [17, 21]. Performing this fitness test strengthens the cardiovascular and respiratory systems of the body and leads to an increase in its duration and intensity when the body is subjected to some physical activity. Among the population living in the Republic of Karakalpakstan, there is no scientific data on whether scientific studies have been conducted using such aerobic tests or specifically the multi-stage fitness test. Therefore, we set a goal to compare the level of physical endurance of schoolchildren who do not regularly engage in sports and the parameters of the subjects' physique according to these levels, as well as some functional indices using a Multi - Stage Fitness test.

2. Methods

2.1. Participants and study area. In recent years, physical development and functional states of adolescents have been studied in the territory of the Republic of Karakalpakstan of the Southern Aral Sea region [4]. There are also scientific works aimed at using artificial intelligence to study factors affecting athletes' fitness [24], physical development and performance [18, 19]. However, research on physical endurance in schoolchildren who do not participate in sports is still poorly studied.

The study was conducted in secondary general education school №8 in Nukus city of the Republic of Karakalpakstan. The study involved 131 adolescents aged 14-15 years old. The participants were divided into 2 groups depending on their physical endurance. In particular, the first group included adolescents with “poor” physical endurance, and the second group included adolescents with “good” physical endurance. In the next step, body parameters and some functional parameters of the participants were studied and these parameters were compared in both groups.

2.2. Anthropometrics. Anthropometric parameters were measured according to the procedures recommended at the Airlie Conference on the Standardization of anthropometric measurements [22]. They were assessed by two experienced researchers in the morning under comfortable environmental conditions (temperature 18-20°C, humidity 50-60%) in a separate medical room with artificial lighting.

Stature and sitting height were assessed using a mobile stadiometer SECA 217, Germany with a measurement accuracy of 0.1 cm. Body weight was assessed using electronic flat scales SECA 876, Germany with measurement accuracy up to 100 g. Body mass index (BMI) was calculated using the Quetelet formula. To measure the diameters (breadth) of large joints, a sliding caliper (KAFA, Russia) was used, with measurement accuracy up to 0.1 cm. Non-elastic ergonomic circumference measuring tape was used to measure limb circumference with an accuracy of 0.01 cm. The skinfolds were measured using a caliper Slim Guide Caliper, China, with spring calibrated to produce equal pressure (0.01 kg/mm²) on both sides of the fold, and the accuracy of the measurement was 0.2 mm.

2.3. Somatotyping. Somatotyping was performed by the Heath-Carter method, and based on Sheldon's physical taxonomy, which assumes all possible body types are categorized on three somatotypes [16]. Pure ectomorph is characterized as skinny, tall subject with long limbs and a short body; pure mesomorph – hard and strong, with even weight distribution, muscular, thick-skinned; pure endomorph – usually short, with a high content of body fat, and a subject with a long body and short limbs [16]. In 1960, Heath and Carter proposed a formulaic approach based on a series of equations that allows one to calculate the degree of involvement of ectomorphic (ECTO (1)), mesomorphic (MESO (2)) and endomorphic (ENDO (3)) components in the total body shape of a particular subject [16]. Application of the Heath-Carter formula requires the measurement of the 10 anthropometric parameters: StH, BW, KB, EB, U-AC, CC, SubSS, SupraIS, TS, CS [16]:

$$\text{ECTO (HWR, height-to-weight ratio)} = \frac{\text{StH, cm}}{\sqrt[3]{\text{BW, kg}}}; \quad (1)$$

If $\text{HWR} \geq 40,75$, then $\text{ECTO} = 0,732 * \text{HWR} - 28,58$

If HWR from 38,25 to 40,75 then $\text{ECTO} = 0,463 * \text{HWR} - 17,63$

If $\text{HWR} \leq 38,25$ then $\text{ECTO} = 0,5$

$$\text{MESO} = (0,858 * \text{EB, cm} + 0,601 * \text{KB, cm} + 0,188 * (\text{U} - \text{AC, cm} - \frac{\text{TS, mm}}{10}) + 0,161 * (\text{CC, cm} - \frac{\text{CS, mm}}{10}) - (0,131 * \text{StH, cm}) + 4,5 ; \quad (2)$$

$$\text{ENDO} = -0,7182 + 0,1451 * X - 0,00068 * X^2 + 0,0000014 * X^3; \quad (3)$$

$$X = (\text{TS, mm} + \text{SubSS, mm} + \text{SupraIS, mm}) * (\frac{170,18}{\text{StH, cm}})$$

2.4. Multi-stage fitness test – MSFT. Maximum oxygen consumption (MOC) was calculated based on the Multi-Stage Fitness test. The Multi-Stage Fitness test (MSFT) is a popular aerobic test for maximum speed and endurance. The test involves continuous “shuttle” running between two checkpoints at a distance of 20 meters. This method is considered to be a reliable method of MCI detection in “field” experimental conditions [15]. After a light warm-up (warm-up), the subject was offered by a sound signal to run continuously between two lines at a distance of 20 m from each other (Fig. 1).

Multi-stage Fitness Test Track

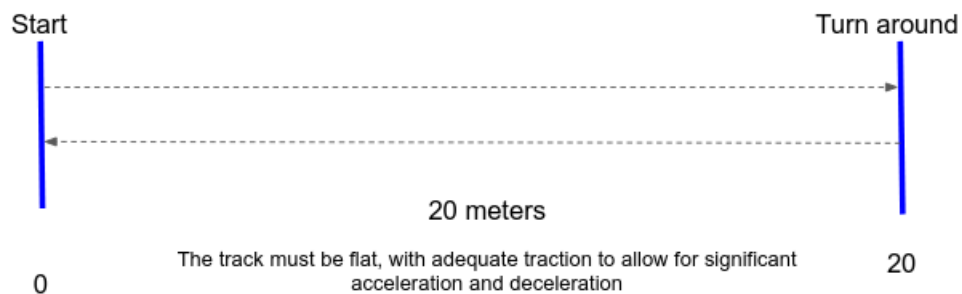


Figure 1. Schematic view of conducting a multi-stage fitness test

To conduct the test, participants line up facing the opposite line and begin running between them after the beep at a low speed (Fig. 2). After about a minute, the time of the audible encounter shortens, requiring the volunteers to increase their speed. If the subject has made it to the line before the alarm is sounded, he or she must wait for a signal indicating a return before returning. If the line is not reached before the alarm sounds, the volunteer is cautioned and must continue to run toward the line. This volunteer should attempt to maintain speed during the next two alarms. The study participant receives a warning if he or she fails to reach the line within 2 meters for the first time. After the second warning, the test is terminated.



Figure 2. A snapshot of the multi-stage fitness test process

Results and interpretation: the score of a/b result is similar to a binary number, where A is the level (which increases every minute), A B is the number of intervals at that level.

Example entry: up to 12/3.

Below is a table to interpret the fitness level¹ (Table 1).

Table 1

Interpretation of children's physical fitness level and assessment of results

Years	Very poor	Poor	Fair	Average	Good	Very good	Excellent
9	<2/2	2/2-3/4	3/5-4/4	4/5-5/4	5/5-6/4	6/5-7/7	>7/7
10	<2/2	2/2-3/5	3/6-4/5	4/6-5/5	5/6-6/6	6/7-8/1	>8/1
11	<2/2	2/2-3/6	3/7-4/7	4/8-5/8	5/9-6/10	7/1-8/6	>8/6
12	<2/2	2/2-3/8	4/1-5/1	5/2-6/4	6/5-7/6	7/7-9/3	>9/3
13	<2/4	2/4-4/2	4/3-5/6	5/7-6/9	6/10-8/3	8/4-10/1	>10/1
14	<2/6	2/6-4/5	4/6-6/1	6/2-7/4	7/5-8/9	8/10-10/9	>10/9
15	<2/7	2/7-4/7	4/8-6/3	6/4-7/7	7/8-9/2	9/3-11/3	>11/3
16	<2/8	2/8-4/9	5/1-6/6	6/7-7/10	8/1-9/6	9/7-11/8	>11/8
17	<3/1	3/1-5/2	5/3-6/8	6/9-8/3	8/4-9/9	9/10-12/1	>12/1

Calculation: the volunteer's score is based on the level and number of twenty-meter runs achieved before completing the test.

The MOC is calculated according to the formula:

$$\text{MOC} = 31,025 - 3,238 \times (8 + 0,5 \times \text{level}) - 3,248 \times \text{age} + 0,1536 \times (8 + 0,5 \times \text{level}) \times \text{age}$$

2.5. Statistical Analysis. When statistically significant differences were identified, a posteriori comparisons were performed using the Mann-Whitney criterion with Bonferroni correction to correct for inflation of the 1st kind of error. The results were considered statistically significant at $p < 0.05$. All results were performed using Excel program functions installed in Microsoft Office 2010 application package; using Past (version 2.17, Norway, Oslo, 2012) and MicroCAL OriginPro 8.5.0 (EULA, Northampton, MA 01060-4401, USA) statistical data processing program. All data are presented as mean (μ) values and lower (LL) and upper limit (UL) of the 95% confidence interval (μ ; (LL; UL 95% CI)) of the anthropometric parameter.

3. Results

The results of physical endurance in school children using multi-stage fitness test were as follows: 4.58% very poor, 25.20% poor, 25.95% fair, 26.71% average, 12.22% good, 3.81% very good, 1.53% excellent. As mentioned above, according to the results of physical endurance, the adolescents were divided into 2 groups, including "Group 1-adolescents with low physical endurance" and "Group 2-adolescents with good physical endurance" (Fig. 3).

All adolescents who participated in the study

Very poor	Poor	Fair	Average	Good	Very good	Excellent
4.58%	25.20%	25.95%	26.71%	12.22%	3.81%	1.53%
Group №1 (Poor endurance)				Group №2 (Good endurance)		

¹ <https://alivemedicine.ru/sport-med/tpost/eyd4ul0rv1-bip-test-beep-test>

Figure 3. Schematic expression of the grouping of adolescents according to the physical endurance outcomes that participated in the study

The results of multistage fitness test in both groups are summarized in Table 2.

Table 2. Parameters of the multi-stage fitness test in the studied groups

Parametr	Group №1 (Poor endurance)	Group №2 (Good endurance)	P value
Total time, s	203.59 (187.82; 219.37)	395.75 (373.23; 418.28)	P<0.0001
Total distance, m	515.34 (472.55; 558.14)	1085.17 (1010.10; 1160.30)	P<0.0001
Current level	4/5 (3/5; 5/2)	7/7 (6/7; 9/3)	P<0.0001
VO ₂ max	32.39 (31.63; 33.16)	41.91 (40.85; 42.97)	P<0.0001
Time level, s	25.77 (20.72; 30.82)	24.13 (20.15; 28.11)	0.814
Distance level, m	67.30 (54.90; 79.71)	78.08 (64.85; 91.32)	0.0816
level Speed, km/h	9.96 (9.84; 10.09)	14.48 (9.48; 19.48)	P<0.0001

It was observed that almost all of its parameters were high in the representatives of group 2. This is due to the fact that the representatives of this group ran longer and longer distances than their peers from group 1, and they were found to have a high maximum oxygen consumption.

Table 3 compares somatotype characteristics, body mass index and some functional indices of adolescents in the studied groups.

Table 3. The features of somatotype characteristics and some functional indicators in adolescents in the studied groups and their comparison

Parametr	Group №1 (Poor endurance)	Group №2 (Good endurance)	P value
Standing height (StH), cm	155.99 (155.30; 164.69)	166.82 (164.42; 169.22)	0.004875
Body weight (BW), kg	50.27 (47.59; 54.24)	52.56 (49.96; 55.16)	0.0351
Body mass index (BMI), kg/m ²	18.73 (18.17; 19.29)	19.06 (18.09; 20.03)	0.4928
Chest circumference, cm	72.71 (70.28; 76.74)	76.02 (74.44; 77.59)	0.0053
Upper-Arm circumference (U-AC), cm	23.22 (22.31; 24.13)	23.83 (23.09; 24.56)	0.0902
Calf circumference (CC), cm	28.99 (28.05; 30.92)	30.39 (29.67; 31.13)	0.0037
Knee breadth (KB), cm	7.27 (7.08; 8.07)	7.96 (7.74; 8.17)	0.0435
Elbow breadth (EB), cm	6.71 (6.54; 6.88)	6.71 (6.56; 6.85)	0.9889
Triceps skinfold (TS), cm	0.35 (0.33; 0.37)	0.37 (0.35; 0.38)	0.274
Suprailiac skinfold (SupraIS), cm	0.48 (0.45; 0.51)	0.48 (0.46; 0.51)	0.6625
Subscapular skinfold (SubSS), cm	0.49 (0.46; 0.52)	0.50 (0.48; 0.53)	0.2782
Calf skinfold (CS), cm	0.51 (0.48; 0.54)	0.52 (0.49; 0.54)	0.3226
Endomorphic (ENDO), value	1.08 (0.99; 1.16)	1.12 (1.05; 1.19)	0.3809
Mesomorphic (MESO), value	2.13 (1.88; 2.71)	3.05 (2.69; 3.58)	0.0146
Ectomorphic (ECTO), value	4.78 (3.99; 5.47)	3.44 (3.10; 4.16)	0.00374
Lung vital capacity, ml	3068.60	3306.70	0.03229

	(2908.90; 3227.80)	(3087.30; 3526.10)	
Carpal muscle strength (right), kg	26.48 (24.44; 28.51)	33.10 (30.92; 35.27)	1.967×10^{-6}
Carpal muscle strength (left), kg	25.17 (23.22; 27.11)	30.58 (28.50; 32.66)	8.344×10^{-5}
Systolic blood pressure, mmHg.	116.94 (113.31; 120.58)	116.83 (113.25; 120.40)	0.862
Diastolic blood pressure, mmHg.	80.48 (76.61; 84.35)	78.62 (74.41; 82.84)	0.3598
Heart rate, beats/min	86.88 (84.15; 89.60)	84.52 (80.82; 88.21)	0.1188

In particular, it was found that adolescents in the group with expected high physical endurance had statistically high values of height, body mass, chest circumference, calf circumference, knee breadth, mesomorphic body type, vital capacity of lungs (LVC) and hand muscle strength (for right and left hand) ($p < 0.05$). However, a statistically greater number of adolescents with ectomorphic physique was observed in group 1 ($p < 0.05$). There were no statistically significant differences between the groups in body mass index, skin-fat layer thickness in different anatomical parts, blood pressure and heart rate.

It was also observed that adolescents with low physical endurance had a higher percentage of ectomorphic physique (Fig. 3). At this time, it was found that adolescents with high physical endurance have higher percentage of mesomorphic physique than ectomorphic type.

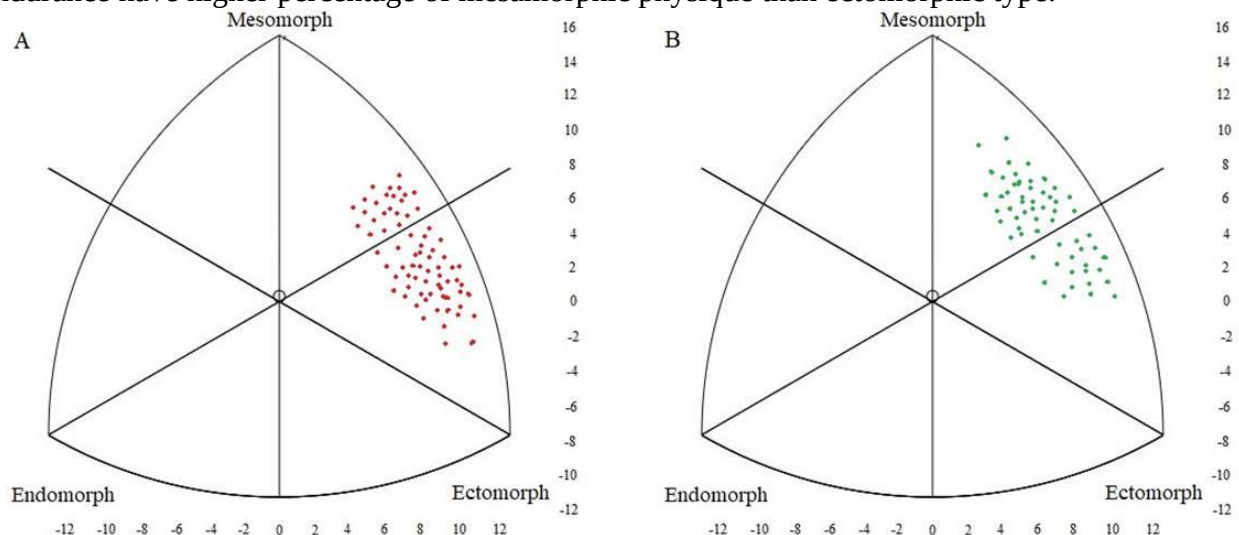


Figure 3. Somatographs showing body types of adolescents in groups with different physical endurance levels (A – Group №1, B – Group №2)

4. Discussion

The results obtained above show that adolescents in group 2 in combination with good endurance had higher values of functional and some morphometric indices. Strength endurance, vital capacity of lungs and VO_2 max were higher in adolescents in group 2. The obtained results are in good agreement with the literature data.

The development of endurance in adolescents is conditioned by the influence of physical exercise on the cardiovascular, respiratory, and central nervous systems. It is necessary to take into account the peculiarities of the impact of physical exercises on the mechanisms of energy supply of muscles (aerobic, anaerobic) and to develop endurance in adolescents in accordance with their individual characteristics (somatotypes). The most effective means of developing general endurance in adolescents is, first, the alternation of medium and long running distances with gradual alternation of intervals of physical activity in the working zone of submaximal and medium intensity [10]. As for endurance, studies among servicemen and cadets have shown that the greatest dynamics of endurance development was observed in servicemen with macrosomal somatotype, and the least in

servicemen with microsomal somatotype [10]. In another similar study, it was observed that mesosomal-type military personnel had an advantage over representatives of other somatotypes in speed-force abilities and speed-force endurance, while representatives of the macrosomal type were inferior to representatives of other somatotypes in all indicators [2]. This is consistent with the results of the study by Baskevich (2015), which found higher indicators of most physical qualities in students of microsomal type living in Ukraine compared to representatives of macrosomal somatotype [1].

Studies have revealed the predominant importance of biological age in the development of physical endurance of schoolchildren [11]. In particular, the highest level of correlation between biological age and the total index of physical endurance was found in boys and girls from high school. In the second position, the correlation between somatotype and endurance was revealed, and in the third position – correlations between the type of higher nervous activity and endurance.

Somatotype and basic physical qualitative characteristics were studied in 1125 female students of Irkutsk National Research Technical University [7]. Girls 17-20 years of age differ significantly in major physical quality characteristics depending on their constitution type. It has been observed that the advantages in movement/physical qualities in comparison with their peers in most cases are higher in students with mesomorphic and brachymorphic body types, especially in terms of general endurance, strength, speed and power abilities and the level of flexibility development. Girls with dolichomorphic body type are noticeably faster and better at demonstrating complex coordination movements [6, 7]. The study conducted on 1286 Slavic young people 17-20 years old living in Pribaikalie showed that in most cases young people with mesomorphic and brachymorphic body types had an advantage in the level of development of general endurance, strength, speed and power abilities and flexibility compared to their peers from other somatotypes. Boys with dolichomorphic type of physique showed significantly higher results in speed and coordination tests (tests “Shuttle Run 10x5” and “Run 100 m”) [5].

According to studies, the higher the muscle strength in representatives of endomorphic somatotype, the higher the muscle index values, but the greater the sum of skin-fat layers, the lower the arm endurance [8]. The more young individuals of mesomorphic somatotype are attracted to sprinting ability, the lower the values of muscle index, the values of which are positively correlated with hand endurance. It was observed that in young individuals with ectomorphic somatotype, the higher the endurance index, the lower the value of wrist strength.

Young players showed a decrease in PWC170 and MOC at the age of 12 years [13]. But from 13-15 years of age, young soccer players establish an optimal combination of centration and autonomy of heart rate control and develop a high level of physical performance and endurance. Young players with mesomorphic somatotype had the highest indices of PWC170 and MOC, which were characterized by economical and efficient activity of the cardiovascular system due to the predominance in the total power of the heart rate variability spectrum of waves reflecting the activity of parasympathetic regulatory communication (HF waves). The risk group includes representatives of brachymorphic type of physique, in whom low PWC170 and MOC indices are combined with tension of mechanisms of regulation of cardiac activity, which indicates a high physiological assessment of adaptation [13]. However, in another study it was shown that adolescents with mesomorphic somatotype have an advantage in “strength” sports, while in game sports adolescents with mesomorphic type have less athletic ability [9].

5. Conclusion

Based on the results of comparing the level of physical endurance of schoolchildren who do not regularly engage in sports and the parameters of body structure of the subjects on these levels and individual functional indices through the application of a multi-stage fitness test, the following conclusions were obtained:

1. Adolescents with good physical endurance will have higher values of multistage fitness test parameters.

2. Adolescents have higher values of total body dimensions, lung vital capacity, VO₂ max and carpal muscle strength (for both hands) show higher physical endurance to this physical activity when given any physical activity.

3. Adolescents with mesomorphic somatotype have been shown to have higher physical endurance than ectomorphic adolescents, which is in good agreement with data from the literature.

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Rezyume: Ko'p bosqichli fitnes testidan foydalanib, sport bilan muntazam shug'ullanmaydigan maktab o'quvchilarining jismoniy chidamlilik darajasi va sub'ektlarning jismoniy parametrlari va ushbu darajalar bo'yicha ba'zi funksional ko'rsatkichlarni solishtirishga harakat qilindi. Tadqiqotda 14-15 yoshli 131 nafar o'smir ishtirok etdi. Ishtirokchilar jismoniy chidamliligiga ko'ra 2 guruhga bo'lingan. Xususan, birinchi guruhga jismoniy chidamliligi "yomon", ikkinchi guruhga "yaxshi" jismoniy chidamli o'smirlar kiritilgan. O'smirlarda umumiy tana hajmi, LVC, VO2 max va bilak mushaklari kuchining yuqori qiymatlari yuqori jismoniy chidamlilik bilan bog'liq. Mezamorfik somatotipli o'smirlar ektomorf tengdoshlariga qaraganda nisbatan yuqori jismoniy chidamlilikka ega ekanligi ko'rsatilgan, bu adabiyotdagi ma'lumotlarga mos keladi.

Резюме: С помощью многоступенчатого фитнес-теста предпринята попытка сопоставить уровень физической выносливости школьников, не занимающихся регулярно спортом, с параметрами телосложения и некоторыми функциональными показателями испытуемых в соответствии с этими уровнями. В исследовании приняли участие 131 подросток в возрасте 14-15 лет. Участники были разделены на 2 группы в зависимости от физической выносливости. В частности, в первую группу вошли подростки с «плохой» физической выносливостью, во вторую — подростки с «хорошей» физической выносливостью. У подростков более высокие значения тотальных размеров тела, LVC, VO2 max и силы мышц запястья связаны с более высокой физической выносливостью. Показано, что подростки с мезаморфным соматотипом имеют сравнительно более высокую физическую выносливость, чем их эктоморфные сверстники, что согласуется с данными литературы.

Kalit so'zlar: jismoniy chidamlilik, maksimal kislorod iste'moli, ko'p bosqichli fitnes testi, somatotip, antropometrik indekslar

Ключевые слова: физическая выносливость, максимальное потребление кислорода, многоступенчатый фитнес-тест, соматотип, антропометрические показатели

CULTURE AS A SOURCE OF REGULATION OF ECOLOGICAL ACTIVITIES

Tlepbergenova P.N.

Karakalpak State University name after Berdakh

Summary: *This article focuses on the specific aspects of culture as a source of regulation of human ecological activities, as well as their role in preserving the current ecology. At the same time, detailed solutions to this problem are presented.*

Key words: *culture, higher education, ecology, ecology of culture, modern era, civilizational crisis, education systems, social institution of education, educational process functioning, education efficiency.*

Culture is a combination of material and spiritual values, as well as ways to create them, use and pass them on from generation to generation. This is the human way of being (as opposed to the biological existence of animals), a means of human self-realization, a measure of mastery of the world, the realization of human freedom and creativity [1,62]. Many definitions have been given to the concept of culture, but researchers they unanimously emphasize that it is precisely this that makes the biological individual a man in the full sense of the word. According to A. A. Huseynov, "culture consists of internally contained and externally manifested norms that determine behavior mastered and mediated with the help of symbols"; its core is the ways of positing meaning, "socio-psychological attitudes, ways of perception, manner of feeling and thinking." The content of culture is "unconsciously and automatically perceived attitudes that are common to the era and the social group as a whole ... patterns of behavior and stereotypes of reactions": thanks to them, the behavior of members of society becomes uniform and predictable. These norms themselves can differ in the degree of rational reflection and in the ways of fixing; but there is a "generally recognized norm ... which sets patterns and standards of behavior and influences the choice between possible behavioral alternatives", called spiritual value. With the help of values and norms, culture (as a "socially inherited system of regulatory mechanisms") streamlines people's behavior, as if imposing restrictions on possible ways to achieve goals. About on, "firstly, it informs about what you can hope for, how to behave in order to be approved by others ... secondly, it encourages, motivates a person to behave, approved in this community; thirdly, it imposes restrictions, controls the behavior of people", excluding from them "manifestations of a disorganizing element based only on natural instincts" [1,62]. In modern society, they are increasingly talking about the degradation of culture, the need for its protection. So, half a century ago R. Guardini believed that culture is no longer "a safe and beautiful security, but a desperate fight not for life, but for death."

It is in danger of degenerating: it should be called "uncivilized," if that expression were appropriate. Modern culture, the thinker believed, lacks organicity and harmony: having protected himself from nature, a person is faced with a new danger - coming from within culture. Modern culture does not know the principle of asceticism, but it was the rejection of it that made a person defenseless in front of himself: "Through overcoming oneself and denying oneself, a person will have to learn to rule over himself" [2,929].

Today, most researchers are confident that culture is threatened by destruction: the decline in the role of "high examples" and the growth of informational garbage - vulgarity and vulgarity. Therefore, the question of the preservation of the cultural level, of the survival of culture is being posed more and more insistently. Where we are talking about the preservation of a self-organizing system and its protection from external destabilizing influences, we are moving into the area studied by ecology. Ecology, as you know, is a science that studies the relationship of organisms and their communities with each other and with their environment; it was proposed as a special scientific discipline as early as 1869 by E. Haeckel. First, numerous areas of biological ecology were formed, studying the features of the distribution of various plant and animal species on the Earth, their adaptation to the conditions of existence, intraspecific relationships, etc. Then there were other

ecological disciplines that explore the life and activities of man. The general goal of environmental research is to ensure environmental safety, which means "the state of protection of the vital interests of the individual, society, the state, as well as the natural environment from threats arising from anthropogenic and natural impacts on it".

The main principle of ensuring security is the formation of "on a planetary scale a purposeful coherent self-organizing socio-natural system." To do this, it is proposed to focus on the leading mechanisms of "creating the desired future." Among the objects of security are not only living generations, but also future ones, as well as ecosystems and the biosphere as a whole; the subject of ensuring security is not only citizens, public organizations, states, but all of humanity as a "planetary subject" [2,929]. Today, the word "ecology" is used in a broad sense - they talk about social, spiritual, political ecology: the struggle for the purity of the natural environment is combined with the struggle for the preservation of cultural traditions or for new spiritual values. In general, today ecology is an interdisciplinary field of knowledge, the science of the arrangement of multilevel systems in nature, society, and their interconnection".

It is necessary not only to create and introduce new educational technologies, but also to preserve the undeservedly forgotten traditions and developments of outstanding teachers of the past. Therefore, the development of the ecology of education seems to be an obligatory stage of any action to improve its effectiveness. Revealing and reflecting with the help theoretical models, the laws of functioning of the real educational process and the relationship between its participants (instead of often replacing this work speculative ideas based not on empirical data, but on ideologemes), we will be able to initiate just such changes that will increase stability of the cultural environment, and not distort it. Thus, the ecology of education is a direction of scientific research that studies the impact of the socio-cultural environment on the education system and the conditions for the functioning of education as a social institution, on the patterns of its implementation and ways to preserve it.

The main tasks of educational ecologists were considered earlier by pedagogical theory and practice; but, united by the common idea of preserving the cultural environment and open to the use of ecological methods, they will be considered from a different perspective, which will make it possible to inject a fresh spirit into their discussion and solution. These tasks are:

- ◆ Identifying the content of the educational process as a self-developing subsystem of society, necessary for the functioning of the social whole, and highlighting its main components and structural links;
- ◆ The study of anthropological, ethical and other foundations of the educational process, characteristic of a particular social situation;
- ◆ Implementation of the worldview and methodological analysis of the main ideas, concepts and methods used in the educational process;
- ◆ Sociological substantiation of the main directions of the educational process as a tool for inculturation and reproduction of the socio-cultural environment;
- ◆ Identification of value dominants of specific educational systems;
- ◆ The formation of an integrative conceptual and methodological apparatus necessary for the creation of environmentally oriented models of educational process and identifying its current methodology;
- ◆ Systematization and classification of the mechanisms for the implementation of educational activities and the connections of the educational subsystem with other subsystems of life societies (especially those related to culture);
- ◆ Identifying the relationship of education as a social institution with legal norms and political values, finding their interdependence in the transformation of society and predicting possible conflicts;
- ◆ Development of a set of objective criteria reflecting the fulfillment by the educational institution of its social functions (especially the main one - humanistic), and analysis of the possibilities of their inconsistency;

- ◆ Study of a possible conflict between the formation of professional cultures (especially among technical specialists) and the introduction of students to universal and national cultural wealth;
- ◆ Determination of mutual correlations between the two functions of education, between which a conflict is possible - the inculturation and humanization of new generations, on the one hand, and the reproduction of the vocational and educational composition of the population, on the other;
- ◆ Identifying the impact of modern media on the creative and moral potential of students and developing measures to neutralize the negative aspects of this impact;
- ◆ Comparison of existing models of education according to the criterion of formation of innovative activity and identification of side effects of stimulating this activity (in relation to the preservation of cultural identity);
- ◆ Determination of the optimal level of education (combined with the analysis of criteria its insufficiency and redundancy) for a particular society;
- ◆ Identifying the optimal level of technologization of the educational process (taking into account the need for a creative, non-formalizable aspect of it);
- ◆ Development of a mechanism for the selectivity of cultural innovations, which allows to filter out those innovations that threaten the stability of a particular socio-cultural environment (because a worldview that has not yet been formed can be distorted from contact with other values);
- ◆ Systematization of the necessary components of the education process, which allow it to carry out intellectual support for social development (with taking into account the inevitable predominance of conservatism in the presentation of the experience of mankind);
- ◆ Determination of the necessary and sufficient degree of state control over education and the permissible measure of ideologization of its content;
- ◆ Development of measures to counteract the transformation of the educational process into an instrument of political propaganda and ideological control;
- ◆ Study of the consequences (including geopolitical ones) of the globalization of education and the introduction of educational models developed for a different social environment.

As a result of the work done, we will obtain models of educational institutions of various societies, considered as tools for the self-preservation of their cultural environments. Only after that it will be possible to reasonably consider the issues of increasing the efficiency of the educational process, without violating self-regulation of society, but by accelerating its development. About education - in fact, the production of a person as a carrier of a particular culture; therefore, knowledge of the laws of its functioning is necessary for the implementation of the processes of development of culture, leading to its flourishing, and not degradation.

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Rezyume: *Ushbu maqolada madaniyatning insonlar ekologik faoliyatlarini tartibga soluvchi manba sifatida o'ziga xos jihatlari bilan birga ularning hozirgi ekologiyani asrashdagi roliga alohida e'tibor qaratilgan. Shu bilan birga ushbu muammo yuzasidan atroflicha yechimlar keltirilgan.*

Резюме: *В данной статье рассматриваются конкретные аспекты культуры как источника регулирования экологической деятельности человека, а также их роль в*

сохранении современной экологии. В то же время представлены подробные решения этой проблемы.

Kalit so'zlar: madaniyat, oliy ta'lim, ekologiya, madaniyat ekologiyasi, zamonaviy davr, sivilizatsiya inqirozi, ta'lim tizimlari, ta'limning ijtimoiy instituti, ta'lim jarayonining faoliyati, ta'lim samaradorligi.

Ключевые слова: культура, высшее образование, экология, экология культуры, современная эпоха, цивилизационный кризис, системы образования, социальный институт образования, функционирование образовательного процесса, эффективность образования.

CATTLE TREMATODES AND THEIR BIOECOLOGICAL CHARACTERISTICS

Kunisov B.M¹., Abdieva.T.J²., Saburov A¹.

¹*Nukus branch of the Samarkand State University of Veterinary Medicine, Livestock and Biotechnology,*

²*Karakalpak State University named after Berdakh*

Summary: *This article presents a literature review of trematodes parasitizing cattle and their bioecological characteristics. It was used information on cattle trematodes in this work*

Key words: *Trematode, paramphistomatosis, helminthoscopy, Paramphistomatata, Planorbidae, adolesearia, biotope, helminthoovoscopy.*

Trematodes and trematodous diseases of the vertebrates they call are widespread on earth. Most of them are adapted to parasitize fish, birds and mammals. 27 types of trematodes have been identified in mammals in the territory of Uzbekistan.

Complicated process of development of trematodes indicates that their parasitic system is strongly protected biologically and ecologically. In a long evolutionary process, trematodes spend their larval stage of reproduction in their first intermediate host - aquatic and terrestrial molluscs and at the same time, in their development most of invertebrates except molluscs and some vertebrates (fish and some amphibians, reptiles, birds) participation in each biogeocenosis (except desert biogeocenosis) shows the existence of biocenotic connections between them.

Trematodes are the first worms in the animal world to become parasitic in all vertebrates. Due to this way of life, they drastically different from parasitic worms belonging to other systematic groups anatomo-morphologically, bioecologically.

The complex development of trematodes by some replacement (change of generation) was identified in 1842 for the first time. Accordingly, it is noted that they have one, two, three and four owners now. But all of them cannot develop without the participation of mollusks. Very few species are single-host (with monoxene) trematodes. They was not identified in the territory of Uzbekistan. Most trematodes are two (dixene) and three (thrixene) trematodes. They are widespread in the territory of the republic. Their definitive hosts are vertebrates. In dixenous organisms, the intermediate hosts are molluscs living in water and on land, in trixenous trematodes, the first intermediate hosts are mollusks, and the second intermediate hosts are invertebrates (molluscs, arthropods) and vertebrates (fish, etc.). Four-host trematodes include the genera *Alaria* and *Strigea* of the suborder *Strigeata*. Definitive hosts of these tetraxene trematodes are birds and some mammals, the fourth intermediate hosts are the vertebrates they eat - amphibians, reptiles, birds, mammals.

The development of trematodes includes 4 periods: embryogony, parthenogony, cystogony, maritogony.

During their embryonic development, the first-generation larva, ciliated miracidium, appears in the sexually produced egg, which is infectious for the intermediate host in the external or internal environment. This larva actively or passively enters the body of the mollusk, reproduces parthenogenetically and forms a cercarium. Mature cercariae leave the mollusc organism to the external environment and undergo the period of cystogony in the aquatic environment or in the organism of the second intermediate host. As a result, they turn into an infective larva - juvenile (in water) or metacercaria (in the second intermediate host) for the main host (vertebrates). If these larvae enter the body of vertebrates through the mouth, they pass the period of maritogony and become adults and begin to reproduce sexually. There are also such trematodes in the territory of Uzbekistan that in their parthenogenetic development some larvae do not develop and the cystogony period is not observed. Accordingly, cattle and other animals are infected with them due to the penetration of cercariae from the mollusc organism through the skin.

The following trematodes was registered, which have been studied for almost 90 years, parasitizing the organism of cattle and other farm animals in the conditions of Uzbekistan:

1. ***Fasciola hepatica* L., 1758.** *Dixenella* trematode. Definitive hosts are many herbivorous mammals and *Homo sapiens*. The intermediate host is a small freshwater mollusc with pulmonate gastropods. The organ of parasitism is liver tissue, liver bile ducts and partially gall bladder.

Distribution: cosmopolitan species. It cannot develop in the north-western, desert-pasture zone of Uzbekistan (due to the inability of the intermediate host to live), it is widespread in the irrigated, mountain range - mountain area of other regions.

2. ***Fasciola gigantica* (Cobbold, 1856).** *Dixenella* trematode. The definitive hosts are many mammals, *Homo sapiens*. The intermediate host is a large-sized freshwater mollusk with lung gastropods - *Lymnaea auricularia*, *Lymnaea bactriana*, *Lymnaea subdisjuncta*, *Lymnaea impura*. Infectious larva adolesearia.

The organ of parasitism is liver tissue, liver bile ducts, partially gall bladder.

Distribution: all stages of development take a long time compared to *F. hepatica*, so it is distributed in countries with a warm climate. Its oldest center in Uzbekistan is the Republic of Karakalpakstan and the Khorezm region. From the 1960s, *F. gigantica* began to spread to the southern, central and north-eastern parts of Uzbekistan. Currently, Samarkand and Syrdarya regions are extremely unhealthy for it. This species occupies trematode irrigated, the front of the mountain and partly non-high mountain zones. It is somewhat less common in Tashkent region.

3. ***Gastrothylax crumenifer* (Creplin, 1847).** *Dixenella* trematode. Definitive hosts are herbivorous ruminant mammals. The intermediate host is a pulmonate gastropod coil-shaped freshwater mollusk - planorbids.

Infectious larva juvenile. Organs of parasitism are large and net stomachs (imago forms), rennet and duodenum (preimaginal forms).

Distribution: North-eastern, central and north-western parts of Uzbekistan. Currently, this trematode is widespread in Samarkand and Syrdarya regions. In Tashkent region, it is a heartworm.

4. ***Calicophoron calicophorum* (Fishoeder, 1901).** *Dixenella* trematode. Definitive hosts are herbivorous ruminant mammals. The intermediate host is freshwater planorbids. Infectious larva juvenile. Organs of parasitism are large and net stomachs (imago forms), rennet and duodenum (preimaginal forms).

Distribution: southern, central, north-eastern parts of Uzbekistan.

5. ***Calicophoron erschowi* Davidova, 1959.** *Dixenella* trematode. Definitive hosts are herbivorous ruminant mammals. The intermediate host is freshwater planorbids. Infectious larva juvenile. The parasitic organ is similar to the paramphistomas above.

Distribution: Southern part of Uzbekistan (Surkhandarya region).

6. ***Liorchis scotiae* (Willmott, 1950).** *Dixenella* trematode. Definitive hosts are herbivorous ruminant mammals. The intermediate host is freshwater planorbids. Infectious larva juvenile. The organ of parasitism is the gastrointestinal tract.

Distribution: north-eastern, central, north-western parts of Uzbekistan.

7. ***Paramphistomum ischikawai* Fukui, 1922.** *Dixenella* trematode. It was only studied in the cattle of the Republic of Karakalpakstan.

8. ***Orientobilharzia turkestanica* (Skrjabin, 1913).** *Dixenella* trematode. Definitive hosts are herbivorous mammals. Intermediate host - freshwater lungwort-bellied molluscs - *Lymnaea auricularia* Contagious larva - cercarium. The parasitizing organ is hepatic and intestinal vein blood vessels.

Distribution: north-western and north-eastern parts of Uzbekistan.

Currently, this trematode is spreading along the river banks of the Tashkent region. In its old center, the extent of invasion and the intensity of invasion of the parasite have decreased significantly under the influence of some important environmental factors.

As you can see from the above, it is necessary for specialists to correctly imagine their bioecological features when developing effective measures to combat diseases caused by trematodes.

It should be noted that in recent years some professors, doctoral students and other researchers of the Veterinary Scientific Research Institute have been making a number of scientific mistakes

regarding the bioecology, diagnostics, and even systematics of important trematodes. Under such scientific errors, there is lack of information on the bioecological, diagnostic and systematic aspects of widespread parasitic worms, being completely unaware of the achievements made in Uzbekistan about them, issues like acting without consultation with expert scientists. Such scientific mistakes are also found among other helminthosis pathogens and they do not correspond to the requirements of the previous and current new era of our science.

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Rezyume: qayta boshlash. Maqolada qoramollarni parazit qiluvchi trematodlar va ularning bioekologik xususiyatlariga oid adabiyotlar ko'rib chiqilgan. Ishda qoramol trematodalari haqidagi ma'lumotlardan foydalanilgan.

Резюме: В статье представлен обзор литературы о трематодах, паразитирующих на крупном рогатом скоте, и их биоэкологической характеристике. В работе использованы данные о трематодах крупного рогатого скота.

Kalit so'zlar: trematod, paramfistomatoz, gelmintoskopiya, Paramfistomatata, Planorbidae, adoleskariya, biotop, gelminoovoskopiya.

Ключевые слова: трематода, парамфистоматоз, гельминтоскопия, Paramphistomatata, Planorbidae, адолескарий, биотоп, гельминтоовоскопия.

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SOME FUNGAL DISEASES OF APPLE TREES IN UZBEKISTAN

Esemuratova R.X², Mamanazarova K.S¹, Teshaboeva Sh.A¹.

¹*Institute of Botany, Academy of Sciences of the Republic of Uzbekistan*

²*Karakalpak State University named after Berdakh*

Summary: This article presents information about fungal diseases of apple trees, common in the Namangan and Bukhara regions. Fungi causing this disease *Venturia inaequalis* (Cooke) G. Winter, *M. laxa* Honey, *Monilinia fructigena* (Pers.) Honey, *Podosphaera leucotricha* Salm. *Alternaria mali* Roberts describes the symptoms of these diseases in plants.

Keywords: *Malus* Mill. pathogenic fungus, signs of disease, Namangan, Bukhara.

1. INTRODUCTION.

Apples are most predominantly and commercially grown fruits, cultivated in all temperate regions of the globe with a production of around 81 million tonnes with productivity of nearly 18 tonnes/hectare per annum (FAOSTAT, 2023) [1]. Apple trees are typically 4–12 metres (13–39 ft) tall when mature and have dense crown-shaped branching. The leaves are 3–10 cm (1.2–3.9 in) long, arranged alternately on the stem, simple, and serrated along the margin. The flowers are collected in corymbose inflorescences and have five petals, which, depending on the variety, can be white, pink, or red. The flower parts are entirely and predominantly pollinated by insects. The fruits ripen from June to October, depending on the variety. The weight of one fruit varies from 15 g to 400 g. Contains fructose 6.5–11.8%, sucrose 2.5–5.5%, organic (malic and citric) acids 0.2–1.6%, vitamin C 5–30 mg, pectin, additives, etc. will be present. (Namozov, 2021) [2].

These are subject to more than 70 plant diseases, of which the vast majority is caused by pathogenic fungi (Nabi et al., 2020) [3]. Several diseases such as apple scab, *Alternaria* blotch, cankers etc are distributed throughout the world (Muneer et al., 2017) [4]. *Alternaria* leaf and fruit spot (ALFS) disease caused by *Alternaria* spp., poses a severe threat to the apple production and productivity. Over the last decade, *Alternaria* disease in apple causes severe losses to the apple industry in most of apple growing regions of the world (Filajdic et al., 1991) [5]. In India apple is largely grown in Union territory Jammu and Kashmir (J & K) and state of Himachal Pradesh, Uttarakhand which account for about 90% of the total production of country. The ALFS has emerged as an important disease causing economic losses to the farmers and industry. *Alternaria* leaf blotch was first reported in the USA in 1924 (Roberts, 1924) [6], and now has been reported from most apple producing countries. The occurrence of the disease (*Alternaria mali*) in India was reported in 2002 in Kashmir valley of J and K (Shahzad et al., 2002) [7].

There are 513 varieties of apple trees in the world [8], and they are grown for various purposes, such as juice production, apple chips, long-distance export, long-term storage, etc. In Uzbekistan, orchards account for more than 65% of the area planted with fruit trees. According to their biological characteristics, apple species and varieties differ from each other and easily adapt to the environment and conditions. Today, the total volume of apple cultivation in the world is more than 80.5 million tons, with China (44.45 million tons), the United States (4.65 million tons), Poland (3.60 million tons) and Turkey (2.93 million tons) occupying the leading positions. Uzbekistan exports apples mainly to Kazakhstan (2.5 thousand tons), Russia (764 tons), Turkmenistan (649 tons), Kyrgyzstan (444 tons) and Tajikistan (125 tons) (2023). [9].

There are 8 species of apples in the wild in Uzbekistan. Most varieties grown around the world belong to the *Malus Domestica* species. The apple tree is frost-resistant, light-loving and moisture-loving, not picky about the soil, but produces a high yield on fertile soils. The apple tree is propagated by seeds, grafting and root cuttings. An apple tree seedling is planted in the fall and spring to a depth of 30–60 cm. 4–5 years after transplanting into the ground, it begins to bear fruit, producing a rich

harvest for 40-50 years. The yield of an apple tree plant is up to 130-300 tons per year, the apple tree lives up to 90-100 years [10].

2. MATERIAL AND METHODS

In the preparation of this article, herbarium specimens collected during mycological research conducted in Namangan and Bukhara regions during 2021-2024 serve as a source. To analyze the species composition of fungi, a KERN *optiks* microscope was used, as well as references from scientific articles and Internet sources. A modern nomenclature of fungi (indexfungorum.org) and names of plants (powo.science.kew.org) were also given.

3. RESULTS AND DISCUSSION.

As a result of the analysis of fungal samples and scientific literature in the Tashkent Mycological Herbarium (TASM) during scientific research and our own field research in 2021-2023, the economically important *Malus Mill* spread in Namangan and Bukhara regions. 5 classes, 11 orders, 15 families, and 27 species of fungi belonging to 23 genera were found in the representatives of the group.

According to mycological analysis, the dominant section is Ascomycota, consisting of 20 species belonging to 3 classes, 7 orders, 11 families and 16 genera. The species *Monilinia*, *Podosphaera*, *Venturia*, *Alternaria*, *Pleospora*, *Coniothecium*, *Coniothyrium*, *Sporocadus*, *Fusarium*, *Cytospora*, *Diplodia*, *Diplocarpon*, *Plenodomus*, *Botryosphaeria*, *Stegonsporium*, *Tetracoccusporium* were noted.

Analysis of fungal diseases, their symptoms and distribution in economically important plants of the family *Malus* were conducted in the Namangan and Bukhara regions.

Powdery mildew disease. Pathogen: *Podosphaera leucotricha* (Ellis & Everh.) E.S. Salman. Disease symptoms: The disease mainly affects leaves, stems and flowers. Young leaves and leaf stripes emerging from the bud are covered with grey or powdery dust. Later, the leaves develop poorly and acquire a boat-shaped form. Healthy leaves begin to fall off before reaching 1-3 sizes. If the fall begins in the first half of June, by mid-August 50 percent of the affected leaf may fall off. Affected branches are also covered with white or grey powder, later this powder begins to darken, on which a large number of black dots form on the fruiting body of the fungus. In flowers, a sign of the disease is the formation of white dust on flower petals, flower sepals and flower ribbons.

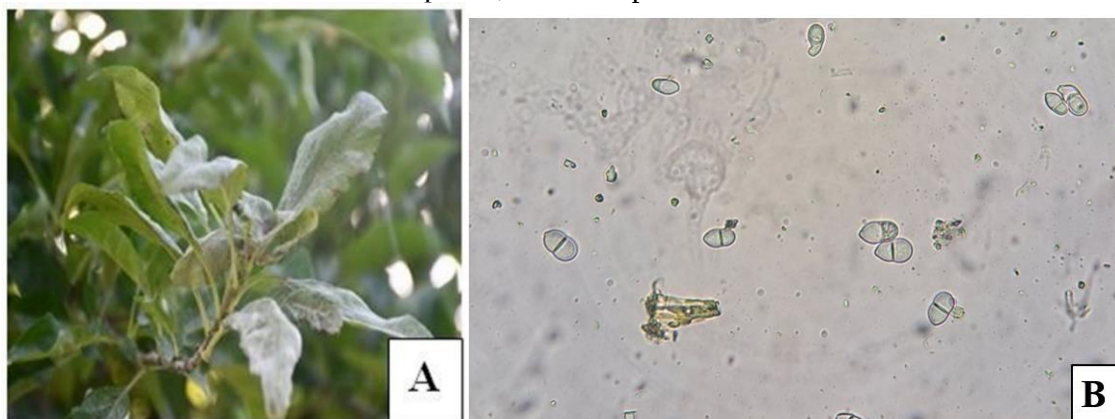


Fig.1. Apple tree powdery mildew disease (A) signs on leaves and (B) photo on microscope

Infected flowers do not produce fruit at all. If the fruit is damaged, its surface becomes covered with a net, as a result the fruit grows poorly. Infected fruits lose their taste and are prone to rotting. If the fruit is damaged early, the fruit nodes will fall off. White, gray, yellow dust formed in diseased organs are fungal spores that spread very quickly with the help of wind and insects and affect healthy plant organs and trees. The pathogen overwinters as mycelium in infected buds.

The climatic conditions of our republic are very favorable for this pathogenic fungus. This disease mainly affects large fruit-bearing trees and seedlings.

Alternaria blight, Pathogen: *Alternaria mali* Roberts

Disease symptoms: The disease damages the fruits and leaves of the plant. Their first symptoms are small, dark brown, round spots on the leaves in the spring, later, as the disease progresses, the spots become larger.

Distribution: Namangan region: Uchkurgan district.

Parsha disease, Pathogen: *Venturia inaequalis* Fuckl.

Symptoms of the disease: Parsy is one of the most common diseases in apple orchards. The disease-causing fungus damages apple leaves, fruit bunches, flowers, fruits and branches. In the spring, small dark spots are formed on the fruit bands and nodes, and their surface is covered with brown dust. When the rainfall is moderate, the symptoms of the disease appear on the leaves and fruits, and spots covered with brown dust appear on the surface of the leaf. Later, these leaves dry up and fall off.



Fig. Infestation of apple fruits by aphids and its appearance under a microscope

Fungi distributed in higher plants in Uzbekistan were studied, and brief information was given about the occurrence of several micromycetes in *Malus* species. For example, N.I. Gaponenko in 1965 "Obzor gribov Bukharskoy oblast", Yu.Sh'Gafforov in 2005 in his dissertations on "Micromycetes of higher plants of Namangan region" recorded information about micromycetes distributed in Namangan and Bukhara region (Gaponenko, 1965, Gafforov, 2005) [11,12]. But the information from these sources is distributed in our Republic *Malus* Mill. cannot fully explain the knowledge about the mycobiota of natural species and cultivated varieties of the genus Today, in our Republic, in particular, in the Namangan and Bukhara regions, various fungal diseases occur in apple plants.

Today, in our Republic, in particular, in Namangan and Bukhara regions, various fungal diseases occur in the *Malus* plant. Studying the mycobiota of natural medicinal plants, trees and shrubs and identifying fungal diseases is one of the urgent problems of today.

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Rezyume: Ushbu maqolada Namangan va Buxoro viloyatlarida keng tarqalgan olma daraxtlarining qo'ziqorin kasalliklari haqida ma'lumot berilgan. Ushbu kasallikni keltirib chiqaradigan zamburug'lar *Venturia inaequalis* (Cooke) G. Winter, *M. laxa* Honey, *Monilinia fructigena*(Pers.)Honey,*Podosphaera leucotricha* Salm. *Alternaria mali* Roberts o'simliklardagi bu kasalliklarning alomatlarini keltirib o'tilgan.

Резюме: В данной статье представлена информация о грибковые болезни яблони, распространенной в Наманганской и Бухарской областях. Грибы, вызывающие эти заболевание *Venturia inaequalis* (Cooke) G. Winter, *M. laxa* Honey, *Monilinia fructigena*(Pers.) Honey, *Podosphaera leucotricha* Salm. *Alternaria mali* Roberts описывается симптомы этих болезней у растений.

Kalit so'zlar: *Malus* Mill. patogen zamburug', kasallik belgilari, Namangan, Buxoro.

Ключевые слова: *Malus* Mill. патогенный гриб, признаки болезни, Наманган, Бухара.

ECOLOGICAL AND BIOLOGICAL CHARACTERISTICS OF INSECTS IN GREENHOUSE CULTIVATION: THE CASE OF SOUTHERN ARAL SEA REGION

Minajatdinova Z.

Karakalpak State University named after Berdakh

Summary: *This article explores the ecological and biological characteristics of insects in greenhouse cultivation in the Southern Aral Sea region. It focuses on the species diversity of insects, their roles in greenhouse ecosystems, and the effects of different environmental factors on their populations. The study highlights the balance between pest control and the role of beneficial insects, offering recommendations for sustainable pest management practices tailored to the arid climatic conditions of the Southern Aral Sea region.*

Key words: *Greenhouse cultivation, Southern Aral Sea region, ecological characteristics, biological characteristics, insect diversity, pest species, beneficial insects, biological control, integrated pest management (IPM), pollinators, microclimate.*

Introduction

Greenhouse agriculture has become a vital method of crop production in the Southern Aral Sea region, where harsh climatic conditions and limited water availability make traditional farming challenging. However, greenhouse environments also present a unique set of challenges, particularly the management of insect populations that can either harm crops as pests or assist in pollination and pest control as beneficial species.

Insects in greenhouse ecosystems perform various ecological roles, ranging from pollinators and natural predators to pests that damage crops. The delicate balance between these roles significantly impacts crop productivity and the overall success of greenhouse farming. The Southern Aral Sea region, with its specific microclimate, offers a distinct environment for insect populations, influencing their behavior and interactions with plants. Understanding the bioecological characteristics of these insects is crucial for improving pest management strategies and ensuring the sustainability of greenhouse farming in this region.

This study aims to investigate the diversity of insect species in greenhouses, analyze their ecological functions, and evaluate the factors influencing their populations. The results will inform integrated pest management (IPM) strategies that reduce reliance on chemical pesticides and support sustainable agriculture in the Southern Aral Sea region.

Methods

The study was conducted in five commercial greenhouses located in the Southern Aral Sea region during the growing season of 2023. A mixed-method approach was used, combining field surveys, laboratory analysis, and interviews with local farmers to gather comprehensive data on insect species and their roles in greenhouse ecosystems.

1. **Insect Sampling:** Insect species were collected using yellow sticky traps, sweep nets, and manual collection from plants. Sampling was carried out at three stages of plant development: early growth, flowering, and fruiting. Insects were categorized based on their behavior and interactions with plants.

2. **Species Identification:** Specimens were identified using taxonomic keys and morphological comparison with reference samples. The species diversity was measured using the Shannon-Weaver Diversity Index, which provides a quantitative measure of species richness and evenness within the ecosystem.

3. **Ecological Function Assessment:** Insects were classified based on their ecological functions in the greenhouse environment, including pests (e.g., aphids, whiteflies), beneficial predators (e.g., ladybird beetles), and pollinators (e.g., honeybees). Observations were made on their feeding behaviors, reproductive patterns, and interactions with greenhouse plants.

4. **Environmental Factors:** The study also examined the influence of temperature, humidity, and crop type on insect population dynamics. Data loggers were installed in each greenhouse to continuously monitor microclimatic conditions, and the correlation between these conditions and insect populations was analyzed using regression models.

5. **Pest Management Practices:** Interviews with greenhouse managers and farmers were conducted to assess current pest management strategies, including the use of biological controls, chemical pesticides, and integrated approaches.

Results

The study identified a total of 53 insect species across the five greenhouses, with significant variation in species composition and abundance depending on the stage of plant development and greenhouse conditions. The dominant pest species included **Trialeurodes vaporariorum** (greenhouse whitefly) and **Aphis gossypii** (cotton aphid), which caused notable damage to tomato, cucumber, and pepper crops by feeding on plant sap and transmitting plant viruses.

Beneficial species included **Coccinella septempunctata** (seven-spotted ladybird) and **Hippodamia variegata** (variegated ladybird), which were effective in controlling aphid populations. Additionally, **Syrphidae** (hoverflies) contributed to natural pest control by preying on aphids, while **Apis mellifera** (honeybee) and **Bombus terrestris** (buff-tailed bumblebee) served as pollinators, enhancing fruit set and crop yields.

The study found that insect populations were strongly influenced by temperature and humidity. Pest populations, particularly whiteflies and aphids, peaked during periods of high humidity and moderate temperatures, which created favorable breeding conditions. In contrast, beneficial predators were less sensitive to these environmental fluctuations but were more abundant in greenhouses where farmers had adopted biological control measures, such as releasing ladybird beetles.

Interviews with greenhouse managers revealed that most greenhouses relied on chemical pesticides to control pests, despite recognizing the potential risks to beneficial insects and crop quality. However, several farmers reported experimenting with biological control agents, such as predatory mites and parasitoid wasps, with promising results. Integrated pest management strategies that combined biological controls with selective pesticide use were found to be the most effective in maintaining pest populations at manageable levels while protecting beneficial species.

Discussion

The results of this study highlight the need for a more nuanced approach to pest management in greenhouse ecosystems. The dominance of pest species such as aphids and whiteflies poses a significant threat to crop productivity, but the reliance on chemical pesticides can disrupt the balance of beneficial insect populations. This study confirms that biological control methods, such as the introduction of ladybird beetles and hoverflies, can provide an effective, sustainable alternative to chemical pesticides.

The correlation between environmental conditions and insect population dynamics underscores the importance of monitoring and managing greenhouse microclimates to prevent pest outbreaks. High humidity, in particular, was associated with increased pest activity, suggesting that improving ventilation and regulating humidity levels could help reduce pest pressures in greenhouses.

The study also highlights the role of pollinators in enhancing crop yields, particularly in crops such as tomatoes and cucumbers, which require pollination for optimal fruit production. However, the confined nature of greenhouses can limit pollinator access, and artificial pollination methods may be necessary in some cases.

The interviews with farmers revealed a growing interest in integrated pest management strategies that reduce pesticide use and promote the conservation of beneficial insects. However, the widespread adoption of such practices is hindered by a lack of knowledge and access to biological control agents. There is a need for greater support and training for farmers on sustainable pest management practices, particularly in the context of the Southern Aral Sea region, where ecological conditions differ from those of more temperate regions.

Conclusion

The ecological and biological characteristics of insects in greenhouse environments play a critical role in the success of greenhouse agriculture in the Southern Aral Sea region. Pest species such as whiteflies and aphids can cause significant damage to crops, but the use of biological control agents offers a sustainable solution to pest management. The integration of biological controls with careful monitoring of greenhouse environmental conditions can help maintain a balance between pest and beneficial insect populations.

To promote sustainable greenhouse farming, it is essential to provide farmers with the knowledge and resources to adopt integrated pest management strategies. This includes access to biological control agents, training on monitoring and managing greenhouse microclimates, and minimizing the use of broad-spectrum chemical pesticides. By fostering a balanced greenhouse ecosystem, farmers can reduce crop losses and improve overall productivity in the Southern Aral Sea region.

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Rezyume: Ushbu maqolada Janubiy Orolbo'yida issiqxonada etishtirishda hasharotlarning ekologik va biologik xususiyatlari o'rganiladi. U hasharotlarning tur xilma-xilligi, issiqxona ekotizimidagi roli va turli xil ekologik omillarning ularning populyatsiyasiga ta'siriga qaratilgan. Tadqiqot zararkunandalarga qarshi kurash va foydali hasharotlarning o'rni o'rtasidagi muvozanatni ta'kidlab, Janubiy Orolbo'yi mintaqasining qurg'oqchil iqlim sharoitiga moslashtirilgan barqaror zararkunandalarga qarshi kurash usullari bo'yicha tavsiyalar beradi.

Резюме: В этой статье рассматриваются экологические и биологические характеристики насекомых в тепличном выращивании в регионе Южного Аральского моря. Основное внимание уделяется видовому разнообразию насекомых, их роли в тепличных экосистемах и влиянию различных факторов окружающей среды на их популяции. В исследовании подчеркивается баланс между борьбой с вредителями и ролью полезных насекомых, предлагаются рекомендации по устойчивым методам борьбы с вредителями, адаптированным к засушливым климатическим условиям региона Южного Аральского моря.

Kalit so'zlar: Issiqxonada etishtirish, Janubiy Orolbo'yi hududi, ekologik xususiyatlari, biologik xususiyatlari, hasharotlar xilma-xilligi, zararkunanda turlari, foydali hasharotlar, biologik kurash, zararkunandalarga qarshi kompleks kurash (IPM), changlatuvchilar, mikroiqlim.

Ключевые слова: тепличное выращивание, регион Южного Аральского моря, экологические характеристики, биологические характеристики, разнообразие насекомых, виды вредителей, полезные насекомые, биологический контроль, комплексная борьба с вредителями (IPM), опылители, микроклимат.

**FORMATION OF SOME TOPONYMS DEPENDING ON NATURAL CONDITIONS IN
THE KHORAZAM REGION**

Kutlimuratov A.A.¹, Allanazarov K.J.²

¹ Urgench State University,

² Karakalpak State University named after Berdakh,

Summary: *The Khorezm region has regions with geographically unique natural conditions. Based on this, this article analyzes the toponyms of the Khorezm region and the fact that many geographical place names were created depending on the natural conditions.*

Keywords: *toponym, geographical names, geographical terms (topotems), hydronyms, oikonyms, ethnonyms, phytonyms, underground waters, soil waters, saline waters, Amudarya river.*

Introduction

The Khorezm region occupies part of the ancient Khorezm lands on the left bank of the Lower Amudarya in the north-western part of the Republic of Uzbekistan. The total land area is 6.05 thousand km², and 74% of the territory of the region is located on the left bank of Amudarya.

Geographical place names — toponyms are formed depending on the natural conditions of the place. We can connect the reflection of natural conditions in place names with the participation of natural geographical terms in toponyms. This article provides information about the place names that arose based on the natural and hydrological conditions of the Khorezm region.

Literature Review

Scientific works of scientists such as H.Hasanov, S.Qoraev, Z.Dosimov, T.Nafasov, T.Enazarov, B.Orinboev, N.Okhunov, Sh.Kadirova, T.Rahmatov, and L.T.Karimova, Yo.Khojamberdiev, J.Latipov, K.Seytniyazov, A.Otajanova, M.Mirakmalov, K.Khakimov, M.Tillaeva, F.Abdullaev, O.Madrahimov, K.Allanazarov, O.Baltabaev and A.Ishaev are of great importance in the formation and development of Uzbek toponymy. During the scientific research of Professor Z.Dosimov, models and types of formation of linguistic characteristics of Khorezm toponyms were analyzed. A.Otajanova analyzed the lexical bases, grammatical properties, and etymological aspects of Khorezm ethnotoponyms. M.Tillaeva analyzed some linguistic features of historical and literary monuments of Khorezm Oasis. The history of Khorezm dialects and their linguistic features were thoroughly studied by F.Abdullaev, O.Madrahimov, A.Ishaev, and other linguists. However, the toponymy of the Khorezm region was not fully studied geographically.

Research Methodology

In recent years, as a result of the deterioration of the geoecological situation, the increase of soil salinization, desertification, and changes in the level of surface and underground water, we have seen an increase in the process of impact on nature. We can describe these processes as follows:

The flatness of the region's surface and the absence of orographic barriers in the vicinity cause moist air masses to easily enter the region;

Due to the fact that the area is located between Kyzylkum and Unguz Karakum, it leads to the formation of a unique climate;

As a result of the region being influenced by the Kyzylkum and Karakum deserts, there are few plant and animal species here, and their spread is hindered;

Due to the location of the region in the ecosystem formed as a result of the formation of the Aral Sea, today it leads to soil salinization in the region, the deterioration of the health of the population, and the occurrence of other negative consequences;

The location in the desert region has led to the predominance of water components in the ecosystem of the region, the problem of fresh water, the mineralization of underground water, etc.

We can see that the commissioning of the Tuyamuyun water reservoir in 1969–1978 has both positive and negative significance for the region. The water reservoir provided the possibility of continuous water supply to the countries of Uzbekistan and Turkmenistan. However, as a result of

the cloudy water of the Amudarya standing in the reservoir, it becomes cloudy and turns into clear water, which causes the problem of decreasing the level of turbidity of the water received during irrigation of the region's lands. According to the conducted experiments, after the construction of the Tuyamuyun water reservoir, the amount of turbidity of the water coming to the Khorezm region through the Amudarya during the growing season has decreased by 10-20 times. This, in turn, affected the bottom of the canals located in the soil layer of the area. Because the turbidity flowing from the Amudarya formed a special layer at the bottom and on the sides of the canals, reducing the absorption of water underground. Due to the movement of water in the canals, which currently have a low level of turbidity, the absorption of water has increased, which has led to the rise of groundwater along the canals and the disturbance of its balance.

The extreme flatness of the region's relief, the Amudarya, lakes, and multi-sectoral irrigation systems play a major role in the formation of groundwater in the region. Also, since irrigated agriculture has been practiced for many years, the underground water is very close to the surface and is strongly mineralized. The average depth of groundwater in the irrigated zone varies from 0.83 to 2.69 m. During the period of hydro melioration (February-March), the groundwater level rises, and its depth from the surface of the earth is 0.4–0.6 m. In winter, the surface water level drops to 2.2–3.6 m; in the zone bordering the desert, ground water is 10–15 m deep; in the desert region, 20–30 m deep. Ground groundwater mineralization in the region varies from 1.16 g/l to 5.42 g/l [4].

In the heavily developed part of the Khorezm region, weakly saline and washed soils make up 37.2% of the total land fund. The share of moderately and highly saline soils is more than 40%. At the same time, non-saline and weakly saline cultivated areas in the region are Khanka (67.3%), Yangibozor (50.6%), Hazorasp (47.8%), and Koshkopir (45.7%). occupies a large area in the districts. It should be noted that the weight of weakly saline and leached soils has changed little in the next ten years, while the area of salt marshes has slightly decreased and its weight in the land fund is about 1.6%. But due to the exploitation of sand and saline lands, the share of highly saline areas has increased. This worsened the general reclamation condition of the irrigated lands of the region.

Analysis and Results

As a result of the Amudarya flowing through the fire in the territory of the Khorezm region, it led to the rise of the underground water level and salinization of the soil surface. There are hundreds of small lakes in the province, most of them are formed from the seepage of underground water to the surface in low-lying areas and waste water [3]. There are many lakes in the southwest of the province adjacent to Karakum, but the area of most of them is 1 less than km². Among them, Ulugshorkol and Akmachitkol lakes are the largest. Also, secondary salinity occurs as a result of irrigation of crop fields in agriculture. This can also be seen from the names of the lakes in the area [2]. Achchikkol (Shavot district), Shorkol (Shavot district), Katta shorkol (Yangiariq district), Ulugshorkol (Yangiariq district), Shorkol (Koshkopir district), Tuzloqkol (Koshkopir district), Shorkol (Bogot district), Tuzkol (Hazorasp district), Eastern shorkol (Hazorasp district) and other names like.

In the hydronyms of the region, there are many place names formed using the topoterm "lake": Achchikkol, Khalpakol, Shorkol (Shavot district), Ashshaqkol, Chukurkol (Urganch district), Buratankol, Obilkol Ulugshorkol (Yangiariq district), Gavkol, Dinakkol, Eshonkol (Khiva district), Davutkol, Shorkol, Tashlikol, Tuzloqkol, Aqdaykol, Ortayapkol (Koshkopir district), Jarmishkol (Khiva and Yangariq districts), Okkol (Khiva, Shavot, Yangariq districts), Suzalikel (Khiva district), Tuzkol, Uzunkol (Hazorasp district) and others.

Among the names related to the geographical location of the place in the Khorezm region: North Arbuzkol (salt lake, northeast of Khiva district), North Korpkol (salt lake, in the south of Kashkopir district), South Alankol (salt lake, Shovot district), East Shorkol (salt lake, in the south of Bogot district), West Otakol (salt lake r lake, Yangiariq district), West Shorkol (saline lake, Bogot district), depending on the location and its characteristics, Katta Shorkol (saline lake, in the south of Yangiariq district), Uligshorkol (saline lake, in the south of Yangiariq district), Chukurkol (saline lake, in the north of Koshkopir district), Batiqlikol (saline lake, in the southwest of Koshkopir

district), Shor lake (saline lake, in the west of Koshkopir district), Shorsolma (stream, in the north-west of Yangiariq district), Uzunsuv (saline lake, in Koshkopir in the southwest of district), Uzunkol (saline lake, in the south of Hazorasp district), Uzunkol (saline lake, in the west of Shovot district), Karangikol (saline lake, in the south of Bogot district) related to the abundance of underwater vegetation cover, Takirkol (salt lake, in the north of Gurlan district) related to the lack of underwater vegetation cover and other similar names composed [5,6].

Some hydronyms in the region are named after the taste of water: Achchikol (in the east of Shovot district), Shorkol (in the southwest of Koshkopir district), Tuzkol (in Hazorasp district), Mazalikol, examples of names like l, and others. [2]

Names such as Achiqquyi (well) (neighborhood, Yangiariq district) and Shirinquduq (neighborhood, Hazorasp district) were created due to the characteristics (saltiness, unfitness) of well water (saltiness, unfitness for consumption).

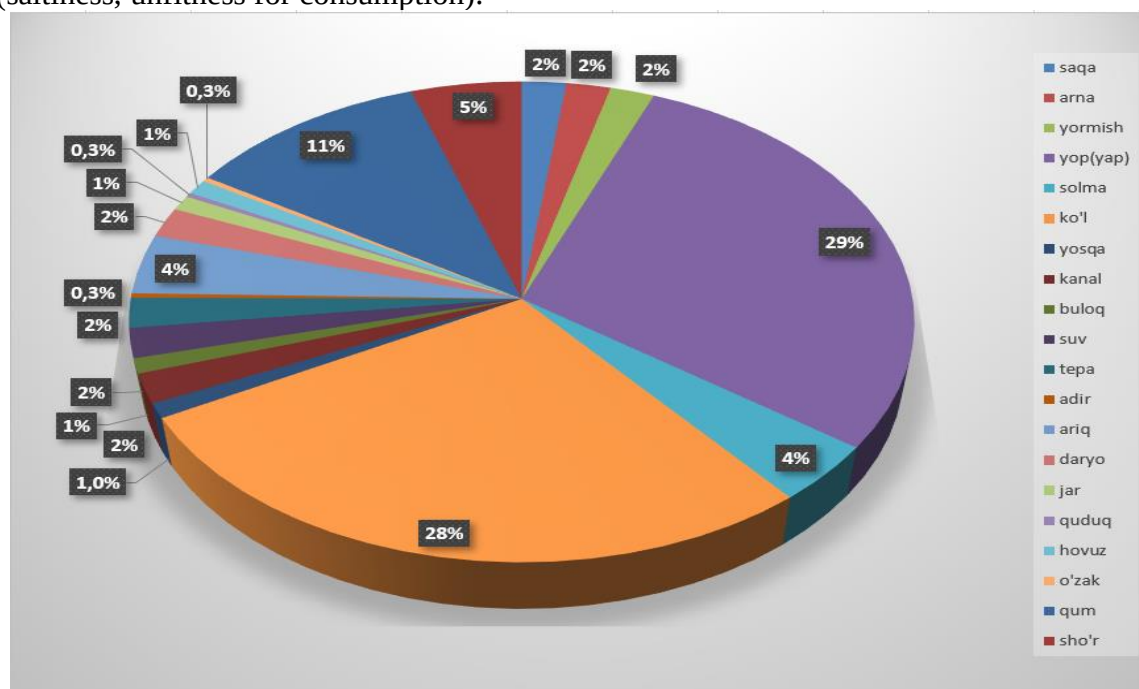


Figure 1. Combination of natural geographical terms in regional toponyms.
(Diagram compiled by the author)

Hydronyms are relatively common in regional toponyms (we can see that 28% of the 314 toponyms studied on the 1:100 000 scale topographic map were formed using the "lake" topoterm).

Due to the fact that the formation and development of the gray soil in the region is directly related to the Amudarya, almost all soils in the region were formed due to the activity of the Amudarya and formed on alluvial deposits. The Khorezm region is characterized by a weak natural flow of groundwater and a lack of artificial drainage facilities. In this regard, all soils, both irrigated and non-irrigated, are subject to salinization. As a result, some geographical names related to the characteristics of the region's soil appeared. The villages located in the fertile lands of the region are called by the names Sog'ali, Sog'alang, and Sog'ayap. As a result of the passage of time, the inhabitants of Shorhok acquired the cultivated lands and settlements - Shorliq, Shortakht (land on the salt land), Shorkala, Shoryop, Shorsolma, etc. named Also, we can know that names such as Boz, Bozli, Bozyap, and Bozyapli are the names of the people who moved to the lands that were later appropriated from the name of this village. Currently, the region includes Bozkala (village, in the north of Yangibozor district), Bozovul (settlement, in the north of Yangibozor district), Bozkala (settlement, in the northwest of Shovot district), Bozyop (Bo 'zyap) (canal, north-west of Khiva district), Bozariq (village, north of Bogot district), Bozariq (stream, north of Bogot district), Boz (settlement, Gurlan district in the southwest) there are names like. Names formed in connection with

the soil conditions: Takir (village, in the west of Khiva district), Takirdovuq (settlement, in the south of Koshkopir district), Takirjarmish (settlement, in the southwest of Khanka district), Takirkol (a salt lake, in the north of Gurlan district), Takiryop (stream, in the southwest of Khiva district), Takhirsolma (a stream, in the southwest of Khiva district), Aktaqir, and other similar names were formed [1, 5, 6].

Due to the fact that Khorezm region is located between Kyzylkum and Unguz Karakum, most of it consists of a plain consisting of sandy and loamy soils. Therefore, using the term "sand" in the list of toponyms of the region: Karakum (settlement, northwest of Khiva district), Karakum (sandy area, northwest of Khiva district), Kумыop (settlement, southwest of Khanka district) (in the west), Kумыaska (neighborhood, Khiva district), Akkum (Oqqum) (Kumlik, in the southwest of Shovot district), Kumbodoq (settlement, in the east of Bogot district), as well as Oltingum, Urekunqum, Ortakum, Kumravot, Vopqum, Kumaqli, Ashaqqum, Kumonchilar, and other such toponyms appeared [5, 6].

Summary

Geographical names act as a "key"—an indicator that informs about the natural conditions of the area today, soil and plant cover, the animal world, and how nature has changed since ancient times. At the same time, the lakes in the region remain a source of information reflecting the characteristics of underground water.

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Rezyume: *Xorazm viloyati geografik jixatdan o'ziga xos bo'lgan tabiiy sharoitga ega bo'lgan hudud hisoblanadi. Shundan kelib chiqib, ushbu maqolada Xorazm viloyati toponimlarini tabiiy sharoitga bogliq holda ko'plab geografik joy nomlari vujudga kelganligi tahlil qilingan.*

Аннотация: *Хорезмская область располагает регионами с географически уникальными природными условиями. Исходя из этого, в данной статье анализируется топонимия Хорезмской области, тот факт, что многие географические топонимы были созданы в зависимости от природных условий.*

Kalit so'zlar: *toponim, geografik nomlar, geografik terminlar (topotermilar) gidronimlar, oykonimlar, etnonimlar, fitonimlar, yer osti suvlari, tuproq suvlari, sho'r suvlar, Amudaryo daryosi.*

Ключевые слова: *топоним, географические названия, географические термины (топотермы), гидронимы, ойконимы, этнонимы, фитонимы, подземные воды, почвенные воды, соленые воды, река Амударья.*

BIOECOLOGICAL FEATURES OF INSECTS ON GREENHOUSE PLANTS IN THE SOUTHERN ARAL SEA REGION

Minajatdinova Z.

Karakalpak State University named after Berdakh

Summary: *This study examines the bioecological characteristics of insects associated with greenhouse plants in the Southern Aral Sea region. The research explores insect species diversity, their ecological roles, and the impact they have on greenhouse ecosystems. By identifying key insect pests and beneficial species, the study provides insight into pest management practices suitable for the specific environmental conditions of the Southern Aral Sea region. The findings contribute to a better understanding of insect-plant interactions and offer strategies for sustainable greenhouse agriculture in this area.*

Key words: *Greenhouse plants, Southern Aral Sea region, bioecological features, insect diversity, pest management, beneficial insects, biological control, pollinators, microclimate, integrated pest management (IPM).*

Introduction

The Southern Aral Sea region, characterized by its unique climate and ecological conditions, has seen increasing greenhouse agricultural activity in recent years. Greenhouse farming allows for the cultivation of a wide variety of crops in controlled environments, despite the region's arid climate. However, the success of these greenhouses is often threatened by insect pests that can significantly reduce crop yields. Understanding the bioecological features of these insects is essential for developing effective pest management strategies.

Insects play a dual role in greenhouse ecosystems. While some species act as pests that damage crops and spread diseases, others serve beneficial roles such as pollinators or natural predators of pests. The ecological dynamics between these species are critical to maintaining a balanced greenhouse environment. The purpose of this study is to identify the primary insect species found in greenhouses in the Southern Aral Sea region, analyze their bioecological characteristics, and evaluate their impact on greenhouse plants. The findings aim to inform sustainable pest control methods that can minimize chemical pesticide use and promote ecological balance.

Methods

This study was conducted in a series of greenhouses located in the Southern Aral Sea region between April and September 2023. The research methodology included both field observations and laboratory analysis to assess insect diversity and their interactions with greenhouse plants.

1. **Insect Sampling:** Insects were collected using a combination of sweep nets, sticky traps, and direct visual inspection of plants. Sampling was conducted at regular intervals throughout the growing season, targeting different crop stages.

2. **Species Identification:** Collected insects were transported to the laboratory for identification. Morphological characteristics were examined using a stereomicroscope, and species were identified with the help of taxonomic keys specific to the region's fauna.

3. **Ecological Role Assessment:** The ecological roles of the identified insects were categorized based on their interactions with greenhouse plants. Insects were classified as pests, pollinators, or predators based on direct observation and literature review.

4. **Data Analysis:** The relative abundance and diversity of each insect species were calculated using ecological indices such as the Shannon-Weaver Diversity Index. The impact of pest species on crop health was assessed by measuring crop damage and yield reduction. Additionally, the effectiveness of beneficial insects in controlling pest populations was evaluated.

Results

The study identified a total of 47 insect species belonging to 8 different orders. The most commonly encountered species were from the orders **Hemiptera** (true bugs), **Lepidoptera** (moths and

butterflies), and **Diptera** (flies). Notably, several species of aphids (**Aphidoidea**) and whiteflies (**Aleyrodidae**) were found to be the primary pests in the greenhouses, causing significant damage to tomato, cucumber, and pepper plants by feeding on plant sap and spreading viral diseases.

Among the beneficial species, **Coccinellidae** (ladybird beetles) and **Syrphidae** (hoverflies) were identified as important natural predators of aphids, contributing to biological pest control. Ladybird beetles were particularly effective, with a marked reduction in aphid populations observed in areas with high ladybird density.

The study also highlighted the role of **Apis mellifera** (honeybee) and other native bee species as pollinators, which improved fruit set in greenhouse crops. However, the presence of pollinators was limited, likely due to the confined greenhouse environment, which restricted their natural foraging behavior.

The bioecological analysis revealed that pest populations peaked during the late spring and early summer months, corresponding to optimal temperature and humidity levels inside the greenhouses. In contrast, beneficial insect populations remained relatively stable throughout the growing season, but their effectiveness in controlling pests was influenced by the timing of their introduction into the greenhouse environment.

Discussion

The results of this study underscore the importance of understanding the bioecological dynamics of insect populations in greenhouse systems. In the Southern Aral Sea region, the unique climatic conditions create a favorable environment for both insect pests and their natural predators. However, the controlled nature of greenhouses can disrupt natural ecological balances, leading to pest outbreaks if not properly managed.

A key finding of this study is the effectiveness of biological control agents, such as ladybird beetles, in reducing pest populations without the need for chemical pesticides. This aligns with global trends in sustainable agriculture, where integrated pest management (IPM) strategies are being promoted to minimize pesticide use and reduce environmental impact.

However, the limited presence of pollinators in greenhouses poses a challenge for crop production. The confined space of greenhouses can restrict pollinator access, leading to reduced fruit set and lower yields. Introducing artificial pollination methods or optimizing greenhouse designs to allow for better pollinator access could help address this issue.

The timing of pest and predator population dynamics also emerged as a critical factor. The synchronization of predator introduction with pest population peaks is essential for effective biological control. In this study, delayed predator release led to increased crop damage before beneficial insects could establish themselves. Therefore, careful monitoring and timely intervention are key components of successful pest management in greenhouses.

Conclusion

The bioecological features of insect populations in greenhouses in the Southern Aral Sea region present both challenges and opportunities for sustainable agriculture. While pest species such as aphids and whiteflies can cause significant crop damage, natural predators like ladybird beetles offer an effective, environmentally friendly solution for pest control. The study recommends the adoption of integrated pest management strategies that prioritize biological control methods and minimize the use of chemical pesticides.

Furthermore, efforts to enhance pollinator activity within greenhouses, either through natural means or artificial interventions, should be considered to improve crop yields. Future research could explore the long-term effects of biological control on greenhouse ecosystems and investigate additional methods for increasing pollinator presence in confined environments.

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Rezyume: *Ushbu tadqiqot Janubiy Orolbo'yida issiqxona o'simliklari bilan bog'liq bo'lgan hasharotlarning bioekologik xususiyatlarini o'rganadi. Tadqiqot hasharotlar turlarining xilma-xilligi, ularning ekologik roli va issiqxona ekotizimlariga ta'sirini o'rganadi. Asosiy hasharotlar zararkunandalari va foydali turlarini aniqlash orqali tadqiqot Janubiy Orol dengizi mintaqasining o'ziga xos ekologik sharoitlariga mos keladigan zararkunandalarga qarshi kurash usullari haqida tushuncha beradi. Topilmalar hasharotlar va o'simliklarning o'zaro ta'sirini yaxshiroq tushunishga yordam beradi va bu sohada barqaror issiqxona dehqonchiligi uchun strategiyalarni taklif qiladi.*

Резюме: *В этом исследовании изучаются биоэкологические характеристики насекомых, связанных с тепличными растениями в регионе Южного Аральского моря. Исследование изучает разнообразие видов насекомых, их экологическую роль и влияние, которое они оказывают на тепличные экосистемы. Выявляя ключевых насекомых-вредителей и полезные виды, исследование дает представление о методах борьбы с вредителями, подходящих для конкретных условий окружающей среды региона Южного Аральского моря. Результаты способствуют лучшему пониманию взаимодействия насекомых и растений и предлагают стратегии для устойчивого тепличного сельского хозяйства в этой области.*

Kalit so'zlar: *Issiqxona o'simliklari, Janubiy Orolbo'yi hududi, bioekologik xususiyatlari, hasharotlar xilma-xilligi, zararkunandalarga qarshi kurash, foydali hasharotlar, biologik kurash, changlatuvchilar, mikroiklim, zararkunandalarga qarshi kurash (IPM).*

Ключевые слова: *тепличные растения, регион Южного Аральского моря, биоэкологические особенности, разнообразие насекомых, борьба с вредителями, полезные насекомые, биологический контроль, опылители, микроклимат, интегрированная борьба с вредителями (ИБВ).*

ECOLOGICAL AND FAUNISTIC ANALYSIS OF HELMINTES OF SPARROWS IN KARAKALPAKSTAN

Akramova F.D¹., Arepbaev I.M²., Turemuratova U.T²., Tursinbaev I.Q²., Minajatdinova Z.N².

¹*Institute of Zoology, Academy of Sciences of Uzbekistan, Tashkent, Republic of Uzbekistan*

²*Karakalpak State University, Nukus, Republic of Uzbekistan*

Summary: The article presents information on the results of studies of the helminth fauna of sparrows in Karakalpakstan. When studying 6 species of birds of the families Sturnidae and Corvidae in Karakalpakstan, 15 species of helminths belonging to the classes Cestoda, Trematoda and Nematoda were registered.

Key words: land birds, passerine birds, nematode, trematode, cestode, extensiveness, helminth fauna, Karakalpakstan.

Today, the worsening of climate change, the global change of ecosystems, the negative impact on the diversity of the animal world and their representatives is increasing year by year. Especially in recent years, sudden changes in hydrological and soil conditions as a result of anthropogenic factors cause a wide spread of animal parasites, including helminths. Therefore, it is of urgent scientific and practical importance to evaluate the change in the diversity of helminths in natural and transformed areas, to determine their adaptability to changed artificial ecosystems, and to improve methods of combating them.

Birds are undoubtedly one of the most popular objects of helminth fauna studies in many regions of the world. However, the list of scientific works on the fauna and distribution of helminths of Karakalpakstan birds is relatively less [12; 78-91 p., 9; pp. 273-277, 15; pp. 59-63].

Research materials and methods

During 2018-2024, endoparasites of land birds were collected in the territory of Karakalpakstan (North-western part of Kyzylkum, Ustyurt plateau and lower reaches of Amu Darya). Land birds were collected from different biotopes in the northwestern part of Kyzylkum, the Ustyurt plateau and the lower reaches of the Amu Darya river and were analyzed using parasitological methods. A total of 178 individuals of 6 species of sparrows belonging to 1 order and 2 families were studied by the method of complete helminthological examination (Table 1).

Table 1

Species composition of the studied sparrows of Karakalpakstan

№	Birds	Checked, copy
Starlings		
1.	Common Starling - <i>Sturnus vulgaris</i> (Linnaeus, 1758)	23
2.	Rosy Starling - <i>Sturnus roseus</i> (Linnaeus, 1758)	24
3.	Common Myna - <i>Acridotheres tristis</i> (Linnaeus, 1766)	36
Crows		
4.	Common Magpie - <i>Pica pica</i> (Linnaeus, 1758)	29
5.	Hooded Crow - <i>Corvus cornix</i> Linnaeus, 1758	32
6.	Carrion Crow – <i>Corvus corone</i> Linnaeus, 1758	34
Total:		178

Inspection of birds, identification of types of helminths, processing of helminths, preparation of temporary and permanent preparations were carried out according to standard parasitological methods [7; p. 139]. Cestodes, trematodes and nematodas were studied, measured, photographed and drawn using modern microscopes (inventory microscope Olympus CK2-TR, Lomo, binocular - ML-2200, trinocular microscope N-300 and Ningbo Yongkin Optics). Identification of species of cestodes,

trematodes and nematodes was carried out in accordance with the literature data of local and foreign authors. Other literature was used to identify some groups of higher taxa [10; 204-s., 11; 340-s., 2; p. 319, 14; 23-s., 13; 143-s., 16; 208-s., 1; p. 650, 3; p. 521, 4; 745 p., 5; p. 824]. The taxonomy of birds was carried out according to Stepanyan (2003) [16 ; p. 308].

Ecological and faunal analysis of helminths of passerine birds of Karakalpakstan

Biogeocenoses of Karakalpakstan are distinguished by diversity and uniqueness of bird fauna [8; 52-s., 6; p. 60]. About 320 species of birds have been registered in this area, most of them are terrestrial birds, which are important in natural processes and in the development of the agro-industrial complex of the Republic of Karakalpakstan.

Helminthological studies of sparrows in the territory of Karakalpakstan were carried out in all seasons of the year. In the spread of helminthic diseases in poultry farms, much attention is paid to the description of the helminth fauna of sparrows.

As a result of helminthological examination of 178 sparrows of Karakalpakstan, 15 types of helminths belonging to three classes - Cestoda (5 species), Trematoda (2 species), Nematoda (8 species) were recorded for the first time (Table 2).

Table 2

Species composition of helminths of sparrows of Karakalpakstan

Class	Family	Species
Cestode	Hymenolepididae	<i>Passerilepis passeris</i> (Gmelin , 1790)
		<i>Passerilepis crenata</i> (Goeze , 1782)
		<i>Passerilepis stylosa</i> (Rudolphi , 1809)
		<i>Variolepis farciminosa</i> (Goeze , 1782)
		<i>Hymenolepis clerk</i> Fuhrmann , 1924
Trematoda	Eucotylidae	<i>Tamerlane necessary</i> Skrjabin , 1924
	Plagiorchiidae	<i>Plagiorchis elegance</i> (Rudolphi , 1802)
Nematoda	Acuariidae	<i>Acuaria alii</i> Rasheed, 1960
		<i>Acuaria brevispicula</i> Mapl., 1932
		<i>Dyspharynx emberizae</i> Yamaguti , 1935
		<i>Dyspharynx nasuta</i> (Rudolphi , 1819)
	Thelaziidae	<i>Oxyspirura pici</i> Borgarenko , 1984
	Aproctidae	<i>Pseudoprocta decorate</i> Lee, 1933
	Diplotriaeidae	<i>Diplotriaeana graculi</i> (Mapl., 1931)
		<i>Diplotriaeana tricuspsis</i> (Fedtch. 1874)

Table 3

Species composition of helminths of sparrows of Karakalpakstan

	Species	Hosts					
		Sturnidae and Corvidae					
		Common Starling	Rosy Starling	Common Myna	Common Magpie	Hooded Crow	Carrion Crow
1	<i>Passerilepis passeris</i> (Gmelin , 1790)	+	+	–	–	–	–
2	<i>Passerilepis crenate</i> (Goeze , 1782)	–	–	–	+	+	+
3	<i>Passerilepis stylus</i> (Rud ., 1809)	+	–	+	+	–	–

4	<i>Variolepis farciminosa</i> (Goeze , 1782)	+	+	+	–	–	–
5	<i>Hymenolepis clersii</i> Fuhrmann , 1924	–	+	+	–	–	–
6	<i>Plagiorchis elegans</i> (Rudolphi , 1802)	+	+	+	+	+	+
7	<i>Tamerlania necessary</i> Skrjabin , 1924	+	+	–	+	+	–
8	<i>Acuaria alii</i> Rasheed, 1960	+	+	+	+	+	–
9	<i>Acuaria brevispicula</i> Mapl., 1932	–	–	+	+	–	–
10	<i>Dyspharynx nasuta</i> (Rudolphi , 1819)	+	+	–	+	–	+
11	<i>Dyspharynx emberizae</i> Yamaguti , 1935	–	–	+	+	–	–
12	<i>Oxyospirura baby</i> Borgarenko , 1984	–	–	–	+	+	+
13	<i>Pseudoprocta decorate</i> Lee, 1933	–	–	–	+	–	–
14	<i>Diplotrriaena tricuspsis</i> (Fedtch. 1874)	+	–	–	–	+	–
15	<i>Diplotrriaena graculi</i> (Mapl., 1931)	+	–	–	–	–	–
		9	7	7	10	6	4

In the studied sparrows, the Cestoda class is represented by 3 genera and 5 species belonging to the Hymenolepididae family - *Passerilepis* (3 species), *Variolepis* and *Variolepis* (1 species). The Trematoda class is represented by two genera - *Plagiorchis* and *Tamerlania* . Nematodas consist of 8 species and belong to the following families - Acuariidae (4 species), Thelaziidae (1 species), Aprocitidae (1 species) and Diplotrriaenidae (2 species) .

Species composition of helminths found in sparrows was observed from 4 to 10 species depending on the species of birds. The extent of damage is high - from 70.5 to 83.5%. The intensity of damage is several tens of samples from one copy.

The helminth fauna of common Starling consists of 9 species: *Passerilepis passeris*, *Passerilepis stylosa*, *Variolepis farciminosa*, *Plagiorchis elegans*, *Tamerlania zarudnyi*, *Acuaria alii*, *Dispharynx nasuta*, *Diplotrriaena tricuspsis*, *Diplotrriaena graculi* . The mentioned species of helminths have a heteroxenous form, and their development has specific intermediate hosts for each species.

The helminth fauna of the Rosy Starling consists of 7 species: *Passerilepis passeris*, *Variolepis farciminosa*, *Hymenolepis clersi*, *Plagiorchis elegans*, *Tamerlania zarudnyi*, *Acuaria alii*, *Dispharynx nasuta* .

Common Myna helminth fauna was also represented by 7 species – *Passerilepis stylosa*, *Variolepis farciminosa*, *Hymenolepis clersi*, *Plagiorchis elegans*, *Tamerlania zarudnyi*, *Acuaria alii*, *Acuaria brevispicula*, *Dispharynx emberizae* . In terms of life cycle forms, all identified helminth species have a heteroxene form.

In the helminth fauna of common Magpie, 10 species of parasites were recorded - *Passerilepis crenata*, *Passerilepis stylosa*, *Plagiorchis elegans*, *Tamerlania zarudnyi*, *Acuaria alii*, *Acuaria brevispicula* , *Dispharynx nasuta*, *Dispharynx emberizae*, *Pseudoprocta decorate* . It was noted that the composition of helminth species of Zaghizghon is significantly similar to the helminth fauna of Chugurchuk species.

The helminth fauna of the Hooded Crow consists of 6 species: *Passerilepis crenata*, *Plagiorchis elegans*, *Dispharynx nasuta*, *Oxyospirura pici*, *Diplotrriaena tricuspsis* .

The helminth fauna of the Carrion Crow consists of 4 species of cestodes, trematodes and nematodas, almost similar to the helminth fauna of the spotted crow: *Passerilepis crenata*, *Plagiorchis elegans*, *Dispharynx nasuta*, *Oxyospirura pici* . *Plagiorchis elegans*, *Pseudoprocta decorate*, *Diplotrriaena graculi* species are excluded.

In the study of 6 species of birds belonging to the Sturnidae and Corvidae families in Karakalpakstan, we noted 15 species of helminths belonging to the classes Cestoda, Trematoda and Nematoda (Table 3).

Describing the helminth fauna of land birds of Karakalpakstan, it should be noted that the identified helminth species were observed in almost all organs and organ systems of birds, and some species were recorded in the form of mixed invasion.

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Rezyume: *Maqolada Qoraqalpog‘iston chumchuqsimon qushlarning gelmintofaunasi bo‘yicha olib borilgan tadqiqotlar natijalari haqida malumotlar keltirilgan. Qoraqalpog‘iston hududidagi Sturnidae va Corvidae oilalariga mansub qushlarning 6 turini o‘rganishda Cestoda, Trematoda va Nematoda sinflariga mansub gelmintlarning 15 turini qayd etilgan.*

Резюме: *В статье приведены сведения о результатах исследований гельминтофауны воробьиных птиц Каракалпакстана. При изучении 6 видов птиц семейства Sturnidae и Corvidae в Каракалпакстане зарегистрировано 15 видов гельминтов, принадлежащих к классам Cestoda, Trematoda и Nematoda.*

Kalit so‘zlar: *quruqlik qushlar, chumchuqsimon qushlar, nematoda, trematoda, cestoda, ekstensivligi, gelmintofauna, Qoraqalpog‘iston.*

Ключевые слова: *наземные птицы, воробьиные птицы, нематода, трематода, цестода, экстенсивность, гельминтофауна, Каракалпакстан.*

UDC 537.622.4

MAGNETIC PROPERTIES OF SILICON DOPED WITH IMPURITY NICKEL ATOMS

Zikrillayev N.F.¹, Ismaylov K.A.², Kamalov X.U.², Ismailov T.B.².

¹Tashkent State Technical University named after Islam Karimov, Tashkent

²Karakalpak State University named after Berdakh, Nukus

Summary: The ferromagnetic properties of clusters of impurity nickel atoms formed in the enriched surface layer of mono-Si were investigated and ferromagnetic properties were found. The topography of the clusters obtained on the silicon surface was studied using atomic force microscope (AFM). The hysteresis loop of the samples was obtained and the parameters of residual magnetisation, saturation magnetisation and coercivity at temperature $T=400$ K were determined using SQUID - magnetometer. The sizes of nanoclusters forming on the surface of silicon samples and ferromagnetic properties of these nanoclusters, as well as ferromagnetic properties at temperature $T=400$ K of silicon doped with impurity Ni atoms were determined from the results of the study. A new silicon-based magnetic material for use in spintronics devices is described.

Key words: Nanocluster; ferromagnetism; temperature; impurity; magnetisation; SQUID, ACM.

INTRODUCTION

Nowadays in the world, it is urgent to obtain semiconductor materials such as Si, Ge and semiconductor compound $A^{\text{III}}B^{\text{V}}$ doped with impurity atoms with magnetic properties of transition iron elements Mn, Ni, Cr, Fe and Co [1]. Scientists and experts are showing more interest in the development of fast magnetic sensors based on new magnetic materials and their use in the field of spintronics [2].

The structural and magnetic properties of low-dimensional thin metallic or semiconductor films with modulated surface morphologies have attracted considerable attention from scientists and experts because of their great importance in both fundamental research and practical applications [3]. Among various ferromagnetic materials, nickel thin films have attracted notable interest in recent years with their physical properties and their potential applications in various fields of science and technology such as recording media, information carriers, spin valves, semiconductor magnetic sensors and resistive switches [4].

In this work, the ferromagnetic properties of silicon doped with impurity Ni atoms formed on the surface and in the volume of the enriched silicon layer are investigated. The introduction of impurity nickel atoms into the silicon, was done by diffusion from the sawn layer, which is widely used in the field of semiconductor instrumentation. In addition, the non-electrically active part of dissolved impurity nickel atoms located in the silicon lattice in the form of interstitial atoms which form nanoclusters, precipitates and magnetic silicides can also have magnetic properties.

An example of such impurities are nickel atoms, easily forming microclusters, precipitates and silicides in silicon, due to this non-electrically active concentration of impurity nickel atoms near the surface is in the range $N_{\text{Ni}}=10^{20}\text{-}10^{21}\text{ cm}^{-3}$. At the same time, the electroactive concentration of nickel does not exceed $N_{\text{Ni}}=10^{15}\text{ cm}^{-3}$, so diffusion doping of silicon with impurity nickel atoms does not change much the electrophysical parameters of the obtained samples [5-12].

TECHNOLOGY FOR OBTAINING SAMPLES

To investigate the magnetic properties of silicon doped with impurity atoms of nickel, silicon wafers of KDB-0.5 grade with p -type conductivity with thickness $d=200\mu\text{m}$ and resistivity $\rho=0.5\text{ Ohm}\cdot\text{cm}$ were used as a starting material. The concentration of boron atoms in the initial silicon is $N_{\text{B}}=4\cdot 10^{16}\text{ cm}^{-3}$.

Diffusion of impurity nickel atoms was carried out from the filed layer in vacuum. The thickness of the filed layer of nickel was equal to $d=1\mu\text{m}$. After sputtering, the diffusion of nickel

atoms in silicon was carried out at a temperature of $T=850^{\circ}\text{C}$ for a time of $t=0.5$ hours. After diffusion, the silicon samples were subjected to additional thermal annealing in the temperature range $T=600\div 800^{\circ}\text{C}$ for a time $t=0.5$ hours, which allowed driving impurity nickel atoms from the silicon surface into the volume.

The sputtering was carried out in a vacuum unit 'DILB832'.

After obtaining silicon samples, electrophysical parameters (conductivity type, resistivity, concentration of charge carriers, mobility of charge carriers) of nickel doped with impurity atoms were measured using Van der Pauw method of 'Ecopia HMS-7000' (Ecopia corporation - South Korea).

The surface topography of silicon samples doped with impurity nickel atoms was studied using an atomic force microscope 'SPM-9700HT' (Shimadzu, Japan).

The magnetisation was measured using a (SQUID, Superconducting Quantum Interference Device) magnetometer 'Quantum Design MPMS-3 SQUID VSM' (USA) with a sensitivity of at least $2\cdot 10^{-8}$ emu at room temperature ($T=300$ K).

EXPERIMENTAL RESULTS

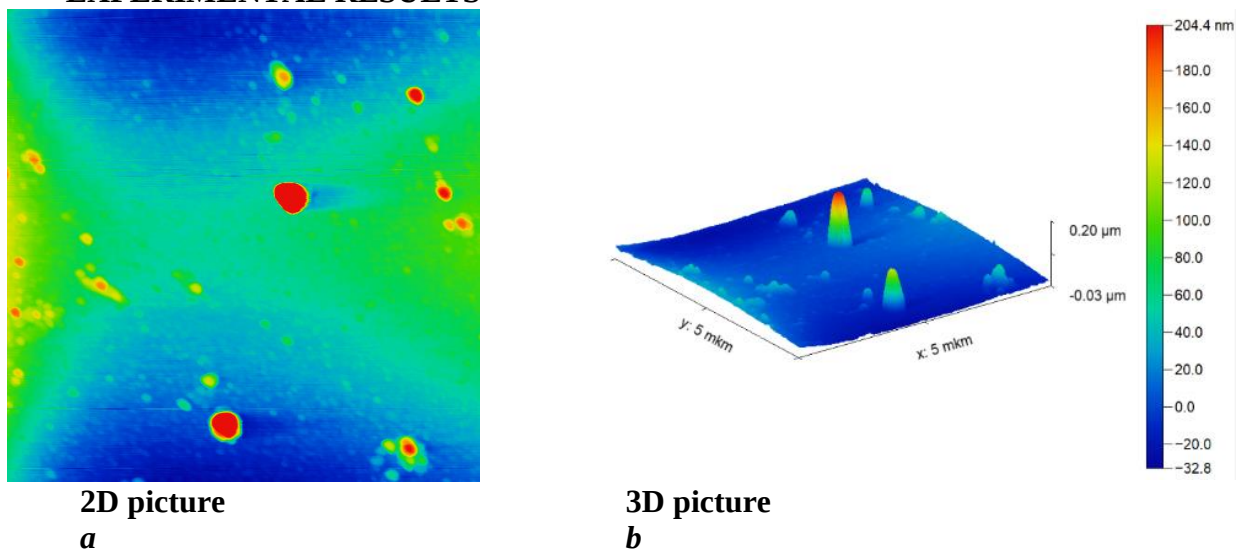


Figure 1. Topography of silicon surface after diffusion of impurity nickel atoms obtained in atomic force microscope.

In Fig. 1. (a and b) we see that shows the atomic force microscopy results of nickel nanoclusters in 2D and 3D dimensions. It can be seen that the size of nickel nanoclusters in the silicon crystal lattice is in the range of $\sim 100\text{-}200$ nm.

Table-1

Sample	Diffusion temperature $T, ^{\circ}\text{C}$	Conductivity type	Specific resistance, $\Omega\cdot\text{cm}$	Concentration, $p, n\text{ cm}^{-3}$	Mobility, $\mu, \text{cm}^2/(\text{V}\cdot\text{s})$
Initial Si	-	p	0.5	$4\cdot 10^{16}$	300
Si<Ni>	850	p	0.5	$4\cdot 10^{16}$	285
Si<Ni>	800	p	0.5	$4\cdot 10^{16}$	275

After diffusion and each heat treatment the electrophysical parameters of the silicon sample doped with impurity nickel atoms were investigated using the Van-der-Pauw method of 'Ecopia HMS-7000'. It was found that the electrophysical parameters (conductivity type, resistivity, concentration of charge carriers, mobility of charge carriers) of silicon doped with impurity nickel atoms do not change.

From the analysis of the obtained results it is established that under certain thermodynamic conditions impurity nickel atoms in the silicon crystal lattice can create both electroneutral and multi-charge nanoclusters. These experimental data indicate that the presence of impurity nickel atoms

significantly affects the concentration of nanoclusters in silicon. This can be explained by the gettering properties of nickel clusters in silicon [6].

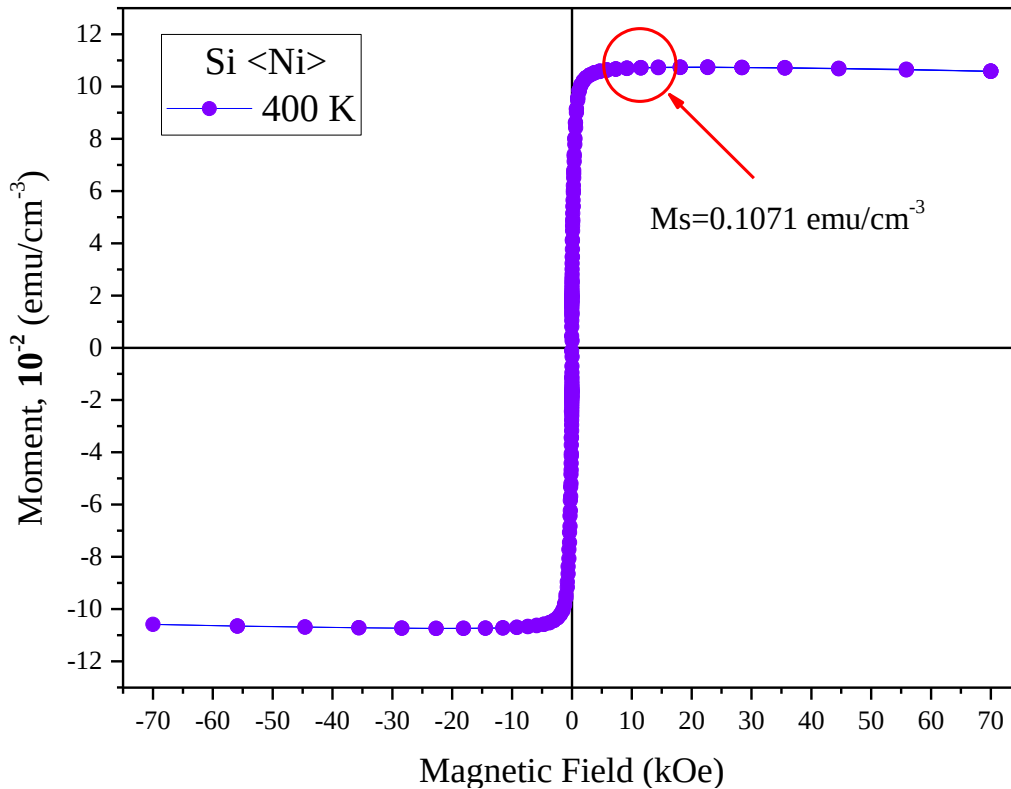


Figure 2. Field dependence of silicon doped with impurity Ni atoms at temperature $T=400 \text{ K}$.

Fig. 2 shows that at $T=400 \text{ K}$, silicon doped with nickel atoms exhibits ferromagnetic properties and the value of saturation magnetisation is $M_s=0.1071 \text{ emu/cm}^{-3}$.

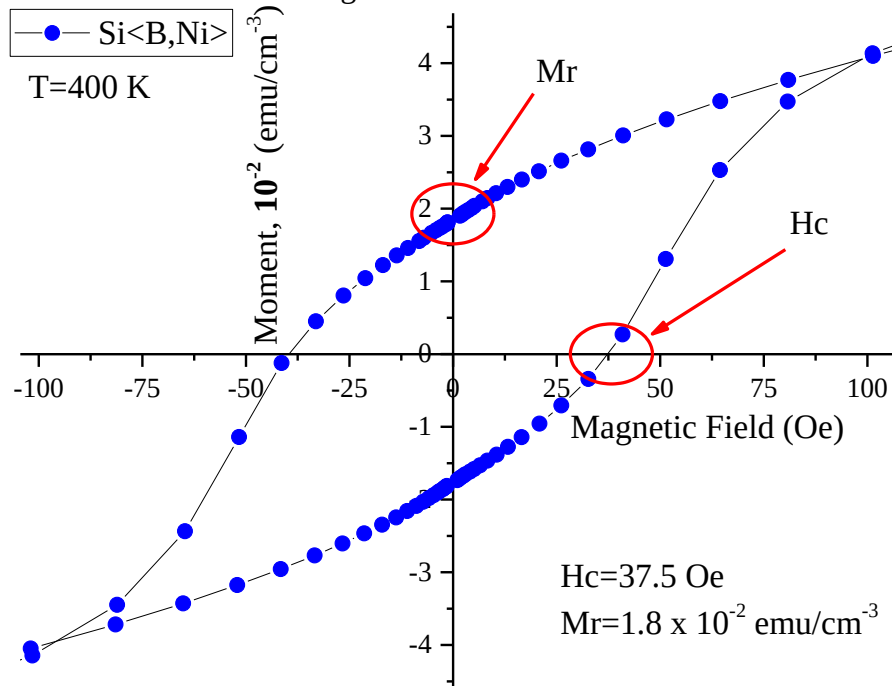


Figure 3. Hysteresis loop in silicon doped with impurity Ni atoms at temperature $T=400 \text{ K}$.

From Fig. 3 shows that the ferromagnetic properties of nickel nanoclusters are manifested by the diffusion of nickel atoms into silicon, and the coercivity and residual magnetisation parameters of these clusters are $H_c=37.5 \text{ Oe}$ and $M_r=1.8 \cdot 10^{-2} \text{ emu/cm}^{-3}$.

DISCUSSION OF THE RESULTS OBTAINED

The results obtained by atomic force microscope show the formation of nanoclusters of impurity nickel atoms on the surface and in the volume of silicon due to diffusion, and their size is about ~200 nm.

The results of diffusion and additional thermal treatment of silicon with the introduction of nickel atoms show that the surface and volume resistivity of the obtained samples did not change, which confirms the presence of the formed nanoclusters and not silicide.

CONCLUSION

The field dependence of neutral nanoclusters formed by the introduction of doping nickel atoms into silicon shows that these nanoclusters retain their ferromagnetic properties not only at room temperature but also at temperatures above room temperature.

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Rezyume: Maqolada Nikel kirishma atomlarning mono-Si (monokristal kremniy) yuzasida (boyitilgan qatlamida) hosil bo'ladigan nanoklasterlarning ferromagnit xususiyatlari o'rganildi va ularning ferromagnit xususiyatlari aniqlandi. Kremniy yuzasida olingan klasterlarning topografiyasi atom-kuch mikroskopi (AKM) yordamida o'rganildi. SQUID-magnitometr yordamida namunalarning gisterezis halqasi olingan va qoldiq magnitlanish, to'yingan magnitlanish hamda koertsitiv kuch parametrlarini $T=400$ K haroratda aniqlash amalga oshirildi. Tadqiqot natijalariga ko'ra kremniy yuzasida hosil bo'lgan nikel nanoklasterlarning o'lchamlari va ushbu nanoklasterlarning ferromagnit xususiyatlari aniqlangan, shuningdek, $T=400$ K haroratda nikel atomlari bilan legirlangan kremniyning ferromagnit xususiyatlari ham o'rganilgan. Olingan yangi materialni spintronika va magetoelektronika qurilmalarida ishlatisha tavsiya beriladi.

Резюме: Исследованы ферромагнитные свойства кластеров примесных атомов никеля, образующихся в обогащенном поверхностном слое моно-Si, и было обнаружено ферромагнитные свойства. Топографию кластеров, полученных на поверхности кремния, изучали с помощью атомно-силовым микроскопом (АСМ). С помощью СКВИД – магнитометра был получен гистерезис петля образцов и определены параметры остаточной намагниченности, намагниченности насыщения и коэрцитивной силы при температуре $T=400$ К. Из результатов исследования определены размеры нанокластеров, образующих на поверхности образцов кремния и ферромагнитных свойств этих нанокластеров, а также ферромагнитные свойства при температуре $T=400$ К кремния легированного примесными атомами Ni. Описан новый магнитный материал, полученный на основе кремния, для использования в устройствах спинтроники.

Kalit so‘zar: nanoklaster, ferromagnetism, temperature, kirishma atomi, SQUID, AKM.

Ключевые слова: нанокластер; ферромагнетизм; температура; примесь; намагниченность; SQUID, АСМ.

SELF-OSCILLATIONS OF CURRENT IN SILICON WITH S, Se, Mn IMPURITIES AND THEIR PROPERTIES

Kamalov X.U., Qudaybergenov A.A.

Karakalpak State University named after Berdakh

Summary: Annotations provide a brief summary of each reference's content, highlighting its relevance to your topic. For example, they explain how each study contributes to the understanding of self-oscillations, impurity effects, or electrical behavior in silicon.

Keywords: Self-oscillations, Silicon doping, Sulfur (S), Selenium (Se), Manganese (Mn), Impurities in semiconductors, Negative differential resistance (NDR), Impact ionization, Avalanche breakdown.

1. Introduction

In this section, the introduction can emphasize both the theoretical and applied importance of studying current self-oscillations in semiconductors.

Extended Example: "Silicon's position as a foundational material for modern electronics stems from its tunable electrical properties through doping. By introducing impurities, such as sulfur (S), selenium (Se), and manganese (Mn), into the silicon lattice, we can significantly alter its behavior, particularly in terms of carrier concentration, mobility, and recombination dynamics. Among the phenomena observed in doped silicon, self-oscillations of current have gained attention due to their relevance in designing oscillatory devices and non-linear electrical components. These oscillations typically arise under certain applied bias conditions and are influenced by the material's internal electric fields and carrier dynamics. Investigating the mechanisms behind self-oscillations in S, Se, and Mn-doped silicon not only offers insights into semiconductor physics but also provides a pathway toward novel device applications."

Here, you can also discuss how these specific impurities (S, Se, Mn) were chosen because of their distinctive effects on the silicon lattice.

2. Materials and Methods

Extended Experimental Approach:

Sample Preparation: Provide detailed descriptions of the doping process, such as the concentration ranges of S, Se, and Mn introduced into the silicon. Discuss whether chemical vapor deposition (CVD), ion implantation, or thermal diffusion was used. Mention any post-processing steps, like annealing, which helps the impurities integrate properly into the crystal lattice.

For instance: "Samples were prepared by ion implantation of sulfur, selenium, and manganese into high-purity n-type silicon substrates, with impurity concentrations ranging from 10^{17} to 10^{19} cm⁻³. Post-implantation, the samples underwent rapid thermal annealing at 800°C to minimize implantation damage and ensure homogeneous impurity distribution."

Measurement Setup: Describe the type of experimental setup used to measure current self-oscillations. This could involve setting up the silicon sample within a vacuum chamber at varying temperatures and applying a DC voltage across the sample while recording the current.

For instance: "Current-voltage characteristics were measured using a four-point probe method to ensure accurate resistance measurements. The samples were cooled to cryogenic temperatures (77 K) and heated to elevated temperatures (up to 500 K) to investigate temperature dependence on oscillatory behavior."

Theoretical Models: If any specific models were employed to simulate or explain the behavior, mention those here, such as the Poisson and continuity equations for semiconductor physics or the drift-diffusion model.

3. Self-Oscillations of Current

In this section, it is essential to break down the mechanisms that lead to current self-oscillations in semiconductors.

Extended Theoretical Discussion:

Negative Differential Resistance (NDR): NDR occurs when an increase in voltage leads to a decrease in current. This unusual behavior can lead to periodic self-oscillations under the right conditions. S, Se, and Mn impurities might lower the energy barrier for such processes, particularly through their influence on the electron and hole dynamics in the conduction and valence bands.

"The phenomenon of negative differential resistance arises when an increase in electric field intensity reduces the effective carrier mobility, resulting in a drop in current despite rising voltage. In doped silicon, the introduction of impurities like sulfur or selenium creates energy states within the bandgap, which can trap charge carriers and promote NDR behavior."

Impact Ionization and Avalanche Breakdown: In heavily doped regions, high electric fields can lead to impact ionization, where energetic carriers collide with silicon atoms and generate additional electron-hole pairs, contributing to an increase in current until the breakdown occurs. In S, Se, and Mn-doped silicon, impurities create additional states that can facilitate this process.

"As the voltage across the doped silicon reaches critical levels, impact ionization leads to a sudden surge in carrier generation, resulting in avalanche breakdown. This creates a feedback loop where the current undergoes self-sustained oscillations, particularly in regions doped with high concentrations of sulfur and selenium, which provide localized energy levels for enhanced ionization."

Role of Mn Doping: Manganese, a transition metal, may introduce deep-level defects and influence the magnetoresistive properties of silicon. This could add a magnetic aspect to the oscillatory behavior, which could be explored in future studies.

"Manganese doping induces deep-level traps in silicon, which act as centers for recombination and contribute to the non-linear oscillatory behavior. Additionally, due to its magnetic properties, Mn-doped silicon could exhibit oscillations affected by external magnetic fields, presenting opportunities for further research."

4. Properties of Doped Silicon (S, Se, Mn)

Here, the electrical and structural properties of silicon doped with these impurities can be examined in more detail.

Extended Property Discussion:

Sulfur (S): Sulfur creates deep donor states within the silicon bandgap, significantly altering the recombination rates of charge carriers. This increases the likelihood of periodic fluctuations in current. "Sulfur introduces a deep donor level at approximately 0.53 eV below the conduction band edge, affecting the recombination kinetics of carriers. This deep level plays a crucial role in modulating the self-oscillatory behavior by influencing the balance of carriers in the system."

Selenium (Se): Selenium doping results in the formation of shallow donor levels that influence the carrier concentration and mobility, which directly impacts the onset of oscillations. "Selenium, as a shallow donor, contributes to increased carrier mobility, thereby lowering the threshold voltage required for self-oscillations to occur."

Manganese (Mn): The introduction of Mn creates mid-gap states that not only affect recombination but also exhibit magnetic interactions. These unique properties can contribute to complex oscillatory behavior, especially when exposed to external magnetic fields. "Manganese introduces deep-level traps in the mid-gap region, affecting both recombination and trapping rates. Its magnetic properties may also contribute to spin-based effects, altering the frequency and amplitude of current oscillations."

5. Applications

Extended Application Insight:

Oscillators: Self-oscillating silicon devices could be used in low-power oscillators for signal processing. "The controlled generation of self-oscillations in doped silicon can be harnessed for applications in radio-frequency oscillators, where stable and tunable frequency sources are required."

Sensors: Sensors based on this behavior could detect small changes in voltage or temperature by tracking changes in oscillation patterns. "The sensitivity of self-oscillatory behavior to external stimuli such as voltage or temperature changes makes these materials suitable for sensor applications in environmental monitoring and industrial control systems."

Memory and Neuromorphic Devices: Current oscillations could potentially mimic neuron-like firing, useful in neuromorphic computing. "The periodic nature of self-oscillations could be leveraged in neuromorphic systems, where oscillatory dynamics are essential for mimicking neural behavior in artificial intelligence applications."

6. Conclusion

Extended Conclusion: "The study of self-oscillations in silicon doped with sulfur, selenium, and manganese reveals that these impurities play a critical role in modulating the material's electrical behavior. Sulfur and selenium enhance the tendency for oscillations through deep-level and shallow-level traps, respectively, while manganese introduces magnetic effects. The practical applications of this phenomenon are vast, from oscillator circuits to advanced neuromorphic devices, highlighting the importance of understanding dopant-induced phenomena in semiconductor physics. Future work could explore the interaction between magnetic fields and self-oscillations, particularly in Mn-doped silicon, as well as potential uses in quantum computing applications."

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Rezyume: Izohlar har bir ma'lumotnomaning mazmuni haqida qisqacha ma'lumot beradi, bu sizning mavzingiz bilan bog'liqligini ta'kidlaydi. Masalan, ular har bir tadqiqot kremniydagi o'z-o'zidan tebranishlar, nopoklik ta'siri yoki elektr xatti-harakatlarini tushunishga qanday hissa qo'shishini tushuntiradi.

Резюме: Аннотации предоставляют краткое изложение содержания каждой ссылки, подчеркивая ее релевантность вашей теме. Например, они объясняют, как каждое исследование способствует пониманию автоколебаний, эффектов примесей или электрического поведения в кремнии.

Kalit so'zlar: O'z-o'zidan tebranishlar, kremniy doping, oltingugurt (S), selen (Se), marganets (Mn), yarim o'tkazgichlardagi aralashmalar, manfiy differentsial qarshilik (NDR), zarba ionlanishi, ko'chki parchalanishi.

Ключевые слова: Автоколебания, Легирование кремнием, Сера (S), Селен (Se), Марганец (Mn), Примеси в полупроводниках, Отрицательное дифференциальное сопротивление (NDR), Ударная ионизация, Лавинный пробой.

DAMAGE OF ANACANTHOTERMES TERMITES IN NATURAL CONDITIONS AND PREVENTIVE MEASURES TO FIGHT AGAINST THEM

Kalilaeva B.R¹., Zhuginisov T.I²., Alimbetov A.A³., Ilyasova G.Zh⁴., Dauletmuratov I.Z⁵.

¹*Nukus State Pedagogical Institute named after Ajiniyaz*

²*Karakalpak State University named after Berdakh*

Summary: *In this article, the pest characteristics of Anacanthotermes termites in the natural, anthropogenically transformed areas of Karakalpakstan and the development of modern technology of using ecological pesticides for their protection are highlighted.*

Key words: *termites, chemical preparations, prevention, ecological, chemicals, insects, garden, alfalfa, vegetable and melon crops.*

Introduction. The increase in global temperature and the increase in arid areas have created high opportunities for the development of termites. Therefore, termite pest activity worldwide is considered a real disaster of buildings, wooden products, archival libraries, textile clothing and agrocenosis field and wild plant world in all tropical and warm countries, causing them to become unusable. Especially today, the increase in the number of termites in the natural conditions of Karakalpakstan is causing serious damage to the development of wild, forest ecosystem plants adapted for the region, to agrocenosis fields in anthropogenically transformed places, and to all products and reforms created by the slave of humanity.

From this point of view, the damage characteristics of termites in natural conditions and anthropogenic-transformed places, monitoring of their distribution, adaptation of the pest to the area from a seasonal point of view, the diversity of the food unit, the degree of damage to people's houses, social, mineral-heritage, strategic objects, as well as to pests Ensuring the construction of durable buildings and implementing improved preventive measures against them are important issues.

Almost all parts of the natural conditions of Karakalpakstan are dry and sandy areas, and due to the extremely hot weather in summer, termites are suitable places for termites. The distribution of the pest is very wide in nature, it lives in communities in various ecological environments, mainly in groves, steppes and semi-arid areas. it is often observed in deserts and foothills. 2 species belonging to the Anacanthotermes (Jacobs) genus: Turkestan and Greater Caspian (A.turkestanicus Jacobs., A.ahngerianus Jacobs.) distribution of termites in anthropogenically transformed areas is known to depend directly on the capabilities of mankind.

In the results of several researches on preventive control measures against termites belonging to the genus Anacanthotermes (Jacobs, 1904) in the natural conditions of the Republic of Uzbekistan, Karakalpakstan and in anthropogenically transformed areas, the total destruction of the pest was not ensured, only temporary control was carried out, because it is natural that their hidden way of life and large number and high ability to regenerate will cause difficulties. If we bring clarity to such cases, that is, by the middle of 2002, termites in the Republic of Karakalpakstan made up 870 km², and in the next 2 years, they expanded their area by another 30 km². To date, 3019 houses and 14 historical monuments are known to be severely damaged by termites. It is also known that termites completely destroy living and dry plants in places that have become dehydrated and dry in the natural ecosystem, which leads to the death of orchards and negative consequences in the development of livestock farming [1; 3].

From this point of view, in the natural conditions of Uzbekistan, Karakalpakstan, the study of the seasonal phenological calendar, the development of constant control of the damage, distribution monitoring and preventive measures against termites belonging to the genus Anacanthotermes (Jacobs, 1904) are of great scientific and practical importance. is enough.

Object and methodology of research. In the conditions of Karakalpakstan during the years 2019-2023, mainly in the conditions of the natural ecosystem - along the Koyi Amudarya delta, from the deserts of Qizilkum, Orolkum, Nukusqum, the plain of Ustyurt, Beruniy, Ellikkala, Tortkul,

Moynoq, Kungirot, Kanlikul, Shumanay, Khodzheyli, Nukus, Kegeyli, Chimboy, Monitoring work and anthropogenic-transformed in the agrocenosis fields of Bozotov, Karauzyak, Takhtakopir districts - Citizens' gathering of Tajyrkol Ovul, Uroq Bolga, Sarancha, Kirpich Zavod settlements, Nukus city of the Republic of Karakalpakstan, preservation and use of cultural heritage objects of the republic State Inspectorate Beruni District - Aqshakhan, the fortress of Tishirman; Ellikkala - Tuproq, Kirqqiz, Ayaz-1-2 castles; Tortkol - Jambas, Kumbaskan fortress; Karauzyak - Jampiq, Sultan Uvois mountain Gaur fortress; Khojaly - Mizdakhkan complex; Collection of research materials and experiments were carried out from the regions of Kegeili - Shibilii father's shrine, Ichan Castle.

Biological means (entomopathogenic microorganism *Beauveria tenella* fungus VD-85 strain) and chemical preparations are used to protect against 2 species of *Anacanthotermes* (Jacobs) termites under natural conditions: Turkestan and large Caspian termites (*A.turkestanicus* Jacobs., *A.ahngerianus* Jacobs.) ("Fipronil Ekstra (20%)", "Sermite (20%) sus.k.", "Piralaks - Lux") was applied. In field experiments, the biological effectiveness of diluting biological agents and chemical preparations in various amounts (0.001%-0.003%-0.005% conc.) was determined on termite nests [4; 5].

All the obtained data were processed in the Biostat, Origin 6.1 [Microsoft USA] program and Lakin statistical processing method [2].

Research results. Biological agent *Beauveria tenella* VD-85 strain against the Big Caspian termite (*A.ahngerianus* Jacobs.) belonging to the genus *Anacanthotermes* in natural conditions, "Sermite (20%) sus" from chemical preparations. k.", "Piralaks-Lux" and local raw materials "Oligomer superplasticizer" in the process of studying the biological effectiveness of 30 days after the experiment, one termite nest was dug for each preparation and the number of termite layers was counted. In this case, the number of termites in nests where the mixture of biological agent *B. tenella* VD-85 strain (1107) was used was on average 1676.4 ± 3.1 ; (100%) has been reached. 260.3 ± 1.1 on the 30th day when we studied the effectiveness of the biological agent during the experiment; 811.7 ± 1.8 on 60 days; On the 90th day, a total of 1253.5 ± 0.9 termite species were killed within days, and the biological efficiency was $422.9 \pm 0.5/74.7\%$ compared to the live pest.

During research, Cermit (20%) was used in chemical preparations. k., the total average number of termites in the tests of "Piralaks-Lux" mixture was $1805.9 \pm 4.2/1876.2 \pm 3.1$ in 100% indicators. During research, Cermit (20%) was used in chemical preparations. k., the total average number of termites in the "Piralaks-Lux" mixture tests was $1805.9 \pm 4/1876.2 \pm 3.1$ at 100%. Killing in days based on the effectiveness of chemical preparations against termites 30 days Cermit (20%) sus. k., 278.5 ± 1.3 in the feed in the mixture; 297.3 ± 1.4 in "Piralaks-Lux"; $976.8 \pm 1.9/998.9 \pm 2.2$ by 60 days; On the 90th day, this indicator was $1497.1 \pm 0.8/1686.5 \pm 0.9$, and the number of live termites was $308.8 \pm 0.1/189.7 \pm 0.1$, and the biological efficiency was 82.9 % was found to be 89.8% (Table 1).

1-table

Biological agent *Beauveria tenella* VD-85 straini, chemical preparations against the termite Big Caspian termite (*A.ahngerianus* Jacobs.) of *Anacanthotermes* (Jacobs) "Cermit (20%) sus. k.", "Piralax-Lux" and local raw material "Oligomer superplasticizer" Biological efficiency

№	Biological means, chemical preparations and local raw materials	Number of termites in nests	Number of termites killed in days			Biological efficiency (number and % of living termites)	
			30 days	60 days	90 days		
1	<i>Beauveria tenella</i> ВД-85 штамми ($1 \cdot 10^7$)	$1676,4 \pm 3,1$ (100%)	$260,3 \pm 1,1$	$811,7 \pm 1,8$	$1253,5 \pm 0,9$	$422,9 \pm 0,5$	74,7%

2	"Sermit (20%) сус. к."	1805,9±4,2 (100%)	278,5±1,3	976,8±1,9	1497,1±0,8	308,8±0,1	82,9%
3	"Piralax-Lux"	1876,2±3,1 (100%)	297,3±1,4	998,9±2,2	1686,5±0,9	189,7±0,1	89,8%
4	"Oligomer superplasticizer"	2005,2±3,5 (100%)	304,5±1,4	517,7±2,1	1602,7±0,8	402,5±0,2	79,9%
5	Control	2201,4±4,2 (100%)	-	-	-	-	100%

Note: (n=3, M±m: significance vs. control P<0.01)

When studying the effectiveness of "Oligomer superplasticizer" taken as a local raw material against termites, the total average indicator of the number of pests in the initial nest was 2005.2±3.5 (100%), the number of termites that died during the experiment was 304.5±1.4 on the 30th day; 517.7±2.1 on 60 days; It turned out to be 1602.7±0.8 on the 90th day. Biological efficiency was 402.5±0.2/79.9% compared to live termites.

In general, according to the results of scientific studies, during the process of digging termite nests, the toxic food based on the chemical drug "Piralax-Lux" and "Oligomer superplasticizer" obtained as a local raw material is almost completely transported from the infected area, but the toxic food is stored in the food collection places without being consumed. noted. In this case, the attractiveness of "Piralax-Lux" and "Oligomer superplasticizer" to termites in the nest was felt.

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Rezyume: Ushbu maqolada Qoraqalpog'iston sharoiti agrotsenozlarida yomg'ir chuvalchanglarining tarqalishi monitoringi darajasi, qirg'oqni yumshatishning foydali xususiyatlari va cho'chqa go'shti, sabzavot, beda, sabzi va poliz ekinlari agrotsenozi dalalarida uchraydigan holatlar yoritilgan.

Резюме: В этой статье освещается уровень мониторинга распространения дождевого червя в агроценозах условий Каракалпакстана, полезные свойства размягчения насыпи и возникновение случаев на полях агроценоза свинины, огорода, люцерны, моркови и бахчевых культур.

Kalit so'zlar: termitlar, kimyoviy moddalar, profilaktika, ekologiya, kimyoviy moddalar, hasharotlar, bog', beda, sabzavot va poliz ekinlari.

Ключевые слова: термиты, химические препараты, профилактика, экология, химикаты, насекомые, сад, люцерна, овощебахчевые культуры.

**METHODS OF ECOLOGICAL-HYGIENIC AND ECOLOGICAL-EPIDEMIOLOGICAL
STUDY OF POPULATION DISEASES IN MEDICAL-GEOGRAPHICAL RESEARCH**

Turdimambetov I.R., Utarbaeva K.A.

Karakalpak State University named after Berdakh

Summary: *The article analyzes the degree of dependence of diseases and pathological conditions on environmental factors in the Republic of Karakalpakstan. In medical-geographical research, the conventional division of cities and regions on the territory of Karakalpakstan into medical-geographical regions (zones) is studied, as well as another important approach - the dynamics of the formation of harmful environmental factors and the possibility of the occurrence of diseases due to negative ecological and hygienic impacts in the conditions of Karakalpakstan. The discussion focused on the use of ecological-hygienic and ecological-epidemiological methods for studying the causes and harmful factors that cause diseases, regional distribution and dynamics of diseases.*

Key words: *nosoecology, medical and geographical studies, classification of diseases, ecological and hygienic factors, human health, human ecology.*

INTRODUCTION. The health status of the population is increasingly recognized as an indicator of the final environmental impact of natural and anthropogenic factors on people, and health is accepted as the main criterion of environmental quality, which is determined mainly by the level of comfort or discomfort. If a person's health is normal, then the environment is also considered healthy. If a person's relationship with the environment is accompanied by deviations from the norm and manifests itself in the form of diseases, then the environment is considered unhealthy. If a person's life becomes impossible due to the nature of the relationship, then the environment is considered absolutely extreme [2].

The development of the fundamentals of the theory and practice of nosoecology, taking into account the geoeological, nosological and socio-economic components, allows us to form a comprehensive picture of the health status of the population living in an area of environmental stress. Geographical analysis of the nosological situation helps to determine the regional differentiation of diseases.

The structure and dynamics of the nosology make it possible to develop targeted preventive and control measures to improve the health of the population. Finally, summing up the situation in the socio-economic sphere serves as the basis for the implementation of specific measures to improve the quality of life, which is the cornerstone of the socially oriented policy of independent Uzbekistan.

MATERIALS AND METHODS. The most important sources of information for conducting medical and geographical research in the Republic of Karakalpakstan are the Karakalpak Department of the Institute of Health and Medical Statistics of the Ministry of Health of the Republic of Uzbekistan (hereinafter – MH of the RUz) and the statistical collection of the State Statistics Committee of the Republic of Uzbekistan. The indicators are usually calculated per 100,000 inhabitants. The indicators for individual age, gender and social groups of the population are calculated per 1,000 people of the corresponding group.

The classification of diseases used in practice by the Ministry of Health of the Republic of Uzbekistan and the Republic of Karakalpakstan differs slightly from the international nomenclature of diseases and is represented by the following classes: I - registered common diseases; II - some infectious and parasitic diseases; III - malignant tumors; IV - diseases of the endocrine system; V - diseases of the blood and hematopoietic organs; VI - mental and behavioral disorders; VII - diseases of the nervous system; VIII - diseases of the eye and its accessory apparatus; IX - diseases of the ear and mammary glands; X - diseases of the circulatory system; XI - diseases of the respiratory system; XII - diseases of the digestive system; XIII - diseases of the genitourinary system; XIV - complications of pregnancy, childbirth and the postpartum period; XV - diseases of the skin and

subcutaneous tissue; XVI - diseases of the musculoskeletal system and connective tissues; XVII - congenital anomalies; XVIII - individual conditions occurring in the perinatal period; XIX - symptoms, signs, deviations from the norm; XX - injuries and poisoning.

In addition, the regional distribution and dynamics of individual nosological units of diseases are studied. For example, tuberculosis, which belongs to the category of infectious and parasitic diseases, kidney diseases, which belong to the category of diseases of the digestive organs, etc. In our opinion, when analyzing environmentally determined diseases, it is more appropriate to compare harmful ecological and hygienic factors with the dynamics of morbidity in individual population groups. These are: village residents, women, children under 14, children under 1 year, etc. In accordance with the recommendations of the World Health Organization, the generally accepted indicator for assessing population health or the indicator in modern methodology is the infant mortality rate (mortality of children under 1 year of age per 1000 live births).

The classification of diseases and pathological conditions according to the degree and nature of dependence on environmental factors was studied, defined and developed by A. P. Avtsin and A. G. Voronov. This classification includes the following in a simplified and abbreviated form:

I - diseases of endogenous origin: a) hereditary diseases; b) diseases associated with damage to the fetus in the womb. II - diseases of exogenous origin: a) diseases associated with the influence of environmental factors; b) diseases associated with the impact of man-made factors.

In our research, the main objects of study are diseases of exogenous origin, which are mainly associated with the influence of harmful environmental factors and, to a lesser extent, man-made factors.

The priority of the sanitary and epidemiological service data in medical and geographical research is that the laboratory service complex, including sanitary and hygienic, toxicological, radiological, bacteriological, virological, parasitological laboratories and laboratories of especially dangerous infections, has received state certification and accreditation, and environmental protection facilities are the most competent body among the services that carry out monitoring. The following subsections provide an opportunity to identify a number of diseases caused by the harmful effects of polluted air, soil and drinking water.

RESULTS AND DISCUSSION. In medical-geographical studies, it is appropriate to conditionally divide the cities and regions of Karakalpakstan into Western, Northern, Central and Southern medical-geographical regions (zones). The reason is that within each zone, the centers of cities and districts are located depending on the distance from the old coast of the Aral Sea, since in practice, the closer the administrative territory is to the Aral Sea, the more obvious the consequences of the environmental disaster become. Therefore, cities and districts in the summary tables are located from the northwest to the southeast of the republic, from the Muynak district to Turtkul. This approach significantly increases the clarity in the study and coverage of environmentally determined diseases from a nosogeographic perspective.

Another important approach is the study of the dynamics of the formation of harmful environmental factors and the possibility of the occurrence of diseases resulting from negative environmental and hygienic impacts in the conditions of Karakalpakstan. The causes and harmful factors that caused the diseases, their impact on the regional distribution and dynamics of the diseases are analyzed.

To formulate this approach more simply, the study of the dependence of the health status of the population on the influence of harmful environmental and hygienic factors should proceed not only from harmful factors to diseases, but also in the opposite direction. This means that if the number of diseases increases, then harmful factors may also increase.

According to S.M. Malkhazov [3; 33-37], at present all the consequences of the use of pesticides and other organic and inorganic substances for human health and biota remain unknown. Even in the United States, one of the most developed countries, the list of 48,500 widely used substances contains no information on the toxic effects of 79% of them.

In the laboratories of ministries and departments accredited to conduct such studies (State Sanitary and Epidemiological Service, State Committee for Nature Protection, Veterinary Service, etc.), an insignificant portion of such chemical substances is detected. Even at the Research Institute of Sanitation, Hygiene and Occupational Diseases of the Ministry of Health of the Republic of Uzbekistan, several dozen chemical substances are subject to hygienic supervision every year. In addition, chemical products containing polychlorinated biphenyls, polychlorinated dioxins and furans, which have a harmful effect on the human body, are increasingly used in industry, agriculture and everyday life.

At the same time, in the Republic of Karakalpakstan there is an increase in drinking water pollution, deterioration of the socio-hygienic and economic living conditions of the population, respiratory diseases, concomitant diseases caused by tuberculosis, as well as a relatively high incidence of intestinal infections.

In medical-geographical research, the solution of anthropoecological problems is carried out using the methods of collecting scientific data, which serve as the basis for the formation of human ecology. B. A. Revich et al. [5] emphasize that the study and assessment of regional aspects of the state of public health will greatly contribute to understanding the role of environmental pollution in the emergence of a number of non-communicable diseases.

In our opinion, when conducting medical-geographical research, it is necessary to take into account that nosogeography and nosoecology are highly variable in space and time; environmental factors that are harmful to health and cause diseases can act differently. Therefore, the problems of human ecology and the geographical characteristics of the natural environment are closely related to each other, and in this study, it should study the issues close to both disciplines and solve these problems. For this reason, V.S. Preobrazhensky and E.L. Reich among these questions, first of all:

- medical and geographical assessment of individual components of the geographical environment, natural-territorial complexes and the geographical distribution of human diseases;
- to study the influence of the geographical environment on the physiological functions of the human body in certain landscapes and zones.
- hygienic assessment of geographical factors of the environment - geographical aspects of hygiene are introduced.

Human ecology has borrowed some research methods from the epidemiology of infectious diseases. This is a science that studies the patterns of the epidemiological process and develops methods to combat infectious diseases in humans. The epidemiology of non-communicable diseases studies the patterns of spread of such diseases among the population and is based on the use of statistical indicators.

Human ecology consists of research at three territorial levels - local, regional and global; processes at each level will have their own breadth and depth and their own cartographic scale. Our local research on this classification is in fact regional in nature and has global significance.

According to A.G. Yemelyanov [4], the assessment of the ecological state of geosystems and ecosystems is considered as determining the level of favorable or unfavorable consequences of changes in natural systems from the point of view of the living conditions and activities of the population. At present, in the practice of assessment studies, normative indicators are often used as benchmarks for comparison. These are sanitary-hygienic and ecological criteria.

Sanitary and hygienic criteria are determined based on the requirements of environmental safety of the population (that is, in relation to human health). These include standards for maximum permissible concentrations of pollutants in air, water, soil and food products (MPC), as well as standards for maximum permissible discharges into the atmosphere (PW) and maximum permissible discharges into water bodies (MPTh).

MPC is the maximum concentration of substances that do not have a negative impact on the health of current and future generations when exposed to the human body during its lifetime. The MPTh is the maximum amount of substances released per unit of time (into the air and water bodies,

respectively), which does not lead to their MPC being exceeded within the impact of the pollution source.

It is known that in Uzbekistan State Standards (SSUz) apply to drinking water and food products, and Sanitary Norms and Rules (ComSan and M) apply to other products. Water safety of open water bodies RUz No. 0318-15 “Hygienic and anti-epidemic safety requirements for water bodies on the territory of the Republic of Uzbekistan” Sanitary rules and regulations (ComSan and M) are applied. The indicators given in % in Chapter 3 represent the percentage of indicators of water samples taken from open water bodies that exceed the standards 0318-15 of the Sanitation Committee and M.

Hygienic standards for water quality. On water quality SSUz-950-2000 “Drinking water” and SSUz-951-2000 “Centralized water supply sources” since 2000 and since 2011, updated respectively SSUz-950-2011 “Drinking water” and SSUz-951-2011 “Standards of centralized water supply sources” are some of the main regulatory documents.

The hygienic standardization scheme includes three groups of indicators of the harmful effects of substances:

- the effect of chemicals on the body (toxicological);
- organoleptic properties of water (organoleptic);
- natural processes of self-purification of water bodies (general sanitation).

Drinking water must be safe from an epidemiological and radiation point of view, harmless in chemical composition and comfortable in organoleptic properties. An indirect indicator of the epidemiological safety of drinking water is the coli index: the number of E. coli bacteria in 1 liter of water should not exceed 3.

Hygienic standards for atmospheric air. Hygienic standards establish maximum one-time and daily norms of MPC. In environmental assessment of the impact of industrial facilities on the atmosphere, the maximum permissible emission of substances, i.e. disposal (MPE) is used. Then, when a person breathes, no reflex reactions should occur in his body for 20 minutes.

Hygienic standards for chemical pollutants in soil – the chemical composition of soils is very complex, and many elements are necessary for the normal functioning of living organisms. Their imbalance can lead to diseases, but even more dangerous consequences are the processes of soil pollution due to salinization, toxic substances and pesticides. A significant part of the soils of Karakalpakstan is saline, and the area of saline lands has increased several times. If before desertification such lands occupied an area of only 85,000 hectares, then with the drying up of the delta their area increased more than 10 times.

When developing the MPC of chemical substances in the soil, their stability and mechanisms of migration from the soil into the accompanying environment (water, air, plants) are taken into account. Standards are established for minimum quantitative indicators of harmfulness. These are general sanitation, water migration, air migration and movement, etc. Values of the MPC for some harmful substances in the soil (given in Table 1.1).

Table 1.1

Permissible limit of harmful substances in the soil (PLS)

Substances	PLS mg/kg	The minimum rate of damage
Benzopyrene	0,02	General sanitation
HCH (from linden)	0,1	Transfer to plants
Copper	3,0	General sanitation (impact on soil microbiocenoses)
Nitrates	130,0	Water migration
Toluene	0,3	Air migration and translocation
Zinc	23,0	Translocation

Source: (Prokhorov B.B.,) [1]

Hygienic standards for food products. Harmful chemicals from the environment begin to migrate into different ecosystems and eventually move through the food chain and enter the human body with plant and animal products. For example, environmentally persistent pesticides enter the human body 95% with food, 4.7% with water, and only about 0.3% with atmospheric air and in very small quantities through the skin.

Toxic substances in food products can be of both natural and artificial origin; the main toxicants are listed in Table 1.2.

Table 1.2

Permissible levels of basic food products and some chemicals, mg/kg

Substances	Food products						
	Fish	Meat	Milk	Bread	Vegetables	Fruits	Juice and drinks
Mercury	0,5	0,03	0,005	0,01	0,02	0,01	0,005
Cadmium	0,1	0,05	0,01	0,02	0,03	0,03	0,02
Plumbum	1,0	0,5	0,05	0,2	0,5	0,4	0,4
Copper	10,0	5,0	0,5	5,0	10,0	10,0	5,0
Zinc	40,0	40,0	5,0	25,0	10,0	10,0	10,0
Iron	30,0	50,0	3,0	50,0	50,0	50,0	15,0
Tin	200,0	200,0	100,0	-	200,0	200,0	100,0

Source: (Prokhorov B.B.) [1]

Social and hygienic monitoring (SHM) is a state system for monitoring, analyzing, assessing and forecasting the state of health of the population and the environment, as well as determining the cause-and-effect relationship between the state of health of the population and its consequences, based on environmental factors. Risk assessment is the process of analyzing hygienic, toxicological and epidemiological data to determine the quantitative and probable level of negative impact on the environment.

In hygienic studies, the magnitude of potential risk is determined and interpreted as follows: “absolute”, “relative”, “attributive”. The real risk can only be determined in the course of epidemiological studies.

According to S.B. Shoumarov [6; 6 10], human health is primarily determined by the interaction of heredity and the environment. The environment includes all external factors that affect human health. Air, water, food, and soil often contain physical, chemical, and biological substances that are hazardous to human health.

CONCLUSIONS. Thus, each of the modern geographical, statistical, hygienic, epidemiological and mathematical research methods used in practice is useful in its own way. Based on the goals and objectives of the study, we are interested in questions about the criteria for assessing environmental quality indicators in the Southern Aral Sea region, in particular in the Republic of Karakalpakstan, primarily the state of water supply and the environmental crisis. As a result of the environmental disaster in the Southern Aral Sea region, the problem of using water for drinking and domestic purposes comes to the fore. In the Republic of Karakalpakstan, it was established that the dynamics of the share of water samples by chemical indicators taken from open water bodies has a tendency to decrease from 77.6 percent in 1991 to 39.4 percent in 2021, river water flow - from 69.0 percent to 24.7 percent, chemical pollution of well water decreased from 83.6 percent in 2009. In 2021, an increase in non-standard water samples from open water bodies for bacteriological indicators was noted, reaching 60.6%; The share of such samples in the Republic of Karakalpakstan as a whole was 13.9 percent in 1991, 28.4 percent in 2009 and 27.2 percent in 2021. According to bacteriological indicators, the share of non-standard samples of tap water is 10.1%, 7.6% and 2.2%, well water - 15.9%, 28.2% and 3.1%, respectively.

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Rezyume: *Maqolada Qoraqalpog'iston Respublikasida kasalliklar va patologik holatlarning atrof-muhit omillariga bog'liqlik darajasi tahlil qilindi. Tibbiy geografik tadqiqotlarda Qoraqalpog'iston hududidagi shahar va tumanlarni tibbiy-geografik mintaqalarga (zonalarga) shartli ravishda ajratib o'rganish va yana bir muhim yondashuv – bu zararli ekologik omillarning shakllanish dinamikasini va Qoraqalpog'iston sharoitida ekologik va gigienik salbiy ta'sirida kasalliklarining yuzaga kelishi mumkinligi bayon etildi. Bunda kasalliklarni keltirib chiqargan sabablar va zararli omillar, kasalliklarning hududiy tarqalishi va dinamikasiga ta'siri ekologik-gigienik va ekologik-epidemiologik o'rganish usullari qo'llanilishi haqida so'z borgan.*

Резюме: *В статье проанализирована степень зависимости заболеваний и патологических состояний от факторов окружающей среды в Республике Каракалпакстан. А также изложены медико-географические исследования при которых изучается условное разделение городов и районов территории Каракалпакстана на медико-географические районы (зоны), а также еще один важный подход - динамика формирования вредных факторов внешней среды на возможность возникновения заболеваний вследствие негативного эколого-гигиенического воздействия в условиях Каракалпакстана. При этом речь шла об использовании эколого-гигиенических и эколого-эпидемиологических методов изучения причин и вредных факторов, вызывающих заболевания, регионального распространения и динамики заболеваний*

Kalit so'zlar: *nozoekologiya, tibbiy-geografik tadqiqot, kasalliklar tasnifi, ekologik va gigienik omillar, inson salomatligi, inson ekologiyasi.*

Ключевые слова: *нозоэкология, медико-географические исследования, классификация болезней, эколого-гигиенические факторы, здоровье человека, экология человека.*

THE CURRENT STATE OF THE CLIMATE OF KARAKALPAKSTAN

Tursunboev H.E., Sultashova O.G., Bahramova G.B.

Karakalpak State University named after Berdakh

Summary: *The article analyzes the role of individual climatic factors in increasing the average surface air temperature in Karakalpakstan. A number of natural climate fluctuations, periodic climate changes caused by variations in solar radiation, etc. are considered.*

Key words: *Climate, circulation, anthropogenic, factor, concentration, methane, ozone, aerosol, volcano*

Currently, a definition of climate change has been adopted, which includes both natural and anthropogenic causes of such a change.

Natural climate changes and fluctuations are caused by both internal variations and external factors. The existence of more than a dozen climate-forming factors is generally recognized, among which the following stand out as the most significant:

- concentration of greenhouse gases in the atmosphere (carbon dioxide, methane, nitrous oxide, ozone, etc.);
- concentration of tropospheric aerosols;
- Solar constant;
- Volcanic activity causing pollution of the stratosphere by sulfate aerosols;
- self-oscillations in the atmosphere-ocean system (El Nino/Southern oscillation); fluctuations in solar activity; changes in the parameters of the Earth's orbit [1,8].

A detailed analysis of the role of individual climatic factors in increasing the average surface air temperature was carried out [5,8] using three-dimensional models of the general circulation of the ocean and atmosphere (MOCAO). Their results show that the warming of the atmosphere in the first half of the 20th century (between 1910 and 1940) was mainly due to fluctuations in solar activity and, to a lesser extent, anthropogenic factors - greenhouse gases and tropospheric sulfate aerosols.

According to IPCC estimates, concentrations of major anthropogenic greenhouse gases (carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O) and tropospheric ozone (O₃)) in the atmosphere reached their highest recorded levels in the period after the pre-industrial era, mainly due to the burning of fossil fuels, agriculture and changes in land use. According to the IPCC, the radiation effects of anthropogenic greenhouse gases are positive with a small range of uncertainties, while the potentially significant and negative effects resulting from the indirect effects of aerosols are very uncertain [2, 8].

Globally, the 90s of the 20th century were the warmest decade. The increase in surface temperature in the twentieth century in the northern hemisphere was probably the largest if compared with any other century in the last thousand years. An increase in global surface temperature led to a change in the amount of precipitation and atmospheric humidity, as changes occurred in atmospheric circulation, the hydrological cycle became more active, and the ability of the atmosphere to retain water increased. In the second half of the twentieth century, in the middle and high latitudes of the northern hemisphere, the frequency of occurrence of phenomena with very heavy precipitation increased by 2-4%.

Precipitation trends vary greatly, and in many areas these changes were dominated by fluctuations of the order of several decades or short-period fluctuations (from several years to a decade) associated with natural climate variability.

In [2,6], a number of natural climate fluctuations are considered: 1) periodic climate changes caused by variations in solar radiation; 2) quasi-periodic climate variability (its most striking manifestation is quasi-two-year oscillations in the equatorial stratosphere); 3) El Nino / Southern oscillation (due to the wide frequency range, this phenomenon cannot be considered quasi-periodic); 4) inter-decade climate variations, which are largely determined by the intra-seasonal

and intra-annual variability of the climate system; 5) climate variability on a time scale from between ten years to a century.

According to the authors of the work [5], the hypothesis of the length of the solar cycle also testifies in favor of the anthropogenic nature of global warming, solar activity is the dominant factor in long-term changes in surface temperature, the “solar hypothesis” confirms the existence of significant anthropogenic climate changes.

The projected rate of warming, according to the conclusions of the IPCC [3,8], will be unprecedented in the next 100 years. The global average amount of precipitation is estimated to increase, although both increases and decreases in precipitation are predicted on a regional scale, usually by 5-20%. It is very likely that in most areas where an increase in average precipitation is predicted, there will be significant interannual fluctuations.

Glaciers are projected by the IPCC to continue their widespread retreat in the 21st century. Climate change will lead to changes in ecological productivity and a decrease in biodiversity, with an increasing risk of extinction of some vulnerable species.

The impact of increased CO₂ concentrations will increase the primary net productivity of plants, but climate change can lead to both an increase and a decrease in the net productivity of ecosystems. Global models of carbon uptake by terrestrial ecosystems predict that this uptake will increase in the first half of the 21st century, but then stabilize or begin to decrease as climate change increases [8].

According to estimates based on the results of the IOCAO, an increase in the concentration of greenhouse gases in the atmosphere will lead to a large number of droughts and floods in many regions, which will also affect ecological systems, socio-economic sectors and human health [1,8].

The Republic of Karakalpakstan is located in the north-west of Uzbekistan, with an area of 166.6 thousand km².

The population is more than 2 million thousand people. The average population density is 10-11 people per 1 km² of land. The Republic of Karakalpakstan borders the Republic of Kazakhstan and Turkmenistan, as well as the Bukhara, Navoi and Kharezmi regions. The total length of the border is 2,265 km, accounting for 37% of the area of Uzbekistan.

The northern part of Karakalpakstan is located at the same geographical latitude as the steppe zone of the North Caucasus, and the southern part is located with the subtropical zone of the Caucasus with evergreen forests. But our republic is located several thousand kilometers from the world ocean [3,4].

The cumulative impact of climate change will affect all sectors, including changes in gross domestic product (GDP), and will be negative for most developing countries, including Karakalpakstan. Therefore, the problem of climate change is an integral part of the larger problem of ensuring sustainable development. The socio-economic and technological characteristics of the various development paths of countries will strongly influence the magnitude of emissions, the pace and scale of climate change.

The climate of Karakalpakstan and Khorezm region is sharply continental and arid. Climatic characteristics may be determined by the remoteness of the region from the ocean and its location within the continent. Due to its small size, such a water source has less impact on its coastal part than the island sea.

Since the relief of Karakalpakstan is a plain, this creates the possibility of unhindered penetration of air masses from the north, northeast and northwest. In winter, such advections in the north lead to a sudden and significant overall decrease in cold air masses.

The continental climate is characterized by large daily, monthly, seasonal and annual air temperature amplitudes, drought with slight precipitation.

In winter, cold air masses of temperate and Arctic latitudes freely invade the plains of the Aral Sea region. At night, especially in clear anti-cyclonic weather, intense radiation from the underlying surface occurs, which additionally reduces the temperature of the soil and air, so winters are quite severe here. In January, isotherm -12°C passes through the Aral Sea station in the latitudinal

direction. The average maximum air temperature in January, which characterizes the daytime period, on the northern coast of the Aral Sea is - 8oC, on the southern coast up to -2oC.

The basis of agriculture in Karakalpakstan is cotton farming, grain farming (rice and wheat cultivation) and animal husbandry (meat, dairy, cattle breeding), whereas in the Khorezm region cotton and grain farming are the main industries. Melon farming, vegetable growing, horticulture, horticulture, cattle breeding, as well as sericulture (breeding and cultivation of silkworms) are developed [7].

The increase in socio-economic costs associated with damage caused by dangerous meteorological phenomena and climate fluctuations indicates an increase in vulnerability to impacts. Some socio-economic systems have already felt the negative impact of the ongoing warming and an increase in the intensity of drought in Karakalpakstan, with a clear increase in economic losses due to catastrophic events [4,7].

The rate and magnitude of global warming and its response in certain regions primarily depend on anthropogenic factors in the present and future.

To assess the influence of an anthropogenic factor on the temperature regime of the coast, it is necessary to choose a way to isolate this factor from natural climatic fluctuations associated with the general circulation of the atmosphere.

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Rezyume: Maqolada Qoraqalpog‘istonda yer usti havosining o‘rtacha haroratini oshirishda alohida iqlim omillarining rolini tahlil qiladi. Quyosh radiatsiyasining o‘zgarishi natijasida yuzaga keladigan bir qator tabiiy iqlim o‘zgarishlari va davriy iqlim o‘zgarishlari ko‘rib chiqiladi.

Резюме: В статье приведены анализы роли отдельных климатических факторов в повышении средней приземной температуры воздуха в Каракалпакстане. Рассмотрено ряд естественных колебаний климата, периодические изменения климата, обусловленные вариациями солнечной радиации и т.д.

Kalit so‘zlar: Iqlim, aylanish, antropogen, omil, konsentratsiya, metan, ozon, aerosol, vulqon

Ключевые слова. Климат, циркуляция, антропогенное, фактор, концентрация, метан, озон, аэрозоль, вулкан

DESCRIPTION OF n -DIMENSIONAL COMPLEX NEUTRAL SFS-SPACES OF RANK n

Seypullaev J.X^{1,2}, Eshniyazova D¹, Satniyazova I.Q¹.

¹Karakalpak state university named after Berdakh

²V.I.Romanovskiy Institute of Mathematics

Summary: The paper provides a description of n -dimensional complex neutral strongly facially symmetric spaces of rank n .

Key words: strongly facially symmetric space, symmetric face, geometric tripotent.

In 1989 Friedman and Russo published their papers [1, 2], where they introduced facially symmetric spaces, the main purpose of the introduction was the geometric characterisation of predual spaces of JB*-triples admitting an algebraic structure. Many properties required in these characterizations are natural assumptions for state spaces of physical systems. These spaces are considered as a geometric model for states in quantum mechanics. It was proved that the predual space of a complex von Neumann algebra and more general of a JB*-triples is a neutral strongly facially symmetric (SFS) space (see [3]). One of the important concepts in SFS-spaces is the notion of the rank of the space, which was introduced in [4]. In [5], a description of the unit ball of a n -dimensional real SFS-space of rank n was given. In [6], a description of the unit ball of a reflexive SFS-space of rank 1 was obtained. Issues related to the description of unit balls in low-dimensional facially symmetric spaces were considered in [7]. Additionally, [8] provided a description of the unit ball of a n -dimensional real neutral SFS-space of rank $n - 1$. It is important to note that the problem of characterizing SFS-spaces with respect to rank remains open. In [9], the authors presented a description of finite-dimensional real neutral SFS-spaces with the joint Peirce decomposition property.

The present paper is devoted to the description of n -dimensional complex neutral SFS-spaces of rank n .

Let Z be a real or complex normed space. We say that elements $f, g \in Z$ are orthogonal and write $f \diamond g$ if $\|f + g\| = \|f - g\| = \|f\| + \|g\|$. A face F of the unit ball $Z_1 = \{f \in Z : \|f\| \leq 1\}$ is said to be norm exposed if $F = F_u = \{f \in Z_1 : u(f) = 1\}$ for some $u \in Z^*$ with $\|u\| = 1$. An element $u \in Z^*$ is called a projective unit if $\|u\| = 1$ and $u(g) = 0$ for all $g \in F_u^\diamond$ (see [1]).

A norm exposed face F_u in Z is called a symmetric face if there exists a linear isometry S_u from Z to Z such that $S_u^2 = I$ whose fixed point set coincides with the topological direct sum of the closure $\overline{sp} F_u$ of the linear hull of the face F_u and its orthogonal complement $F_u^\diamond$, i.e., with $(\overline{sp} F_u) \oplus F_u^\diamond$.

A normed space Z is strongly facially symmetric (SFS) space if,

- 1) each norm exposed face in Z_1 is symmetric;
- 2) for each norm exposed face F_u of Z and each $y \in Z^*$ satisfying the conditions $\|y\| = 1$ and $F_u \subset F_y$, we have $S_u^* y = y$, where S_u is the symmetry corresponding to F_u .

For each symmetric face F_u , contractive projections $P_k(u)$, $k = 0, 1, 2$, on Z are defined as follows. First, $P_1(u) = (I - S_u)/2$ is the projection onto the eigenspace corresponding to the eigenvalue -1 of the symmetry S_u . Next, $P_2(u)$ and $P_0(u)$ are defined as projections of Z onto $\overline{sp} F_u$ and $F_u^\diamond$, respectively. The projections $P_k(u)$ are called the geometric Peirce projections. A projective unit u from Z^* is called a geometric tripotent if F_u is a symmetric face and $S_u^* u = u$ for

the symmetry S_u corresponding to F_u . By GU and SF we denote the sets of all geometric tripotents and symmetric faces, respectively; the correspondence $GU \ni u \mapsto F_u \in SF$ is one-to-one (see [2, Proposition 1.6]). We set $U = Z^*$, $Z_k(u) = P_k(u)Z$, $U_k(u) = P_k(u)^* Z^*$, $k = 0, 1, 2$.

A contractive projection Q on Z is said to be neutral if $\|Qf\| = \|f\|$ implies $Qf = f$ for each $f \in Z$. A space Z is said to be neutral if, for each symmetric face F_u , the projection $P_2(u)$ corresponding to the symmetry S_u is neutral.

In a neutral SFS-space Z , each nonzero element admits a polar decomposition [2, Theorem 4.3], that is, for $0 \neq f \in Z$, there exists a unique geometric tripotent $v = v_f$ for which $v(f) = \|f\|$ and $\langle v, f^\diamond \rangle = 0$. A geometric tripotent u is called minimal, if $\dim U_2(u) = 1$.

A strongly facially symmetric space Z is of rank n (denoted as $\text{rank } Z = n$), with $n=1, 2, 3, \dots$ if every orthogonal family of geometric tripotents has cardinality at most n and if there is at least one orthogonal family of geometric tripotents containing exactly n elements (see [4]).

Theorem 1. *Let Z be a n -dimensional complex neutral strongly facially symmetric space of rank n . Then Z is isometrically isomorphic to the space $\mathbb{C}^n$ with norm $\|z\| = |z_1| + \dots + |z_n|$.*

To prove the theorem, we need the following

Lemma 2. *There exists a unique system of linearly independent, mutually orthogonal, minimal geometric tripotents $v_1, \dots, v_n$. Moreover, there exists a unique system of linearly independent, mutually orthogonal, norm exposed points $g_1, \dots, g_n$ from Z_1 such that $\langle v_k, g_k \rangle = 1$, $k = 1, 2, \dots, n$.*

Proof. Since Z is a neutral SFS-space of rank n , then, by definition, there exists at least one mutually orthogonal system $v_1, \dots, v_n$ in Z^* . Assume that $\alpha_1 v_1 + \dots + \alpha_n v_n = 0$ for some numbers $\alpha_1, \alpha_2, \dots, \alpha_n$ from J . Since $v_k \diamond v_l$ ($k \neq l$), then by [1, Lemma 2.1] it follows that

$$\begin{aligned} 0 &= \|\alpha_1 v_1 + \dots + \alpha_n v_n\| = \max \{ \|\alpha_1 v_1\|, \dots, \|\alpha_n v_n\| \} \\ &= \max \{ |\alpha_1| \|v_1\|, \dots, |\alpha_n| \|v_n\| \} = \max \{ |\alpha_1|, \dots, |\alpha_n| \}, \end{aligned}$$

i.e., $\alpha_1 = \dots = \alpha_n = 0$. Hence, the system $v_1, \dots, v_n$ is linearly independent.

Now suppose that v_k is not a minimal geometric tripotent for some $k \in \{1, 2, \dots, n\}$. Then there exists at least one v_l , where $l \neq k$, belonging to $U_2(v_k)$. This contradicts the fact that $v_k \diamond v_l$. Therefore, v_k is a minimal geometric tripotent for all $k = 1, 2, \dots, n$.

Now we will prove uniqueness. Suppose that $w_1, \dots, w_n$ is some system of mutually orthogonal minimal geometric tripotents. We can write the elements of $w_1, \dots, w_n$ as

$$w_k = \beta_1^k v_1 + \dots + \beta_n^k v_n.$$

Since the elements of the system $v_1, \dots, v_n$ are mutually orthogonal, then by [1, Lemma 2.1] it follows that

$$\begin{aligned} 1 &= \|w_k\| = \|\beta_1^k v_1 + \dots + \beta_n^k v_n\| = \max \{ \|\beta_1^k v_1\|, \dots, \|\beta_n^k v_n\| \} \\ &= \max \{ |\beta_1^k| \|v_1\|, \dots, |\beta_n^k| \|v_n\| \} = \max \{ |\beta_1^k|, \dots, |\beta_n^k| \}. \end{aligned}$$

From this, it follows that at least one of the numbers $|\beta_1^k|, \dots, |\beta_n^k|$ is equal to 1. Let's assume that $|\beta_k^l| = 1$, where $|\beta_k^l| = 1$. Then

$$w_l = \beta_1^l v_1 + \dots + \beta_k^l v_k + \dots + \beta_n^l v_n.$$

Since v_k is a system of minimal geometric tripotents, then the corresponding norm exposed face F_{v_k} consists of a single point, i.e. F_{v_k} , and the following holds:

$$\langle \beta_k^l g_k, w_l \rangle = \langle \beta_k^l g_k, \beta_k^l v_k \rangle = \langle g_k, v_k \rangle = 1.$$

It follows that $F_{w_l} = \{\beta_k^l g_k\}$. Then according to [10. Lemma 3.5] we conclude that $w_l = \beta_k^l v_k$. Thus, the system $v_1, \dots, v_n$ is unique.

Since there exists a bijection between the sets of minimal geometric tripotents and normexposed points (see [11. Proposition 2.4]), then the corresponding norm exposed points $g_1, \dots, g_n$ for the minimal geometric tripotents $v_1, \dots, v_n$ are the unique system of linearly independent mutually orthogonal normexposed points. The lemma is proved.

Proof of Theorem 1. Let Z be a n -dimensional complex neutral strongly facially symmetric space of rank n . Then, by Lemma 2, there exist linearly independent mutually orthogonal norm exposed points $g_1, \dots, g_n$. Since $F_u, F_v \subset F_{u \pm v}$, then system $g_1, \dots, g_n$ is a basis of the space Z . Consequently, each element $g \in Z$ can be represented as

$$g = \alpha_1 g_1 + \dots + \alpha_n g_n.$$

Then $\alpha_k = \langle g, v_k \rangle$ and

$$\|g\| = \|\alpha_1 g_1 + \dots + \alpha_n g_n\| = |\alpha_1| \|g_1\| + \dots + |\alpha_n| \|g_n\| = |\alpha_1| + \dots + |\alpha_n|.$$

Thus, the correspondence $g \in Z$ a $\{\langle g, v_k \rangle\}$ is an isometric isomorphism between Z and $\mathbb{C}^n$. The theorem is proved.

It is stated in [11] that a weakly facially symmetric space has property (PE) ("point exposed") if every extreme point of the unit ball is norm exposed.

A neutral SFS-space Z is said to satisfy property (PE) if every extreme point of Z_1 is norm exposed.

It is said [11] that a SFS-space Z has the property (STP) ("symmetry of transition probabilities") if for any pair of extreme points f and g , the equality $\overline{\langle f, g \rangle} = \langle g, f \rangle$ holds, where $\overline{\langle f, g \rangle}$ is the complex conjugate of $\langle f, g \rangle$.

A neutral SFS-space Z is said to satisfy "symmetry of transition probabilities" (STP) if for every pair of extreme points f and g , we have $\overline{\langle f, g \rangle} = \langle g, f \rangle$.

A SFS-space Z is said to satisfy the property (ERP) ("extreme rays") if for each $u \in GU$ and each $f \in \text{ext } Z_1$ there exist $\alpha \in K$ and $h \in \text{ext } Z_1$ such that $P_2(u)f = \alpha h$, where $K = \mathbb{R}$ or $\mathbb{C}$ (see[4]).

A neutral SFS-space Z is said to satisfy the "extreme rays property" (ERP) if for every $u \in GU$ and every extreme point $f \in Z_1$, it follows that $P_2(u)f$ is a scalar multiple of some element in $\text{ext } Z_1$.

A neutral SFS-space is said to satisfy the property of a pure state if it fulfills the properties (PE), (ERP), and (STP) [4].

In all the examples of SFS-spaces we know of, all these properties (PE), (ERP) and (STP) are always fulfilled, but the question of fulfilling these properties in the general case is open.

The following corollary follow from Theorem 1.

Corollary 3. *If Z is a n -dimensional complex neutral SFS-space of rank n , then Z satisfies the pure state property.*

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Rezyume: Mazkur maqolada rangi n bo'lgan n -o'lchamli kompleks neytral qirralari kuchli simmetrik fazo tavsiflangan.

Резюме: В данной работе дается описание n -мерных комплексных нейтральных сильно гранево симметричных пространств ранга n .

Kalit so'zlar: Qirralari kuchli simmetrik fazo, simmetrik qirra, geometrik tripotent.

Ключевые слова: Сильно гранево симметричное пространство, симметричная грань, геометрический трипотент.

**ALMOST INNER DERIVATIONS OF LIE ALGEBRA
OF DIMENSION $2n+1$**

Kurbanbaev T.K^{1,2}, Iskenderov A.S³.

¹Karakalpak State University,

²V.I.Romanovsky Institute of Mathematics, tuuelbay@mail.ru

³Nukus State Pedagogical Institute, aryslanbekiskenderov@gmail.com

Summary: The present paper is devoted to almost inner derivations of Lie algebra of dimension $2n+1$ with nilradical isomorphic to Q_{2n} . We prove that any almost inner derivation of Lie algebra of dimension $2n+1$ with nilradical isomorphic to Q_{2n} is inner.

Keywords: Lie algebra, solvable Lie algebra, derivation, inner derivation, almost inner derivation.

1. Introduction

Almost inner derivations of Lie algebras were introduced by C.S.Gordon and E.N.Wilson [1] in the study of isospectral deformations of compact manifolds. Gordon and Wilson wanted to construct not only finite families of isospectral nonisometric manifolds, but rather continuous families. They constructed isospectral but nonisometric compact Riemannian manifolds of the form G/Γ , with a simply connected exponential solvable Lie group G ; and a discrete cocompact subgroup Γ of G . For this construction, almost inner automorphisms and almost inner derivations were crucial.

Gordon and Wilson considered not only almost inner derivations, but they studied almost inner automorphisms of Lie groups. The concepts of ‘almost inner’ automorphisms and derivations, almost homomorphisms or almost conjugate subgroups arise in many contexts in algebra, number theory and geometry. There are several other studies of related concepts, for example, local derivations, which are a generalization of almost inner derivations and automorphisms [2, 3].

In [4] authors study almost inner derivations of some nilpotent Lie algebras. The authors of this work proved the basic properties of almost inner derivations, calculated all almost inner derivations of Lie algebras for small dimensions. They also introduced the concept of fixed basis vectors for nilpotent Lie algebras defined by graphs and studied free nilpotent Lie algebras of the nilindex 2 and 3. In [5], almost inner derivations of Lie algebras over a field of characteristic zero has been studied and these derivations has been determined for free nilpotent Lie algebras, almost abelian Lie algebras, Lie algebras whose solvable radical is abelian and for several classes of filiform nilpotent Lie algebras.

In [6] authors study almost inner derivations of some nilpotent Leibniz algebras and in this work the almost inner derivations for Leibniz algebras were introduced and it was proved that on a filiform non-Lie Leibniz algebra there exists an almost inner derivation that is not an inner derivation.

In [7] authors study almost inner derivations of quasi-filiform Leibniz algebras of maximum length and in [8] authors study Almost inner derivations of solvable Leibniz algebras whose nilradical is a quasi-filiform Leibniz algebra of maximum length. The papers show that for all algebras considered there, almost inner derivations are inner derivations.

In this paper almost inner derivations of Lie algebra of dimension $2n+1$ with nilradical isomorphic to Q_{2n} will be studied.

2. Preliminaries

Definition 2.1 (Lie algebra). Let K be a field. A Lie algebra L over field K is an algebra where the bilinear map

$$L \times L \rightarrow L : (x, y) \mapsto [x, y]$$

satisfies the following properties:

- The bracket $[x, x] = 0$ holds for all $x \in L$;
- For all x, y and $z \in L$, the Jacobi identity

$$[x, [y, z]] + [y, [z, x]] + [z, [x, y]] = 0$$

is fulfilled.

The first condition implies skew-symmetry, since for all $x, y \in L$

$$0 = [x + y, x + y] = [x, x] + [x, y] + [y, x] + [y, y] = [x, y] + [y, x]$$

holds by bilinearity of the bracket.

Since a Lie algebra is a vector space, every element can be expressed uniquely as linear combination of the basis vectors.

Definition 2.2 (Derived series). Let L be a Lie algebra over a field K . The derived series of L is the series with terms

$$L^{(1)} = [L, L] \text{ and } L^{(k)} = [L^{(k-1)}, L^{(k-1)}] \text{ for } k \geq 2.$$

As for groups, the notion of solvability can also be introduced for Lie algebras.

Definition 2.3 (Solvable Lie algebra). A non-zero Lie algebra L over a field K is solvable when $L^{(k)} = 0$ for some $k \geq 1$.

A Lie algebra for which $[L, L] = 0$ is called ‘abelian’. A non-solvable Lie algebra L is ‘metabelian’ when $L^{(2)} = 0$.

Definition 2.4 (Lower central series). Let L be a Lie algebra over a field K . The lower central series of L is the series with terms

$$L^1 = [L, L] \text{ and } L^k = [L, L^{k-1}] \text{ for } k \geq 2.$$

A Lie algebra is called nilpotent when there exists a natural number k such that every Lie bracket with more than k elements vanishes.

Definition 2.5 (Nilpotent Lie algebra). A non-zero Lie algebra L over a field K is nilpotent when $L^k = 0$ for some $k \geq 1$.

Definition 2.6 (Nilindex). Let L be a nilpotent Lie algebra. The nilindex of L is the integer $r \in \mathbb{I}_{\geq 1}$ such that $L^r = 0$ and $L^{r-1} \neq 0$.

Normally, the word ‘nilindex’ is not used for an abelian Lie algebra, since this is a stronger property than nilpotency.

Definition 2.7 (Derivation). Let A be an algebra over a field K . A derivation of A is a K -linear map $D: A \rightarrow A$ such that

$$D(xy) = D(x)y + xD(y)$$

holds for all $x, y \in A$.

This identity is called ‘Leibniz rule’.

It is clear that the set of all derivations of an algebra A forms a vector space, which is denoted by $\text{Der}(A)$.

Definition 2.8 (Inner derivation). Let L be a Lie algebra and $x \in L$. The map

$$\text{ad}_x: L \rightarrow L: y \rightarrow [x, y]$$

is called an inner derivation of L .

By the Jacobi identity,

$$\text{ad}_x([y, z]) = [x, [y, z]] = [[x, y], z] + [y, [x, z]] =$$

$$= [\text{ad}_x(y), z] + [y, \text{ad}_x(z)]$$

holds for all $y, z \in L$. Hence, every inner derivation is indeed a derivation. The symbol $\text{Inner}(L)$ stands for the set of all inner derivations of the Lie algebra L .

Definition 2.9 (Almost inner derivation). Let L be a Lie algebra. A derivation φ is almost inner if $\varphi(x) \in [x, L]$ for all $x \in L$.

The definition means that there exists a map $B: L \rightarrow L$ such that $\varphi(x) = [x, B(x)]$ for all $x \in L$. Hence, an inner derivation is almost inner derivation for which the map B has to be constant. The set of all almost inner derivations of a Lie algebra L is denoted by $\text{AID}(L)$.

Theorem 2.10. [9] Any solvable Lie algebra of dimension $2n+1$ with nilradical isomorphic to Q_{2n} is isomorphic to one of the following algebras:

$$Q_{2n+1,1}(\alpha) = \begin{cases} [e_i, e_1] = -[e_1, e_i] = e_{i+1}, & 2 \leq i \leq 2n-2, \\ [e_i, e_{2n+1-i}] = -[e_{2n+1-i}, e_i] = (-1)^i e_{2n}, & 2 \leq i \leq n, \\ [e_1, x] = -[x, e_1] = e_1, \\ [e_i, x] = -[x, e_i] = (i-2+\alpha)e_i, & 2 \leq i \leq 2n-1, \\ [e_{2n}, x] = -[x, e_{2n}] = (2n-3+2\alpha)e_{2n}. \end{cases}$$

$$Q_{2n+1,2} = \begin{cases} [e_i, e_1] = -[e_1, e_i] = e_{i+1}, & 2 \leq i \leq 2n-2, \\ [e_i, e_{2n+1-i}] = -[e_{2n+1-i}, e_i] = (-1)^i e_{2n}, & 2 \leq i \leq n, \\ [e_1, x] = -[x, e_1] = e_1 + \varepsilon e_{2n}, & \varepsilon = 0, 1, \\ [e_i, x] = -[x, e_i] = (i-n)e_i, & 2 \leq i \leq 2n-1, \\ [e_{2n}, x] = -[x, e_{2n}] = e_{2n}. \end{cases}$$

$$Q_{2n+1,3}(\alpha) = \begin{cases} [e_i, e_1] = -[e_1, e_i] = e_{i+1}, & 2 \leq i \leq 2n-2, \\ [e_i, e_{2n+1-i}] = -[e_{2n+1-i}, e_i] = (-1)^i e_{2n}, & 2 \leq i \leq n, \\ [e_{2+i}, x] = -[x, e_{2+i}] = e_{2+i} + \sum_{k=2}^{\left[\frac{2n-2-i}{2}\right]} \alpha^{2k+1} e_{2k+1+i}, & 0 \leq i \leq 2n-6, \\ [e_{2n-i}, x] = -[x, e_{2n-i}] = e_{2n-i}, & i = 1, 2, 3, \\ [e_{2n}, x] = -[x, e_{2n}] = 2e_{2n}. \end{cases}$$

3. Main results

We consider almost inner derivations of Lie algebra of dimension $2n+1$ with nilradical isomorphic to Q_{2n} in Theorem 2.10. The following theorem is main result of this work.

Theorem 3.1. Any almost inner derivations of Lie algebra of dimension $2n+1$ with nilradical isomorphic to Q_{2n} is inner derivation.

Proof. We consider the following cases:

Case 1. Let $L = Q_{2n+1,1}(\alpha)$. Now we calculate the dimension of the space of inner derivation. To do this, we take the element $b = \sum_{i=1}^{2n} b_i e_i + b_x x \in L$ and consider $\text{ad}_b(e_i)$ ($i = \overline{1, 2n}$) and $\text{ad}_b(x)$:

$$\text{ad}_b(e_1) = [b, e_1] = -b_{2n+1}e_1 + \sum_{k=2}^{2n-2} b_k e_{k+1},$$

$$\text{ad}_b(e_i) = [b, e_i] = -(i-2+\alpha)b_{2n+1}e_i - b_1e_{i+1} + (-1)^{i-1}b_{2n-i+1}e_{2n}, \quad 2 \leq i \leq 2n-2,$$

$$\text{ad}_b(e_{2n-1}) = [b, e_{2n-1}] = -(2n-3+\alpha)b_{2n+1}e_{2n-1} + b_2e_{2n},$$

$$\text{ad}_b(e_{2n}) = [b, e_{2n}] = -(2n-3-2\alpha)b_{2n+1}e_{2n},$$

$$\text{ad}_b(x) = [b, x] = b_1e_1 + \sum_{k=2}^{2n-1} (k-2+\alpha)b_k e_k + (2n-3+2\alpha)b_{2n}e_{2n}.$$

We have that $\dim \text{Inner}(L) = 2n+1$.

Let $D \in \text{AID}(L)$, then by definition of almost inner derivation for each e_i ($i = \overline{1, 2n}$) and x there exist $a_{e_i} = \sum_{k=1}^{2n} a_{i,k}e_k + a_{i,2n+1}x$ and $a_x = \sum_{k=1}^{2n} a_{2n+1,k}e_k + a_{2n+1,2n+1}x$ respectively and we have the following:

$$D(e_1) = [a_{e_1}, e_1] = -a_{1,2n+1}e_1 + \sum_{k=2}^{2n-2} a_{1,k}e_{k+1},$$

$$D(e_2) = [a_{e_2}, e_2] = -\alpha a_{2,2n+1}e_2 - a_{2,1}e_3 - a_{2,2n-1}e_{2n},$$

$$D(e_i) = [a_{e_i}, e_i] = -((i-2)a_{1,2n+1} + \alpha a_{2,2n+1})e_i - a_{2,1}e_{i+1} + (-1)^{i-1}a_{1,2n-i+1}e_{2n}, \quad 3 \leq i \leq 2n-2,$$

$$D(e_{2n-1}) = [a_{e_{2n-1}}, e_{2n-1}] = -((2n-3)a_{1,2n+1} + \alpha a_{2,2n+1})e_{2n-1} + a_{1,2}e_{2n},$$

$$D(e_{2n}) = [a_{e_{2n}}, e_{2n}] = -((2n-3)a_{1,2n+1} + 2\alpha a_{2,2n+1})e_{2n},$$

$$D(x) = [a_x, x] = a_{2n+1,1}e_1 + \sum_{k=2}^{2n-1} (k-2+\alpha)a_{2n+1,k}e_k + (2n-3+2\alpha)a_{2n+1,2n}e_{2n}.$$

Since D is derivation, we check $D([e_1, x]) = D(e_1)$ and $D([e_2, x]) = \alpha D(e_2)$. By checking $D([e_1, x]) = D(e_1)$ we have $a_{2n+1,i} = a_{1,i}$ ($2 \leq i \leq 2n-2$) and if we check $D([e_2, x]) = \alpha D(e_2)$ we have that $a_{2n+1,1} = a_{2,1}$ and $a_{2n+1,2n-1} = a_{2,2n-1}$.

Consider

$$\begin{aligned} D(e_1 + e_2) = [c, e_1 + e_2] &= \left[\sum_{i=1}^{2n} c_i e_i + c_{2n+1}x, e_1 + e_2 \right] = -c_{2n+1}e_1 - \alpha c_{2n+1}e_2 - \\ &\quad -(c_1 - c_2)e_3 + \sum_{k=3}^{2n-2} c_k e_{k+1} - c_{2n-1}e_{2n}. \end{aligned}$$

On the other hand

$$D(e_1 + e_2) = D(e_1) + D(e_2) = -a_{1,2n+1}e_1 - \alpha a_{2,2n+1}e_2 - \\ - (a_{2,1} - a_{1,2})e_3 + \sum_{k=3}^{2n-2} a_{1,k}e_{k+1} - a_{2,2n-1}e_{2n}.$$

From there, we have $a_{2,2n+1} = a_{1,2n+1}$. Then

$$D(e_1) = [a_{e_1}, e_1] = -a_{1,2n+1}e_1 + \sum_{k=2}^{2n-2} a_{1,k}e_{k+1},$$

$$D(e_2) = [a_{e_2}, e_2] = -\alpha a_{1,2n+1}e_2 - a_{2,1}e_3 - a_{2,2n-1}e_{2n},$$

$$D(e_i) = [a_{e_i}, e_i] = -(i-2+\alpha)a_{1,2n+1}e_i - a_{2,1}e_{i+1} + \\ + (-1)^{i-1} a_{1,2n-i+1}e_{2n}, \quad 3 \leq i \leq 2n-2,$$

$$D(e_{2n-1}) = [a_{e_{2n-1}}, e_{2n-1}] = -(2n-3+\alpha)a_{1,2n+1}e_{2n-1} + a_{1,2}e_{2n},$$

$$D(e_{2n}) = [a_{e_{2n}}, e_{2n}] = -(2n-3+2\alpha)a_{1,2n+1}e_{2n},$$

$$D(x) = [a_x, x] = a_{2,1}e_1 + \sum_{k=2}^{2n-2} (k-2+\alpha)a_{1,k}e_k + \\ + (2n-3+\alpha)a_{2,2n-1}e_{2n-1} + (2n-3+2\alpha)a_{2n+1,2n}e_{2n}.$$

Hence $\dim \text{AID}(L) = \dim \text{Inner}(L) = 2n+1$. In other words, for each element

$$y = \sum_{k=1}^{2n} y_k e_k + y_{2n+1} x \in L, \text{ we can take an element}$$

$$a = a_{2,1}e_1 + \sum_{k=2}^{2n-2} a_{1,k}e_k + a_{2,2n-1}e_{2n-1} + a_{2n+1,2n}e_{2n} + a_{1,2n+1}x \in L$$

such that the almost inner derivation D is inner.

Case 2. Let $L = Q_{2n+1,2}$. Now we calculate the dimension of the space of inner derivation.

To do this, we take the element $b = \sum_{i=1}^{2n} b_i e_i + b_x x \in L$ and consider $\text{ad}_b(e_i)$ ($i = \overline{1, 2n}$) and $\text{ad}_b(x)$:

$$\text{ad}_b(e_1) = [b, e_1] = -b_{2n+1}e_1 + \sum_{k=2}^{2n-2} b_k e_{k+1} - \varepsilon b_{2n+1}e_{2n},$$

$$\text{ad}_b(e_i) = [b, e_i] = -(i-n)b_{2n+1}e_i - b_1 e_{i+1} + (-1)^{i-1} b_{2n-i+1}e_{2n}, \quad 2 \leq i \leq 2n-2,$$

$$\text{ad}_b(e_{2n-1}) = [b, e_{2n-1}] = -(n-1)b_{2n+1}e_{2n-1} + b_2 e_{2n},$$

$$\text{ad}_b(e_{2n}) = [b, e_{2n}] = -b_{2n+1}e_{2n},$$

$$\text{ad}_b(x) = [b, x] = b_1 e_1 + \sum_{k=2}^{2n-1} (k-n)b_k e_k + (\varepsilon b_1 + b_{2n})e_{2n}.$$

We have that $\dim \text{Inner}(L) = 2n+1$.

Let $D \in \text{AID}(L)$, then by definition of almost inner derivation for each e_i ($i = \overline{1, 2n}$) and x there exist $a_{e_i} = \sum_{k=1}^{2n} a_{i,k} e_k + a_{i,2n+1} x$ and $a_x = \sum_{k=1}^{2n} a_{2n+1,k} e_k + a_{2n+1,2n+1} x$ respectively and we have the following:

$$\begin{aligned} D(e_1) &= [a_{e_1}, e_1] = -a_{1,2n+1} e_1 + \sum_{k=2}^{2n-2} a_{1,k} e_{k+1} - \varepsilon a_{1,2n+1} e_{2n}, \\ D(e_2) &= [a_{e_2}, e_2] = -(2-n) a_{2,2n+1} e_2 - a_{2,1} e_3 - a_{2,2n-1} e_{2n}, \\ D(e_i) &= [a_{e_i}, e_i] = -((i-2) a_{1,2n+1} + (2-n) a_{2,2n+1}) e_i - a_{2,1} e_{i+1} + \\ &\quad + (-1)^{i-1} a_{1,2n-i+1} e_{2n}, \quad 3 \leq i \leq 2n-2, \\ D(e_{2n-1}) &= [a_{e_{2n-1}}, e_{2n-1}] = -((2n-3) a_{1,2n+1} + (2-n) a_{2,2n+1}) e_{2n-1} + a_{1,2} e_{2n}, \\ D(e_{2n}) &= [a_{e_{2n}}, e_{2n}] = -((2n-3) a_{1,2n+1} + (4-2n) a_{2,2n+1}) e_{2n}, \\ D(x) &= [a_x, x] = a_{2n+1,1} e_1 + \sum_{k=2}^{2n-1} (k-2 + (2-n)) a_{2n+1,k} e_k + (\varepsilon a_{2n+1,1} + a_{2n+1,2n}) e_{2n}. \end{aligned}$$

Since D is derivation, we check $D([e_1, x]) = D(e_1) + \varepsilon D(e_{2n})$ and $D([e_2, x]) = (2-n) D(e_2)$. By checking $D([e_1, x]) = D(e_1) + \varepsilon D(e_{2n})$ we have $a_{2,2n+1} = a_{1,2n+1}$, $a_{2n+1,i} = a_{1,i}$ ($2 \leq i \leq 2n-2$) and if we check $D([e_2, x]) = (2-n) D(e_2)$ we have that $a_{2n+1,1} = a_{2,1}$ and $a_{2n+1,2n-1} = a_{2,2n-1}$. Then

$$\begin{aligned} D(e_1) &= [a_{e_1}, e_1] = -a_{1,2n+1} e_1 + \sum_{k=2}^{2n-2} a_{1,k} e_{k+1} - \varepsilon a_{1,2n+1} e_{2n}, \\ D(e_2) &= [a_{e_2}, e_2] = -(2-n) a_{1,2n+1} e_2 - a_{2,1} e_3 - a_{2,2n-1} e_{2n}, \\ D(e_i) &= [a_{e_i}, e_i] = -(i-n) a_{1,2n+1} e_i - a_{2,1} e_{i+1} + (-1)^{i-1} a_{1,2n-i+1} e_{2n}, \quad 3 \leq i \leq 2n-2, \\ D(e_{2n-1}) &= [a_{e_{2n-1}}, e_{2n-1}] = -(n-1) a_{1,2n+1} e_{2n-1} + a_{1,2} e_{2n}, \\ D(e_{2n}) &= [a_{e_{2n}}, e_{2n}] = -a_{1,2n+1} e_{2n}, \\ D(x) &= [a_x, x] = a_{2,1} e_1 + \sum_{k=2}^{2n-2} (k-n) a_{1,k} e_k + \\ &\quad + (n-1) a_{2,2n-1} e_{2n-1} + (\varepsilon a_{2n+1,1} + a_{2n+1,2n}) e_{2n}. \end{aligned}$$

Hence $\dim \text{AID}(L) = \dim \text{Inner}(L) = 2n+1$. In other words, for each element $y = \sum_{k=1}^{2n} y_k e_k + y_{2n+1} x \in L$, we can take an element

$$a = a_{2,1} e_1 + \sum_{k=2}^{2n-2} a_{1,k} e_k + a_{2,2n-1} e_{2n-1} + a_{2n+1,2n} e_{2n} + a_{1,2n+1} x \in L$$

such that the almost inner derivation D is inner.

Case 3. Let $L = Q_{2n+1,3}(\alpha)$. Now we calculate the dimension of the space of inner derivation. To do this, we take the element $b = \sum_{i=1}^{2n} b_i e_i + b_x x \in L$ and consider $\text{ad}_b(e_i)$ ($i = \overline{1, 2n}$) and $\text{ad}_b(x)$:

$$\text{ad}_b(e_1) = [b, e_1] = \sum_{k=2}^{2n-2} b_k e_{k+1},$$

$$\begin{aligned} \text{ad}_b(e_i) = [b, e_i] = & -b_{2n+1}e_i - b_1e_{i+1} - \sum_{k=2}^{\left[\frac{2n-i}{2}\right]} \alpha^{2k+1} b_{2n+1}e_{2k+i-1} + \\ & + (-1)^{i-1} b_{2n-i+1}e_{2n}, \quad 2 \leq i \leq 2n-4, \end{aligned}$$

$$\text{ad}_b(e_{2n-3}) = [b, e_{2n-3}] = -b_{2n+1}e_{2n-3} - b_1e_{2n-2} + b_4e_{2n},$$

$$\text{ad}_b(e_{2n-2}) = [b, e_{2n-2}] = -b_{2n+1}e_{2n-2} - b_1e_{2n-1} - b_3e_{2n},$$

$$\text{ad}_b(e_{2n-1}) = [b, e_{2n-1}] = -b_{2n+1}e_{2n-1} + b_2e_{2n},$$

$$\text{ad}_b(e_{2n}) = [b, e_{2n}] = -2b_{2n+1}e_{2n},$$

$$\begin{aligned} \text{ad}_b(x) = [b, x] = & b_2e_2 + b_3e_3 + b_4e_4 + (\alpha^5b_2 + b_5)e_5 + (\alpha^5b_3 + b_6)e_6 + K + \\ & + (\alpha^{2n-1}b_2 + \alpha^{2n-3}b_4 + K + \alpha^5b_{2n-4} + b_{2n-1})e_{2n-1} + 2b_{2n}e_{2n}. \end{aligned}$$

We have that $\dim \text{Inner}(L) = 2n + 1$.

Let $D \in \text{AID}(L)$, then by definition of almost inner derivation for each e_i ($i = \overline{1, 2n}$) and

x there exist $a_{e_i} = \sum_{k=1}^{2n} a_{i,k} e_k + a_{i,2n+1} x$ and $a_x = \sum_{k=1}^{2n} a_{2n+1,k} e_k + a_{2n+1,2n+1} x$ respectively and we have the following:

$$D(e_1) = [a_{e_1}, e_1] = \sum_{k=2}^{2n-2} a_{1,k} e_{k+1},$$

$$D(e_2) = [a_{e_2}, e_2] = -a_{2,2n+1}e_2 - a_{2,1}e_3 - \sum_{k=2}^{n-1} \alpha^{2k+1} a_{2,2n+1}e_{2k+1} - a_{2,2n-1}e_{2n},$$

$$\begin{aligned} D(e_i) = [a_{e_i}, e_i] = & -a_{2,2n+1}e_i - a_{2,1}e_{i+1} - \sum_{k=2}^{\left[\frac{2n-i}{2}\right]} \alpha^{2k+1} a_{2,2n+1}e_{2k+i-1} + \\ & + (-1)^{i-1} a_{1,2n-i+1}e_{2n}, \quad 3 \leq i \leq 2n-4, \end{aligned}$$

$$D(e_{2n-3}) = [a_{e_{2n-3}}, e_{2n-3}] = -a_{2,2n+1}e_{2n-3} - a_{2,1}e_{2n-2} + a_{1,4}e_{2n},$$

$$D(e_{2n-2}) = [a_{e_{2n-2}}, e_{2n-2}] = -a_{2,2n+1}e_{2n-2} - a_{2,1}e_{2n-1} - a_{1,3}e_{2n},$$

$$D(e_{2n-1}) = [a_{e_{2n-1}}, e_{2n-1}] = -a_{2,2n+1}e_{2n-1} + a_{1,2}e_{2n},$$

$$D(e_{2n}) = [a_{e_{2n}}, e_{2n}] = -2a_{2,2n+1}e_{2n},$$

$$D(x) = [a_x, x] = a_{2n+1,2}e_2 + a_{2n+1,3}e_3 + a_{2n+1,4}e_4 + (\alpha^5a_{2n+1,2} + a_{2n+1,5})e_5 +$$

$$+ (\alpha^5 a_{2n+1,3} + a_{2n+1,6}) e_6 + K + \\ + (\alpha^{2n-1} a_{2n+1,2} + \alpha^{2n-3} a_{2n+1,4} + K + \alpha^5 a_{2n+1,2n-4} + a_{2n+1,2n-1}) e_{2n-1} + 2a_{2n+1,2n} e_{2n}.$$

Since D is derivation, we check $D([e_{2n-i}, x]) = D(e_{2n-i})$, $i = 1, 2, 3$ and

$$D([e_{2+i}, x]) = D\left(e_{2+i} + \sum_{k=2}^{\left[\frac{2n-2-i}{2}\right]} \alpha^{2k+1} e_{2k+1+i}\right), \quad 0 \leq i \leq 2n-6. \quad \text{By checking}$$

$D([e_{2n-i}, x]) = D(e_{2n-i})$, $i = 1, 2, 3$ we have $a_{2n+1,i} = a_{1,i}$, $i = 2, 3, 4$ and if we check

$$D([e_{2+i}, x]) = D\left(e_{2+i} + \sum_{k=2}^{\left[\frac{2n-2-i}{2}\right]} \alpha^{2k+1} e_{2k+1+i}\right), \quad 0 \leq i \leq 2n-6 \quad \text{we have that } a_{2n+1,i} = a_{2,i},$$

$5 \leq i \leq 2n-4$ and $a_{2n+1,2n-1} = a_{2,2n-1}$. Then

$$D(e_1) = [a_{e_1}, e_1] = \sum_{k=2}^{2n-2} a_{1,k} e_{k+1},$$

$$D(e_2) = [a_{e_2}, e_2] = -a_{2,2n+1} e_2 - a_{2,1} e_3 - \sum_{k=2}^{n-1} \alpha^{2k+1} a_{2,2n+1} e_{2k+1} - a_{2,2n-1} e_{2n},$$

$$D(e_i) = [a_{e_i}, e_i] = -a_{2,2n+1} e_i - a_{2,1} e_{i+1} - \sum_{k=2}^{\left[\frac{2n-i}{2}\right]} \alpha^{2k+1} a_{2,2n+1} e_{2k+i-1} + \\ + (-1)^{i-1} a_{1,2n-i+1} e_{2n}, \quad 3 \leq i \leq 2n-4,$$

$$D(e_{2n-3}) = [a_{e_{2n-3}}, e_{2n-3}] = -a_{2,2n+1} e_{2n-3} - a_{2,1} e_{2n-2} + a_{1,4} e_{2n},$$

$$D(e_{2n-2}) = [a_{e_{2n-2}}, e_{2n-2}] = -a_{2,2n+1} e_{2n-2} - a_{2,1} e_{2n-1} - a_{1,3} e_{2n},$$

$$D(e_{2n-1}) = [a_{e_{2n-1}}, e_{2n-1}] = -a_{2,2n+1} e_{2n-1} + a_{1,2} e_{2n},$$

$$D(e_{2n}) = [a_{e_{2n}}, e_{2n}] = -2a_{2,2n+1} e_{2n},$$

$$D(x) = [a_x, x] = a_{1,2} e_2 + a_{1,3} e_3 + a_{1,4} e_4 + (\alpha^5 a_{1,2} + a_{1,5}) e_5 + (\alpha^5 a_{1,3} + a_{1,6}) e_6 + \\ + K + (\alpha^{2n-1} a_{1,2} + \alpha^{2n-3} a_{1,4} + K + \alpha^5 a_{1,2n-4} + a_{2,2n-1}) e_{2n-1} + 2a_{2n+1,2n} e_{2n}.$$

Hence $\dim \text{AID}(L) = \dim \text{Inner}(L) = 2n+1$. In other words, for each element

$$y = \sum_{k=1}^{2n} y_k e_k + y_{2n+1} x \in L, \quad \text{we can take an element}$$

$$a = a_{2,1} e_1 + \sum_{k=2}^{2n-2} a_{1,k} e_k + a_{2,2n-1} e_{2n-1} + a_{2n+1,2n} e_{2n} + a_{1,2n+1} x \in L$$

such that the almost inner derivation D is inner. The theorem is proved.

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Rezyume: Mazkur maqolada $2n+1$ o'lchamli Li algebrasining nilradikali Q_{2n} ga izomorf bo'lgan deyarli ichki differensiallashtirishlari o'rganilgan. $2n+1$ o'lchamdagi Li algebrasining nilradikali Q_{2n} ga izomorf bo'lgan deyarli ichki differensiallashtirishlari ichki bo'lishi isbotlangan.

Резюме: В этой статье изучены почти внутренние дифференцирования алгебры Ли размерности $2n+1$ с нильрадикалом, изоморфным Q_{2n} . Доказано, что любое почти внутреннее дифференцирование алгебры Ли размерности $2n+1$ с нильрадикалом, изоморфным Q_{2n} , является внутренним.

Kalit so'zlar: Li algebrasi, yechiluvchan Li algebrasi, differensiallashtirish, ichki differensiallashtirish, deyarli ichki differensiallashtirish.

Ключевые слова: Алгебра Ли, разрешимая алгебра Ли, дифференцирование, внутреннее дифференцирование, почти внутреннее дифференцирование.

EXPLORATION OF THE COMPOSITION AND STRUCTURE OF VERMICULITES FROM THE TEBINBULAK DEPOSIT

Dosanova G.M.

Karakalpak State University named after Berdakh

Summary: *The findings of an investigation into the structure and composition of the vermiculites found in the Tebinbulak deposit are summarized in this paper. According to the findings, Tebinbulak vermiculite has a higher alkali content, which suggests that there is a significant amount of clay in the ore. In comparison to the vermiculites formed by phlogopite (vermiculite of Kovdor) and biotite (vermiculite of Karatas), the amount of magnesium oxide is in the middle. Additionally, there is more iron oxide present than in the previous two. Thus, it can be said that the vermiculite from the Tebinbulak deposit under study is a byproduct of the hydration of biotite. Vermiculite is known to be the primary crystalline phase found in vermiculite concentrate. Impurities include flagopite (0.997; 0.338; 0.313 nm), calcite (0.3035; 0.285; 0.2085 nm), and a trace amount of biotite (1.02; 0.339; 2.618 nm). A flaw in the structure of the minerals contained in the vermiculite concentrate is indicated by the fact that the intensity of the diffraction signification characteristic of the minerals does not entirely match the reference data.*

Key words: *vermiculite, compound of vermiculite, structure of vermiculite concentrate.*

Vermiculites are minerals characterized by mica-like layers and classified as three-layer silicates with a 2:1 lattice type. Presently, vermiculites are employed across various fields based on their physical and chemical properties. Notably, expanded vermiculite, a porous material that is obtained by heating vermiculite concentrate, has garnered significant attention.

The object of this research was on vermiculites extracted from the Tebinbulak deposit, which is situated in the northwestern region of the Sultanuvays mountains, approximately 16 km from the village of Karatau and 8 km from the Karauzyak railway station in the Republic of Karakalpakstan, Uzbekistan.

Two samples of vermiculite concentrate with grain sizes of 0.5–1 mm and 2–4 mm were analyzed.

The mineral raw material under investigation exhibits homogeneity, characterized by a dark gray coloration. It is comprised of lamellar aggregates displaying a vitreous luster, with a pearly luster observable on the cleavage planes. Cleavage is distinctly perfect in one direction. The layer exhibit elasticity rather than brittleness and are occasionally arranged in multilayer structures.

Microscopic exploration, conducted using an MBS-10 microscope (Russia) at a magnification of 32, revealed the prevalence of lamellar aggregates in both samples of raw materials. The presence of impurity calcite with clearly defined crystals forming granular aggregates, 1–3 mm in size, was detected. Upon exposure to 10% HCl, violent effervescence was observed.

The chemical composition of the vermiculite concentrate from the average sample was determined using a wave-dispersive X-ray fluorescence spectrometer, model XRF-1800, manufactured by Shimadzu (Japan). The analysis revealed that the chemical composition of vermiculite includes, in weight percent: Na₂O 1.67; MgO 19.00; Al₂O₃ 13.10; SiO₂ 37.91; K₂O 5.53; CaO 3.13; TiO₂ 1.87; Fe₂O₃ 11.02; ZnO 0.01; BaO 0.54; NiO 0.03; SO₃ 0.2; Cr₂O₃ 0.08; MnO 0.07; SrO 0.03; Co₂O₃ 0.04. The loss on ignition is 5.77 weight percent. A comparative analysis of the chemical composition of vermiculites from the Tebinbulak (Karakalpakstan), Karatas (Kazakhstan), and Kovdor (Russia) deposits was conducted (Table 1).

Table 1

Chemical analysis of vermiculites from the Tebinbulak (Karakalpakstan), Karatas (Kazakhstan), and Kovdor (Russia) deposits

	Vermiculite name component content, mass %

Name of vermiculite	SiO ₂	Mg O	Al ₂ O ₃	Fe ₂ O ₃ + FeO	K ₂ O	Ca O	TiO ₂	Na ₂ O	other oxide s	*l.d.c
Vermiculite of Tebinbulak (Karakalpakstan)	37,9 1	19,0 0	13,10	11,02	5,5 3	3,13	1,87	1,67	1,00	5,77
Vermiculite of Karatas (Kazakhstan)	49,4 6	5,25	18,83	9,39	2,1	6,16	1,48	3,75	-	3,58
Vermiculite of Kovdor (Russia)	38,6 2	27,7 6	12,15	6,91	0,4 4	1,82	0,80	trace s	-	11,5 0

*l.d.c. - Losses during calcination

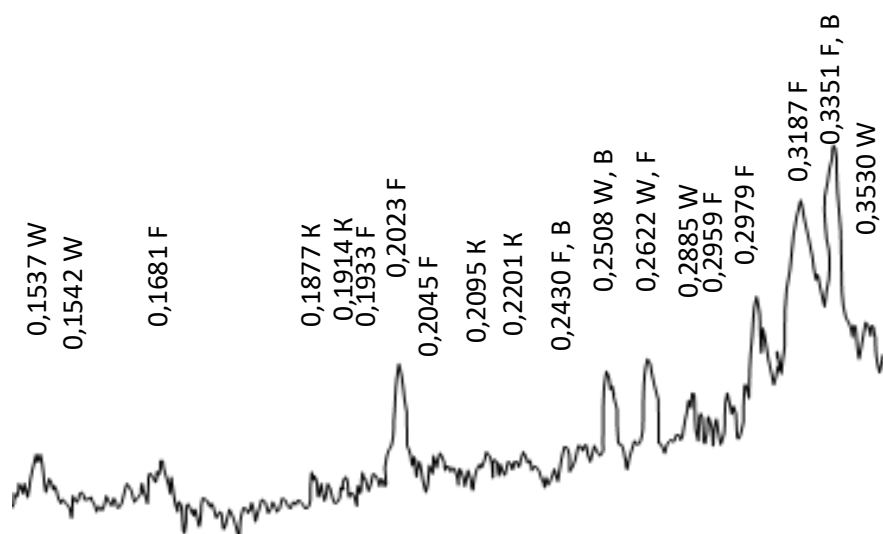
The data presented in the table indicate that Tebinbulak vermiculite exhibits a high alkali content of 7.2 %, in contrast to Karatas at 5.85 % and Kovdor at 0.44 %, suggesting a substantial clay presence in the ore. The magnesium oxide concentration is intermediate when compared to vermiculites derived from phlogopite (Kovdor) and biotite (Karatas). Furthermore, the iron oxide content is comparatively higher than that observed in the latter two samples. Consequently, it can be inferred that the vermiculite examined from the Tebinbulak deposit results from the hydration of biotite.

An X-ray phase analysis of a finely ground vermiculite sample was performed using a DRON-3 X-ray diffractometer. The radiation source employed was CuK α , and a scintillation counter was utilized for detection. Data recording was conducted over an angular range of 2 θ –5–70 °C with a 0.1° step interval.

The X-ray diffraction pattern for the finely ground vermiculite is illustrated in Figure 1.

A distinction was observed in the behavior of the finely ground vermiculite sample compared to the relatively larger aggregates of vermiculite concentrate selected for the study, which possess a diameter of approximately 2 mm and consist of closely packed layers.

The main crystalline phases in vermiculite concentrate were found to be vermiculite. There are impurities of calcite (0.3035; 0.285; 0.2085 nm), phlogopite (0.997; 0.338; 0.313 nm) and a minimal amount of biotite (1.02; 0.339; 2.618 nm).



W – vermiculite, F – phlogopite, B – biotite

Figure 1. Diffractogram of powdered vermiculite

The diffraction maxima characteristic of minerals do not completely agree in intensity with the reference data, indicating an imperfection in the structure of the minerals present in the vermiculite concentrate. The products of heat treatment of vermiculite concentrate were subjected to the study of their phase composition using X-ray phase analysis. It was found that enstatite formation occurs after swelling at a temperature of 950 °C and above, which is illustrated by the X-ray image shown in Figure 2.

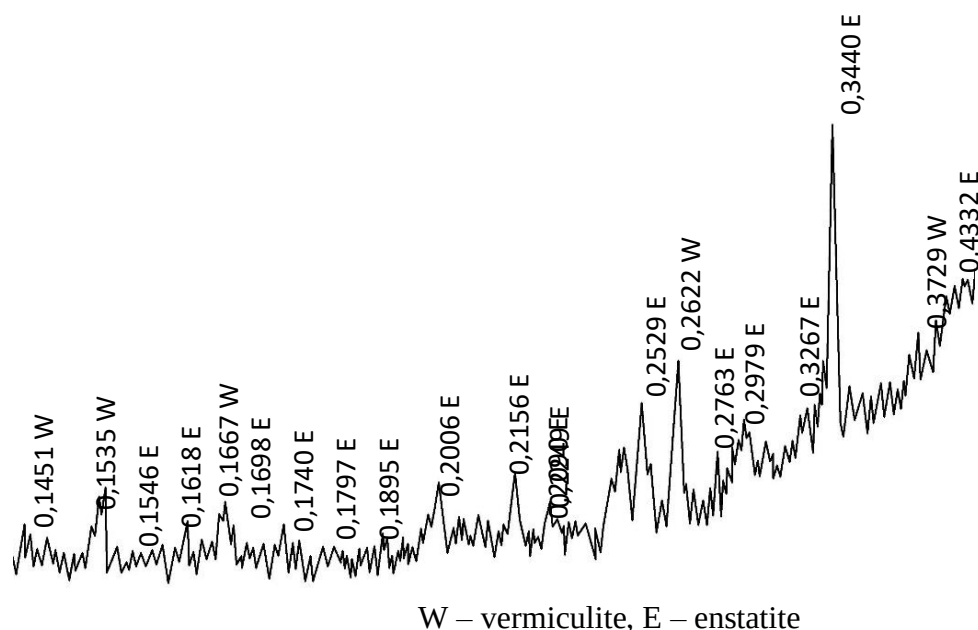


Figure 2. Diffractogram of expanded vermiculite

Thermogravimetric analysis was performed using the TGA/DSC–1/1600 HF thermal analysis system from METTLER TOLEDO Institutions (Sweden) at a temperature rise rate of 10 °C per minute and an error of $\pm (1-2) \%$. It was found that the mass loss of finely ground vermiculite samples at 96.6 °C is 2.56%, then at 293.7 °C – 0.23 %, at 634.5 °C – 1.32 %.

The endoeffect at 836.1 °C is associated with a mass loss of 1.39 % of the sample. The maximum mass loss occurs at 971.4 °C and is 1.66 %. The total mass loss of the sample is 7.19 %. The investigations carried out have shown that the vermiculite concentrate examined is characterized by the presence of significant amounts of weakly bound water, which determines the high swelling capacity of the raw material.

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Rezyume: Maqolada Tebinbuloq konidagi vermikulitlarning tarkibi va tuzilishini o'rganish natijalari keltirilgan. Natijalar shuni ko'rsatdiki, Tebinbuloq vermikulitida ishqoriy miqdori yuqori bo'lib, bu rudada loyning ko'pligini ko'rsatadi. Magniy oksidi miqdori flogopit (Kovdor) va biotit (Karatas) bo'ylab rivojlangan vermikulitlarga qaraganda oraliq qiymatga ega, temir oksidi miqdori nisbatan kattaroqdir. Demak, o'rganilayotgan Tebinbuloq konining vermikuliti biotitning hidratsiyasi mahsulotidir, degan xulosaga kelishimiz mumkin. Vermikulit kontsentratida mavjud bo'lgan asosiy kristall fazalar vermikulit ekanligi aniqlandi. Kaltsit (0,3035; 0285; 0,2085 nm), flagopit (0,997; 0,338; 0,313 nm) va minimal miqdordagi biotit (1,02; 0,339; 2,618 nm) aralashmalari mavjud. Minerallarning diffraksion maksimal xarakteristikasi intensivligi bo'yicha ma'lumotnomadagilarga to'liq mos kelmaydi, bu vermikulit kontsentratida mavjud bo'lgan minerallar tuzilishining nomukammalligini ko'rsatadi.

Резюме: В работе приведены результаты изучения состава и структуры вермикулитов Тебинбулакского месторождения. Результаты показали, что Тебинбулакский вермикулит отличается повышенным содержанием щелочей, что свидетельствует о большом количестве глины в руде. Количество оксида магния имеет промежуточное значение, чем у вермикулитов развитых по флогопиту (Ковдорское) и по биотиту (Каратасское). А количество оксида железа больше по сравнению двух последних. Следовательно, можно сделать вывод, что исследуемый вермикулит Тебинбулакского месторождения продукт гидратации биотита. Установлено, что основными кристаллическими фазами, присутствующими в вермикулитовом концентрате, является вермикулит. Имеются примеси кальцита (0,3035; 0285; 0,2085 нм), флагопита (0,997; 0,338; 0,313 нм) и в минимальном количестве биотита (1,02; 0,339; 2,618 нм). Диффракционные максимумы, характерные для минералов, не в полной мере отвечают таковым по интенсивности справочным данным, что свидетельствует о несовершенстве структуры присутствующих в вермикулитовом концентрате минералов.

Kalit so'zlar: vermikulit, vermikulitning kimyoviy tarkibi, vermikulit kontsentrating tuzilishi.

Ключевые слова: вермикулит, химический состав вермикулита, строение вермикулитового концентрата.

UDC 519.24

CRAMER-RAO TYPE INEQUALITIES FOR PARTIALLY INFORMATIVE MODEL OF RANDOM CENSORING

Abdikalikov F.A^{1,2}, Erisbaev S.A¹, Urazimbetova S.P¹.

¹Karakalpak State University named after Berdakh, Nukus, Uzbekistan

²V.I.Romanovskiy Institute of Mathematics Uzbekistan Academy of Sciences, Tashkent, Uzbekistan
sabitbekn@mail.ru

Summary: This paper considers the construction of a lower bound to determine the efficiency of estimators in a partially informative model of random censoring from the right.

Key words: random censoring, partially informative model, regularity conditions.

The article examines the effectiveness of statistical estimation, which is considered fundamental in mathematical statistics, and the concept of Fisher information related to it in a private partially informative model of competing risks. The competing risks model includes random censoring from the right. At first, Abdushukurov and Kim [1] obtained the issue of the appropriateness of the lower bound for the variance of a function estimate in the informative model of random censoring, and then Prakasa Rao [3-5] considered a Bayesian version of estimation and other generalizations of the problems. In the articles [2-5], these results were transferred to informative competing risk models. In this paper, a Cramer-Rao type lower bound is established to determine the effectiveness of estimates in the partially informative model of competing risks.

Let $\{(X_i, Y_{1i}, Y_{2i}), i \geq 1\}$ be a sequences of independent and identically distributed random variables, where X_i , Y_{1i} and Y_{2i} are independent random variables. Let the corresponding distribution functions be absolutely continuous:

$$F(x; \theta) = \int_{-\infty}^x f(u; \theta) du, \quad G_k(x) = \int_{-\infty}^x g_k(u) du, \quad (x; \theta) \in R \times \Theta,$$

there $\theta \in \Theta \subset R$. The sample $S^{(n)} = \{(Z_i, \delta_i), i = \overline{1, n}\}$, there $Z_i = \min(X_i, Y_{1i}, Y_{2i})$ and indicators

$$\delta_i = \begin{cases} -1, & Y_{2i} \leq \min(X_i, Y_{1i}), \\ 0, & Y_{1i} \leq \min(X_i, Y_{2i}), \\ 1, & X_i \leq \min(Y_{1i}, Y_{2i}). \end{cases}$$

So, the model under consideration is the model of competing risks. The main problem is F to estimate an unknown parameter θ of the distribution, G_1 and G_2 the distributions are intercepts. So, we are interested in X_i random variables in every i – experiment the $\min(Y_{1i}, Y_{2i})$ are right-censored by random variables and observed only $\delta_i = 1$ when they are present. We require in this model (X_i, Y_{1i}) that the pairs also satisfy the condition of proportional hazards. According to the definition of the proportional hazards model, there exists such a number $\beta > 0$ for all points $(x; \theta) \in R \times \Theta$

$$1 - G_1(x) = (1 - F(x; \theta))^\beta, \quad \beta = \beta(\theta), \quad (1)$$

attitude is appropriate. For example, the expression (1) holds in $\beta(\theta) = \frac{\lambda}{\theta}$ if $F(x; \theta) = 1 - \exp\{-\theta x\}$, $x \geq 0$, $\theta > 0$ and $G(x; \lambda) = 1 - \exp\{-\lambda x\}$, $x \geq 0$, $\lambda > 0$. Here λ unknown parameter. Based on condition (1), we call the considered statistical model partially informative (because of $\beta(\theta)$ its dependence on θ). If (1) is considered, then

$$K(x; \theta) = P(\min(X_i, Y_{1i}) \leq x) = 1 - (1 - F(x; \theta))(1 - G_1(x)) = \\ = 1 - (1 - F(x; \theta))^{1+\beta}, (x, v) \in R \times \Theta.$$

So, in this model, X_i are censored informatively through Y_{1i} and noninformative through Y_{2i} .

If for an arbitrary distribution function $L(x)$

$$\tau_L = \sup\{x : L(x) = 0\}, T_G = \inf\{x : L(x) = 1\}$$

If we include the definitions, then

$$\tau_L = \tau_{G_1} = \tau_k \text{ and } T_F = T_G = T_K, T_H = \min(T_F, T_{G_2}).$$

We define the following sub-distributions:

$$H_1(x; \theta) = P(\min(X_i, Y_{1i}) \leq \min(x, Y_{2i})) = \int_{-\infty}^x (1 - G_2(u)) dK(u; \theta),$$

$$H_2(x; \theta) = P(Y_{2i} \leq \min(x, X_i, Y_{1i})) = \int_{-\infty}^x (1 - K(u; \theta)) dG_2(u).$$

Hence, the density functions corresponding to the sub-distributions

$$h_1(x; \theta) = (1 - G_2(x))k(x; \theta), \quad h_2(x; \theta) = (1 - K(x; \theta))g_2(x),$$

here

$$k(x; \theta) = \frac{\partial K(x; \theta)}{\partial x} = (\beta(\theta) + 1)(1 - F(x; \theta))^{\beta(\theta)} \cdot f(x; \theta)$$

function is the density function corresponding to $K(x; \theta)$. For example, the first degree derivative of the density θ function $k(x; \theta)$

$$\frac{\partial k(x; \theta)}{\partial \theta} = (\beta(\theta)(1 - F(x; \theta)) + 1)^{\beta(\theta)} \cdot \left(\beta'(\theta) \log(\beta(\theta)(1 - F(x; \theta)) + 1) - \right. \\ \left. - \frac{\beta(\theta)\beta'(\theta)(1 - F(x; \theta)) \frac{\partial F(x; \theta)}{\partial \theta}}{\beta(\theta)(1 - F(x; \theta)) + 1} \right) \cdot f(x; \theta) + \\ + (\beta(\theta)(1 - F(x; \theta)) + 1)^{\beta(\theta)} \frac{\partial f(x; \theta)}{\partial \theta}$$

is equal to the expression. Understandably, the second order derivative becomes even more complicated. Therefore, we state the regularity conditions by subdivisions for convenience. Regularity conditions:

- (I) The set $N_h = \{x : h(x; \theta) > 0\}$ does not depend on $\theta \in \Theta$;
- (II) $h_1(x; \theta)$ and $h_2(x; \theta)$ are differentiable with respect to θ and

$$\int_{-\infty}^{\infty} \left| \frac{\partial^i h_1(x; \theta)}{\partial \theta^i} \right| dx < \infty, \quad \int_{-\infty}^{\infty} \left| \frac{\partial^i h_2(x; \theta)}{\partial \theta^i} \right| dx < \infty, \quad i = 1, 2;$$

$$(III) \quad E_{\theta} \left(\frac{\partial \ln h_1(x; \theta)}{\partial \theta} \right)^2 < \infty \text{ and } E_{\theta} \left(\frac{\partial \ln h_2(x; \theta)}{\partial \theta} \right)^2 < \infty \text{ for all } \theta \in \Theta.$$

The density function $S^{(n)}$ of the sample, we can determine

$$L_n(S^{(n)}; \theta) = \prod_{i=1}^n (h_1(Z_i; \theta))^{I(\delta_i \neq -1)} \cdot (h_2(Z_i; \theta))^{I(\delta_i = -1)}.$$

(IV) The derivative $g'(\theta)$ of the function $g(\theta)$ being evaluated exists and for $0 < D_{\theta} \hat{g}_n(S^{(n)}) < \infty$ its unbiased estimate $\hat{g}_n(S^{(n)})$ and for all $\theta \in \Theta$

$$\int \left| \hat{g}_n(S^{(n)}) \frac{\partial}{\partial \theta} L_n(S^{(n)}; \theta) \right| \mu(dS^{(n)}) = g'(\theta)$$

equality is appropriate.

Lemma-1. Regularity conditions (I) and (II) hold for all $\theta \in \Theta$

$$E_{\theta} \left[\frac{\partial}{\partial \theta} \ln L_n(S^{(n)}; \theta) \right] = 0$$

equality is appropriate.

Lemma-2. (I)-(III) when the regularity conditions are satisfied for all $\theta \in \Theta$

$$E_{\theta} \left[\frac{\partial}{\partial \theta} \ln L_n(S^{(n)}; \theta) \right]^2 = nI(\theta),$$

here is a view of Fisher's information:

$$I(\theta) = \int_{-\infty}^{\infty} \left(\frac{\partial}{\partial \theta} \ln h_1(x; \theta) \right)^2 dH_1(x; \theta) + \int_{-\infty}^{\infty} \left(\frac{\partial}{\partial \theta} \ln h_2(x; \theta) \right)^2 dH_2(x; \theta).$$

Below we present the inequality of the Cramer-Rao type.

Theorem. Let the regularity conditions (I)-(IV) hold. Then for all $\theta \in \Theta$ we have

$$D_{\theta} \hat{g}_n(S^{(n)}) \geq \frac{(g'(\theta))^2}{nI(\theta)}. \quad (2)$$

Now we present the analogue of inequality (2) for the biased estimate $\hat{g}_n(S^{(n)})$. Let $b_n(\theta)$ be the bias of the estimate. In that case

$$b_n(\theta) = E_{\theta}(\hat{g}_n(S^{(n)}) - \theta).$$

If the function $b_n(\theta)$ is differentiable, then

$$E_{\theta}(\hat{g}_n(S^{(n)}) - \theta)^2 \geq b_n^2(\theta) + \frac{(1 + b_n'(\theta))^2}{nI(\theta)}, \quad \theta \in \Theta$$

the inequality becomes relevant.

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Rezyume: Bu maqolada o'ng tomondan tasodifiy senzurlanish bo'lgan holda qisman informativ modelida baholar effektivligini aniqlash uchun quyi chegarani qurish masalasi kurib chiqilgan.

Резюме: В данной работе рассматривается модель частично-информативного случайного цензурирования справа и в ней построена нижняя граница для определения эффективности оценок.

Kalit so'zlar: tasodifiy senzurlanish, qisman informativ, regularlik shartlar, Fisher informatsiyasi.

Ключевые слова: случайная цензурирования, частично-информативная модель, условия регулярности, информация Фишера.

DESCRIPTION OF 3-DIMENSIONAL COMPLEX LEIBNIZ DIASSOCIATIVE ALGEBRAS

Kurbanbaev T.K^{1,2}, Uzakbaev N.E², Satniyazova I¹.

¹Karakalpak State University named after Berdakh,

²V.I.Romanovskiy Institute of Mathematics

Summary: In this paper describes a three-dimensional diassociative Leibniz algebra.

Keywords: algebra Leibniz, associative algebra, diassociative algebra

1. Introduction. In 1993 Loday introduced several classes of algebras. These classes of algebras initially have arisen from some problems algebraic K -theory. It is well known that any associative algebra gives rise to a Lie algebras, with bracket $[a, b] := ab - ba$. Let D be an algebra, equipped with two binary operations, $''$ the left product and $\mathfrak{h}$ the right product, satisfying the following five axioms:

$$(a'' b)'' c = a'' (b'' c), (a'' b)'' c = a'' (b \mathfrak{h} c), (a \mathfrak{h} b)'' c = a'' (b \mathfrak{h} c),$$

$$(a'' b) \mathfrak{h} c = a \mathfrak{h} (b \mathfrak{h} c), (a \mathfrak{h} b) \mathfrak{h} c = a \mathfrak{h} (b \mathfrak{h} c), \forall a, b, c \in D.$$

Then D , according to Loday (Loday et al., (2001)), is said to be an associative dialgebra (or a diassociative algebra). In fact, these axioms are variations of the associative law. Therefore associative algebras are dialgebras for which the two products coincide. The peculiar point is that the bracket $[a, b] = a \mathfrak{h} b - b'' a$ defines a structure in D , called Leibniz algebra structure, with identity

$$[[a, b], c] = [[a, c], b] + [a, [b, c]].$$

2. Preliminaries. Let us first give the definitions of Leibniz algebra and Leibniz diassociative algebra.

Definition 2.1. Leibniz algebra L is an algebra with a binary operation $[\cdot, \cdot]: L \times L \rightarrow L$ satisfying the following Leibniz identity

$$[a, [b, c]] = [[a, b], c] - [[a, c], b], \forall a, b, c \in L.$$

When the bracket happens to be skew-symmetric, we get a Lie algebra since the Leibniz identity becomes the Jacobi identity.

Any associative algebra gives rise to a Lie algebra by $[a, b] = ab - ba$. In 1993 Loday proposed to introduce a new notion of algebra which gives, by a similar procedure, a Leibniz algebra. He started with two distinct operations for the product ab and the product ba , so that the bracket is not necessarily skew-symmetric. Explicitly, he defined an *associative dialgebra* (or a *diassociative algebra*) as a vector space D equipped with two associative operations $''$ and $\mathfrak{h}$ called respectively left and right product, satisfying three more axioms:

$$(a'' b)'' c = a'' (b \mathfrak{h} c), (a \mathfrak{h} b)'' c = a \mathfrak{h} (b'' c),$$

$$(a'' b) \mathfrak{h} c = a \mathfrak{h} (b \mathfrak{h} c), \forall a, b, c \in D.$$

It is immediate to check that $[a, b] = a'' b - b \mathfrak{h} a$ defines a Leibniz bracket. Hence any diassociative algebra gives rise to a Leibniz algebra.

Definition 2.2. Algebra Leibniz L is called Leibniz diassociative algebra, if for all $x, y, z \in L$ satisfying the following identities:

$$DL_1: (x'' y)'' z = (x \mathfrak{h} y) \mathfrak{h} z,$$

$$DL_2: x'' (y \mathfrak{h} z) = x'' (y'' z),$$

$$DL_3: (x'' y)'' z = x'' (y'' z) + (x'' z)'' y, \quad (2.1)$$

$$DL_4: (x \mathfrak{h} y)'' z = x \mathfrak{h} (y'' z) + (x \mathfrak{h} z) \mathfrak{h} y,$$

$$DL_5: (x \mathfrak{h} y) \mathfrak{h} z = x \mathfrak{h} (y \mathfrak{h} z) + (x \mathfrak{h} z)'' y.$$

To study the 3-dimensional Leibniz diassociative algebra we need the following theorem.

Theorem 2.1 [1]. Any 3-dimensional complex Leibniz algebra A is isomorphic to one of the following pairwise non-isomorphic algebras:

Solvable Leibniz algebras:

$$L_1(\alpha), \alpha \in \mathbb{J} \setminus \{0\}: [e_1, e_3] = \alpha e_1, [e_2, e_3] = e_1 + e_2, [e_3, e_3] = e_1.$$

$$L_2: [e_3, e_3] = e_1, [e_2, e_3] = e_1 + e_2.$$

$$L_4(\alpha): [e_1, e_3] = \alpha e_2, [e_2, e_3] = -e_2, [e_3, e_2] = e_2, [e_3, e_3] = e_1.$$

$$L_5: [e_1, e_3] = e_1, [e_2, e_3] = e_1, [e_3, e_3] = e_1.$$

$$L_7: [e_1, e_2] = e_1, [e_1, e_3] = e_1, [e_3, e_2] = e_1, [e_3, e_3] = e_1.$$

$$L_8: [e_1, e_1] = e_2, [e_2, e_1] = e_2.$$

$$L_{14}: [e_1, e_3] = e_1, [e_2, e_3] = e_2, [e_3, e_3] = e_1.$$

Simple Lie algebras:

$$L_3: [e_1, e_2] = e_3, [e_1, e_3] = -2e_3, [e_2, e_1] = -e_3, [e_2, e_3] = 2e_3, [e_3, e_1] = 2e_3, [e_3, e_2] = -2e_3.$$

Nilpotent Leibniz algebras:

$$L_6: [e_1, e_3] = e_2, [e_3, e_3] = e_1.$$

$$L_{12}(\alpha), \alpha \in \mathbb{J}: [e_2, e_2] = e_1, [e_2, e_3] = e_1, [e_3, e_3] = \alpha e_1.$$

$$L_{13}: [e_2, e_2] = e_1, [e_2, e_3] = e_1, [e_3, e_2] = e_1.$$

$$L_{15}: [e_1, e_1] = e_2.$$

Solvable Lie algebras:

$$L_9(\alpha), \alpha \neq 0, 1; \alpha \leftrightarrow \alpha^{-1}: [e_1, e_2] = e_2, [e_1, e_3] = \alpha e_3, [e_2, e_1] = -e_2, [e_3, e_1] = -\alpha e_3.$$

$$L_{10}: [e_1, e_2] = e_2, [e_2, e_1] = -e_2.$$

$$L_{11}: [e_1, e_2] = e_2, [e_1, e_3] = e_2 + e_3, [e_2, e_1] = -e_2, [e_3, e_1] = -e_2 - e_3.$$

3. Main result. In this section we discuss a classification of complex Leibniz diassociative algebras. The following theorem is main result the present paper.

Using the result from Theorem 2.1, we have the following.

Theorem 3.1. Any 3-dimensional complex Leibniz diassociative algebra D is isomorphic to one of the following algebras:

$$DiasL_{1,1}: e_1'' e_3 = \alpha e_1, e_2'' e_3 = e_1 + e_2, e_3'' e_3 = e_1, e_1 \mathfrak{h} e_3 = \alpha e_1, e_2 \mathfrak{h} e_3 = \frac{\alpha}{\alpha - 1} e_1,$$

$$e_3 \mathfrak{h} e_2 = \frac{1}{\alpha - 1} e_1 - e_2, e_3 \mathfrak{h} e_3 = ne_1.$$

$$DiasL_{1,2}: e_1'' e_3 = \alpha e_1, e_2'' e_3 = e_1 + e_2, e_3'' e_3 = e_1, e_2 \mathfrak{h} e_3 = \frac{\alpha}{\alpha - 1} e_1, e_3 \mathfrak{h} e_2 = \frac{1}{\alpha - 1} e_1 - e_2.$$

$$DiasL_{2,1}: e_2'' e_3 = e_1 + e_2, e_3'' e_3 = e_1, e_2 \mathfrak{h} e_3 = e_1 + e_2, e_3 \mathfrak{h} e_3 = ne_1.$$

$$DiasL_{2,2}: e_2'' e_3 = e_1 + e_2, e_3'' e_3 = e_1, e_3 \mathfrak{h} e_2 = le_1 + me_2, e_3 \mathfrak{h} e_3 = ne_1.$$

$$DiasL_{2,3}: e_2'' e_3 = e_1 + e_2, e_3'' e_3 = e_1, e_3 \mathfrak{h} e_2 = -e_1 - e_2, e_3 \mathfrak{h} e_3 = ne_1.$$

$$DiasL_{2,4}: e_2'' e_3 = e_1 + e_2, e_3'' e_3 = e_1, e_2 \mathfrak{h} e_3 = ge_1 + ge_2, e_3 \mathfrak{h} e_3 = ne_1.$$

$$DiasL_4: e_1'' e_3 = \alpha e_2, e_2'' e_3 = -e_2, e_3'' e_2 = e_2, e_3'' e_3 = e_1, e_2 \mathbin{\dot{\vee}} e_3 = -e_2, e_3 \mathbin{\dot{\vee}} e_2 = e_2, \\ e_3 \mathbin{\dot{\vee}} e_3 = ne_1.$$

$$DiasL_{5,1}: e_1'' e_3 = e_1, e_2'' e_3 = e_1, e_3'' e_3 = e_1, e_3 \mathbin{\dot{\vee}} e_1 = -e_1, e_3 \mathbin{\dot{\vee}} e_2 = -e_1, e_3 \mathbin{\dot{\vee}} e_3 = -e_1.$$

$$DiasL_{5,2}: e_1'' e_3 = e_1, e_2'' e_3 = e_1, e_3'' e_3 = e_1, e_3 \mathbin{\dot{\vee}} e_1 = -e_1, e_3 \mathbin{\dot{\vee}} e_2 = -e_1, e_3 \mathbin{\dot{\vee}} e_3 = ne_1 + qe_2$$

$$DiasL_{5,3}: e_1'' e_3 = e_1, e_2'' e_3 = e_1, e_3'' e_3 = e_1, e_1 \mathbin{\dot{\vee}} e_3 = e_1, e_2 \mathbin{\dot{\vee}} e_3 = e_1, e_3 \mathbin{\dot{\vee}} e_3 = ne_1 + ne_2.$$

$$DiasL_{6,1}: e_1'' e_3 = e_2, e_3'' e_3 = e_1, e_3 \mathbin{\dot{\vee}} e_2 = me_2.$$

$$DiasL_{6,2}: e_1'' e_3 = e_2, e_3'' e_3 = e_1, e_3 \mathbin{\dot{\vee}} e_1 = -e_1, e_3 \mathbin{\dot{\vee}} e_3 = ne_1.$$

$$DiasL_{6,3}: e_1'' e_3 = e_2, e_3'' e_3 = e_1, e_3 \mathbin{\dot{\vee}} e_1 = ke_1.$$

$$DiasL_{6,4}: e_1'' e_3 = e_2, e_3'' e_3 = e_1, e_1 \mathbin{\dot{\vee}} e_3 = e_2, e_3 \mathbin{\dot{\vee}} e_2 = me_2, e_3 \mathbin{\dot{\vee}} e_3 = e_1.$$

$$DiasL_{6,5}: e_1'' e_3 = e_2, e_3'' e_3 = e_1, e_1 \mathbin{\dot{\vee}} e_3 = fe_1, e_3 \mathbin{\dot{\vee}} e_1 = (f-1)e_1, e_3 \mathbin{\dot{\vee}} e_3 = e_1.$$

$$DiasL_{8,1}: e_1'' e_1 = e_2, e_2'' e_1 = e_2, e_1 \mathbin{\dot{\vee}} e_1 = -e_1, e_1 \mathbin{\dot{\vee}} e_2 = -e_2.$$

$$DiasL_{8,2}: e_1'' e_1 = e_2, e_2'' e_1 = e_2, e_1 \mathbin{\dot{\vee}} e_1 = e_2, e_2 \mathbin{\dot{\vee}} e_1 = e_2.$$

$$DiasL_{12}: e_2'' e_2 = e_1, e_2'' e_3 = e_1, e_3'' e_3 = \alpha e_1, e_2 \mathbin{\dot{\vee}} e_2 = se_1, e_2 \mathbin{\dot{\vee}} e_3 = ge_1, e_3 \mathbin{\dot{\vee}} e_2 = le_1, \\ e_3 \mathbin{\dot{\vee}} e_3 = ne_1.$$

$$DiasL_{14,1}: e_1'' e_3 = e_1, e_2'' e_3 = e_2, e_3'' e_3 = e_1, e_2 \mathbin{\dot{\vee}} e_3 = ge_1 + e_2.$$

$$DiasL_{14,2}: e_1'' e_3 = e_1, e_2'' e_3 = e_2, e_3'' e_3 = e_1, e_3 \mathbin{\dot{\vee}} e_1 = -e_1, e_3 \mathbin{\dot{\vee}} e_2 = le_1, e_3 \mathbin{\dot{\vee}} e_3 = -e_1.$$

$$DiasL_{14,3}: e_1'' e_3 = e_1, e_2'' e_3 = e_2, e_3'' e_3 = e_1, e_2 \mathbin{\dot{\vee}} e_3 = ge_1 + e_2, e_3 \mathbin{\dot{\vee}} e_1 = -e_1, \\ e_3 \mathbin{\dot{\vee}} e_2 = ge_1, e_3 \mathbin{\dot{\vee}} e_3 = -e_1.$$

$$DiasL_{14,4}: e_1'' e_3 = e_1, e_2'' e_3 = e_2, e_3'' e_3 = e_1, e_3 \mathbin{\dot{\vee}} e_2 = le_1 - e_2.$$

$$DiasL_{14,5}: e_1'' e_3 = e_1, e_2'' e_3 = e_2, e_3'' e_3 = e_1, e_3 \mathbin{\dot{\vee}} e_1 = -e_1, e_3 \mathbin{\dot{\vee}} e_2 = -e_2, e_3 \mathbin{\dot{\vee}} e_3 = -e_1.$$

$$DiasL_{14,6}: e_1'' e_3 = e_1, e_2'' e_3 = e_2, e_3'' e_3 = e_1, e_3 \mathbin{\dot{\vee}} e_1 = ke_2, e_3 \mathbin{\dot{\vee}} e_2 = -e_2, e_3 \mathbin{\dot{\vee}} e_3 = ke_2.$$

$$DiasL_{14,7}: e_1'' e_3 = e_1, e_2'' e_3 = e_2, e_3'' e_3 = e_1, e_3 \mathbin{\dot{\vee}} e_1 = he_1 + ke_2,$$

$$e_3 \mathbin{\dot{\vee}} e_2 = \frac{h(1+h)}{k} e_1 - (1+h)e_2, e_3 \mathbin{\dot{\vee}} e_3 = he_1 + ke_2.$$

$$DiasL_{14,8}: e_1'' e_3 = e_1, e_2'' e_3 = e_2, e_3'' e_3 = e_1, e_1 \mathbin{\dot{\vee}} e_3 = fe_2, e_2 \mathbin{\dot{\vee}} e_3 = e_2, e_3 \mathbin{\dot{\vee}} e_3 = fe_2.$$

$$DiasL_{14,9}: e_1'' e_3 = e_1, e_2'' e_3 = e_2, e_3'' e_3 = e_1, e_1 \mathbin{\dot{\vee}} e_3 = fe_2, e_2 \mathbin{\dot{\vee}} e_3 = e_2, e_3 \mathbin{\dot{\vee}} e_1 = -e_1 + fe_2, \\ e_3 \mathbin{\dot{\vee}} e_3 = -e_1 + 2fe_2.$$

$$DiasL_{14,10}: e_1'' e_3 = e_1, e_2'' e_3 = e_2, e_3'' e_3 = e_1, e_1 \mathbin{\dot{\vee}} e_3 = de_1 + fe_2,$$

$$e_2 \mathbin{\dot{\vee}} e_3 = \frac{d(1-d)}{f} e_1 + (1-d)e_2, e_3 \mathbin{\dot{\vee}} e_1 = \frac{d-1}{f} ke_1 + ke_2, e_3 \mathbin{\dot{\vee}} e_2 = \frac{d(1-d)}{f^2} ke_1 - \frac{d}{f} ke_2,$$

$$e_3 \mathbin{\dot{\vee}} e_3 = (d+h)e_1 + (f+k)e_2.$$

$$DiasL_{14,11}: e_1'' e_3 = e_1, e_2'' e_3 = e_2, e_3'' e_3 = e_1, e_1 \mathbin{\dot{\vee}} e_3 = e_1, e_2 \mathbin{\dot{\vee}} e_3 = ge_1, e_3 \mathbin{\dot{\vee}} e_3 = e_1.$$

$$DiasL_{14,12}: e_1'' e_3 = e_1, e_2'' e_3 = e_2, e_3'' e_3 = e_1, e_1 \mathbin{\dot{\vee}} e_3 = e_1, e_2 \mathbin{\dot{\vee}} e_3 = ge_1, e_3 \mathbin{\dot{\vee}} e_2 = ge_1, \\ e_3 \mathbin{\dot{\vee}} e_3 = e_1.$$

$$DiasL_{14,13}: e_1'' e_3 = e_1, e_2'' e_3 = e_2, e_3'' e_3 = e_1, e_1 \mathbin{\dot{\vee}} e_3 = e_1, e_2 \mathbin{\dot{\vee}} e_3 = e_2, e_3 \mathbin{\dot{\vee}} e_3 = e_1.$$

$$DiasL_{15,1}: e_1'' e_1 = e_2, e_1 \mathbin{\dot{\vee}} e_1 = \alpha e_2, e_1 \mathbin{\dot{\vee}} e_3 = fe_2, e_3 \mathbin{\dot{\vee}} e_1 = ke_2, e_3 \mathbin{\dot{\vee}} e_3 = qe_2.$$

$$DiasL_{15,2}: e_1 \circ e_1 = e_2, e_1 \circ e_1 = \alpha e_2 + p e_3, e_3 \circ e_1 = k e_2.$$

$$DiasL_{15,3}: e_1 \circ e_1 = e_2, e_1 \circ e_1 = -e_2 + p e_3, e_1 \circ e_2 = c e_3.$$

$$DiasL_{15,4}: e_1 \circ e_1 = e_2, e_1 \circ e_1 = \alpha e_2, e_1 \circ e_3 = f e_2, e_3 \circ e_1 = k e_2.$$

$$DiasL_{15,5}: e_1 \circ e_1 = e_2, e_1 \circ e_1 = -e_2, e_1 \circ e_2 = b e_2 - \frac{b^2}{f} e_3, e_1 \circ e_3 = f e_2 - b e_3,$$

$$e_3 \circ e_1 = -f e_2 + b e_3.$$

$$DiasL_{15,6}: e_1 \circ e_1 = e_2, e_1 \circ e_1 = -\frac{pf+b}{b} e_2 + p e_3, e_1 \circ e_2 = b e_2 - \frac{b^2}{f} e_3, e_1 \circ e_3 = f e_2 - b e_3,$$

$$e_3 \circ e_1 = -f e_2 + b e_3.$$

Proof. We provide the proof only for one case. The other cases can be carried out similarly.

Let the algebra $A_1 = (D, \circ)$ of D be the algebra $L_1(\alpha)$ from Theorem 2.1, with the following table of multiplication:

$$e_1 \circ e_3 = \alpha e_1, e_2 \circ e_3 = e_1 + e_2, e_3 \circ e_3 = e_1,$$

where $\alpha \in J \setminus \{0\}$.

The second part $A_2 = (D, \circ)$ of D we define by unknown structure constants α_i ($i=1, K, 27$) as follows:

$$\begin{aligned} e_1 \circ e_1 &= \alpha_1 e_1 + \alpha_2 e_2 + \alpha_3 e_3, & e_2 \circ e_1 &= \alpha_{10} e_1 + \alpha_{11} e_2 + \alpha_{12} e_3, \\ e_1 \circ e_2 &= \alpha_4 e_1 + \alpha_5 e_2 + \alpha_6 e_3, & e_2 \circ e_2 &= \alpha_{13} e_1 + \alpha_{14} e_2 + \alpha_{15} e_3, \\ e_1 \circ e_3 &= \alpha_7 e_1 + \alpha_8 e_2 + \alpha_9 e_3, & e_2 \circ e_3 &= \alpha_{16} e_1 + \alpha_{17} e_2 + \alpha_{18} e_3, \\ e_3 \circ e_1 &= \alpha_{19} e_1 + \alpha_{20} e_2 + \alpha_{21} e_3, \\ e_3 \circ e_2 &= \alpha_{22} e_1 + \alpha_{23} e_2 + \alpha_{24} e_3, \\ e_3 \circ e_3 &= \alpha_{25} e_1 + \alpha_{26} e_2 + \alpha_{27} e_3. \end{aligned}$$

Verifying the diassociative algebra axioms (2.1), we get the following constraints for the structure constants:

$$\begin{aligned} \alpha_1 &= \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = \alpha_8 = \alpha_9 = \alpha_{10} = \alpha_{11} = \alpha_{12} = \alpha_{13} = \alpha_{14} = \\ &= \alpha_{15} = \alpha_{17} = \alpha_{18} = \alpha_{19} = \alpha_{20} = \alpha_{21} = \alpha_{24} = \alpha_{26} = \alpha_{27} = 0, \\ \alpha_7 &= \alpha, \alpha_7 + \alpha_{16} = \alpha_7 \alpha_{16}, \alpha_7 \alpha_{22} + \alpha_{16} \alpha_{23} = 0, \alpha_{22}(\alpha_{23} + 1) = 0, \alpha_{23}(\alpha_{23} + 1) = 0. \end{aligned}$$

After some simple computations we get a list of algebras as follows:

Case 1. If $\alpha_{22} \neq 0$, then $\alpha_{23} = -1$, $\alpha_{16} = \frac{\alpha}{\alpha-1}$, $\alpha_{22} = \frac{1}{\alpha-1}$, where $\alpha \in J \setminus \{0, 1\}$. In this case

we obtain the algebra $DiasL_{1,1}$.

Case 2. If $\alpha_{22} = 0$, then we have $\alpha_{23} = 0$, $\alpha_{16} = \frac{\alpha}{\alpha-1}$, where $\alpha \in J \setminus \{0, 1\}$ and the algebra

$DiasL_{1,2}$.

Similar observations can be applied for the other cases. Some of the structural constants from Theorem 3.1 are denoted as follows

$$\begin{aligned} \alpha_2 &= a, \alpha_5 = b, \alpha_6 = c, \alpha_7 = d, \alpha_8 = f, \alpha_{16} = g, \alpha_{19} = h, \alpha_{20} = k, \alpha_{22} = l, \alpha_{23} = m, \\ \alpha_{25} &= n, \alpha_{26} = q, \alpha_3 = p, \alpha_{13} = s. \end{aligned}$$

The theorem is proved.

Remark 3.1. The isomorphism between algebras from Theorem 3.1 is not verified.

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Rezyume: *Diassociative algebralarning tavsifini o'rganish murakkab masala hisoblanadi. Shuning uchun bunday masala bilan juda kam matematiklar shug'illangan. Bu maqolada uch o'lchamli diassociativ Leybnis algebralari tavsifi o'rganilgan.*

Резюме: *Изучение описания диссоциативных алгебр является сложной задачей. Поэтому очень немногие математики занимались такой проблемой. В статье изучается описание трехмерных диссоциативных алгебр Лейбница.*

Kalit so'zlar: *Leybnis algebrasi, associativ algebra, diassociativ algebra*

Ключевые слова: *алгебра Лейбница, ассоциативная алгебра, диассоциативная алгебра*

**ECOLOGICAL ANALYSIS OF THE DYNAMICS OF THE RANGE OF DYNAMICS OF
MEDICINAL PLANT SPECIES IN THE CONDITIONS OF THE SOUTHERN ARAL SEA
REGION**

Shaniyazov Sh.O¹, Ajiev A.B².

¹Karakalpak State University named after Berdakh,

²Nukus State Pedagogical Institute named after Ajiniyaz

Summary: *The article provides an analysis of the spatial and temporal dynamics of the range of medicinal plants and measures for their protection in the Southern Aral Sea region. The drying up and high mineralization of water in the Aral Sea caused a decrease in hydromorphic vegetation, the disappearance of freshwater algae and most coastal tugai thickets in the thickets. For species of medicinal plants whose resources are undermined by anthropogenic impact, or having a limited range, it is necessary to plan and carry out the harvesting of raw materials in strictly defined areas, in volumes not exceeding the annual possible harvest.*

Key words: *Southern Aral Sea region, medicinal plants, price complexes, raw materials, blanks, mapping, spatial and temporal changes of NDVI vegetation cover.*

1. Worldwide, practical healthcare is characterized by an increasing interest in herbal medicines and centuries-old experience of their use in medicine. Reducing stocks of widespread medicinal plant species and studying the spatial and temporal distribution, protection and rational use of medicinal plants is of great theoretical and practical importance.

In the leading scientific centers of the world, large-scale studies of the features of the spatial and temporal range of the dynamics of populations of medicinal plants in various growing conditions are carried out. Determining the sustainability of ecosystems and the population strategy of species and their adaptation to changing environmental conditions is of great scientific and practical importance [1, 2].

Degradation of coastal zones due to frequent lake drying up causes ecological and environmental damage to vegetation growth and distribution, biodiversity conservation, and seriously threatens the health and safety of local populations in the Aral Sea region [1, 4, 5]. Soil water, salinity, and depth of groundwater table (DTW) are considered to be the dominant driving factors of these environmental transformations.

The groundwater level affects the flow that replenishes the soil with water, which, in turn, affects the absorption of water by plant roots [3, 6]. The deeper the groundwater level, the more difficult it is for plants to absorb soil water replenished by groundwater through capillaries [7, 8].

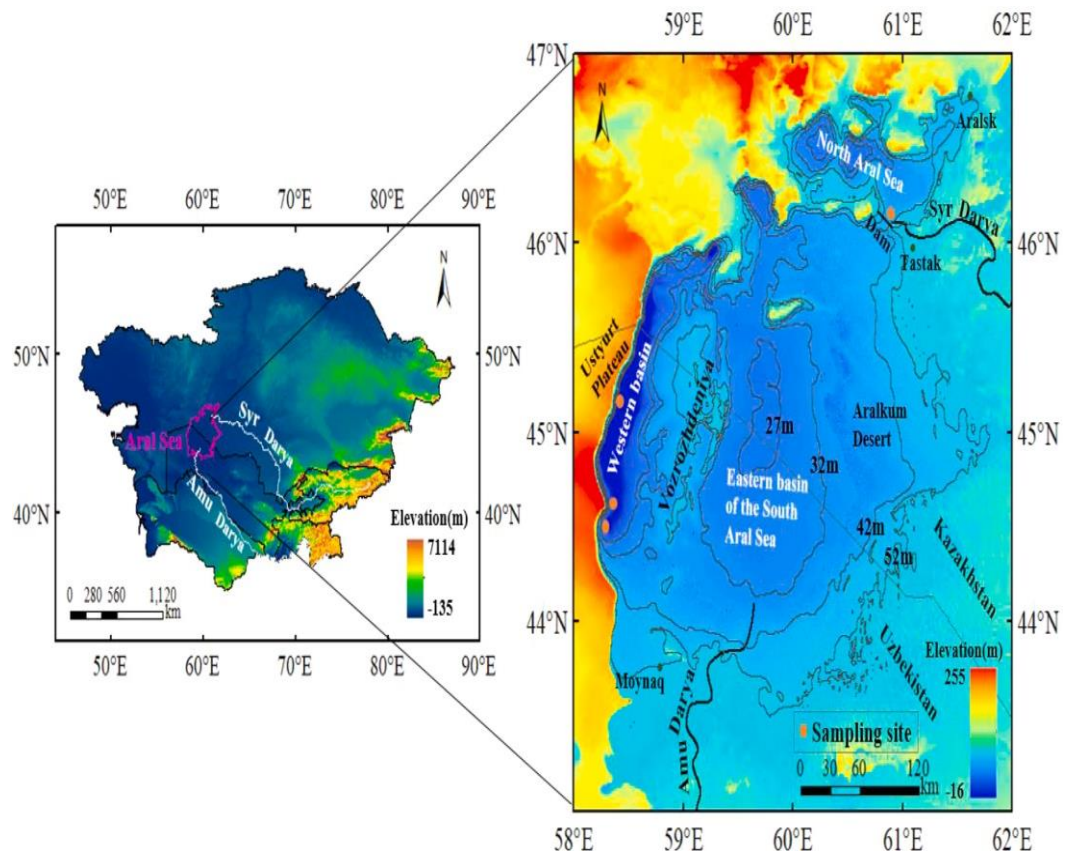


Fig.1. Map-diagram of the location of the research area

The lowering of groundwater can lead to cyclical succession and patterns of vegetation regression, which leads to a decrease in the projective cover of vegetation. The formation of successions was influenced by the hydrological regime, the granulometric composition of the soil and the salinization process. The drying out and high mineralization of water in the Aral Sea caused a decrease in hydromorphic vegetation, the disappearance of freshwater algae and most coastal tugai thickets in the thickets, as well as the gradual replacement of mesaphytic species with halotolerant plants [2, 3, 4].

Environmental changes associated with anthropogenic impact on nature have led to a sharp reduction in the natural resources of many valuable wild medicinal plants in a significant area. It is proved that the coverage of areas of saline soils with plants, including medicinal ones, occurs due to natural patterns that cause the gradual settlement of psammophilic plants in soils previously mastered by halophytes [3].

Soil salinization also plays an important role in the spatial distribution and development of vegetation [4]. The seasonal hydrological regime significantly influenced the dynamics of the projective vegetation coverage. In the spring and summer period, an increase in soil moisture contributed to the good formation and growth of vegetation. Salinity and soil structure are also important factors affecting the development of flora and vegetation. In this study, spatial and temporal changes in the NDVI vegetation cover on the drained bottom of the Aral Sea were analyzed. The effects of precipitation, groundwater level, and water mineralization on NDVI were quantified.

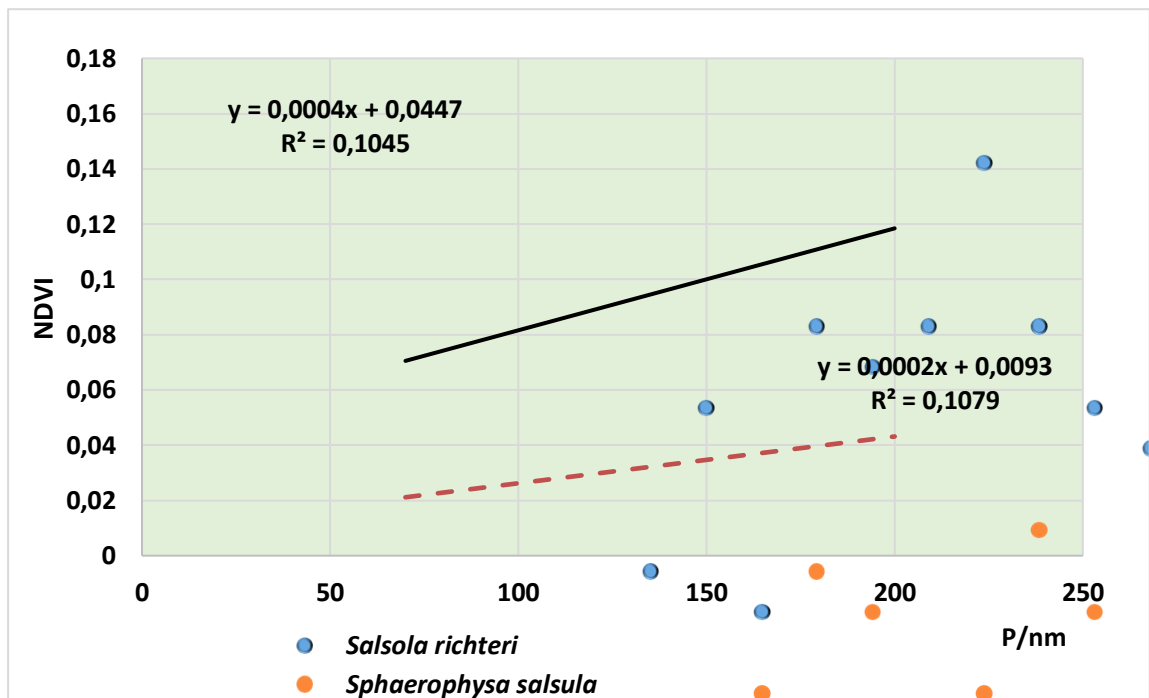


Fig. 2. The relationship between NDVI and salinity of water affecting the distribution of model species of medicinal plants

The obtained NDVI values showed a slight decrease, as evidenced by the red areas, but the percentage area was small. Using the Pearson correlation equations, we performed a correlation analysis between NDVI and UGV, precipitation and salinity of water.

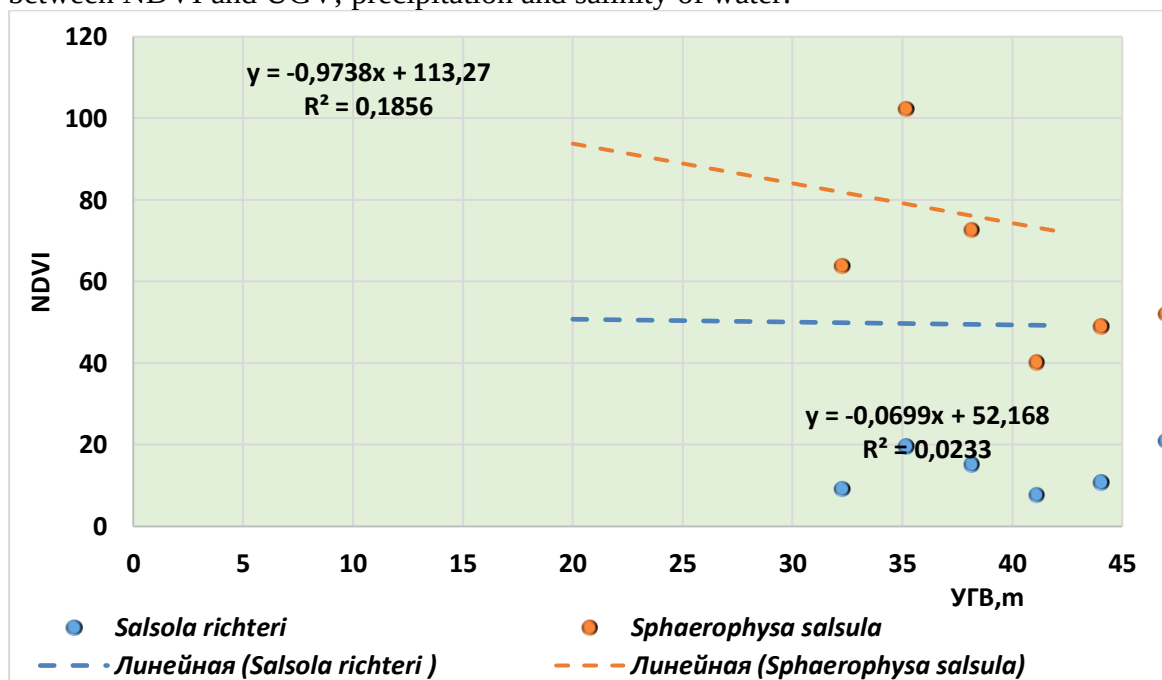


Fig.3. The relationship between NDVI and UGV affecting the distribution of model species of medicinal plants

The correlation coefficients between NDVI and WL, as well as mineralization, were 0.80 and 0.64, respectively, which is higher than between NDVI and precipitation. According to the analysis, the established correlation between UGV and its mineralization was significant ($P < 0.01$). The effects of the factors under consideration, depending on the air temperature, may be opposite. As a result of the influence of primary and secondary degradation of landscapes and the drying of the Aral Sea, the

area of vegetation cover is continuously decreasing. If all the factors are decisive during the modeling period in the first decade, in the following decades salt aerosol will take the main place, which will dominate all other factors affecting vegetation cover.

Thus, for species of medicinal plants whose resources are undermined by anthropogenic impact, or having a limited range, it is necessary to plan and carry out the harvesting of raw materials in strictly defined areas, in volumes not exceeding the annual possible collection, and under a special license under the control of environmental organizations.

References:

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Rezyume: Maqolada dorivor o'simliklar diapazonining hududiy vaqtinchalik dinamikasi va Janubiy Orolbo'yi hududida ularni himoya qilish choralari tahlil qilinadi. Orol dengizidagi suvning qurishi va yuqori minerallashuvi gidromorfik o'simliklarning pasayishiga, chakalakzorlarda yo'q bo'lib ketishiga olib keldi. chuchuk suv o'tlari va qirg'oq bo'yidagi To'g'ay tog'larining aksariyati. Resurslari antropogen ta'sirga uchragan yoki cheklangan hududga ega bo'lgan dorivor o'simliklar turlari uchun xom ashyoni qat'iy belgilangan joylarda, yillik mumkin bo'lgan yig'imdan oshmaydigan hajmlarda rejalashtirish va yig'ish kerak.

Резюме: В статье приводится анализ пространственно-временной динамики ареала лекарственных растений и меры их охраны в Южном Приаралье. Усыхание и высокая минерализация воды в Аральском море вызвали уменьшение гидроморфной растительности, исчезновение в зарослях пресноводные водоросли и большинство прибрежных тугайных зарослей. Для видов лекарственных растений, ресурсы которых подорваны антропогенным воздействием, или имеющих ограниченный ареал, планировать и осуществлять заготовку сырья необходимо в строго определенных районах, в объемах, не превышающих ежегодный возможный сбор.

Kalit so'zlar: Janubiy Orolbo'yi mintaqasi, dorivor o'simliklar, narx komplekslari, xom ashyo, blankalar, xaritalash, ndvi o'simlik qoplamining hududiy vaqtinchalik o'zgarishi.

Ключевые слова: Регион Южного Приаралья, лекарственные растения, ценовые комплексы, сырье, заготовки, картографирование, пространственные и временные изменения растительного покрова NDVI.

JUSTIFICATION OF THE POSSIBILITIES OF USING UNDERGROUND WATER TO SUPPLY DRINKING WATER TO THE SETTLEMENTS OF MOYNAK DISTRICT

Kurbanbaev S¹., Turlibaev Z²., Seytimbetov A²., Akimbaeva S².

¹Karakalpak branch office of the Scientific-research Institute of irrigation and water problems,

²Karakalpak State University named after Berdakh

Summary: The article presents the results of research work to justify the use of underground water for water-supply on territory of the populated points of Muynak region. Broadly lit results of the actual prospecting work on experienced area, They are presented accounting given on rollout and presenting of drinking water to population. The formed working conditions of the rollout. On base got result are given conclusions and practical offers on use and introducing the called on work.

Key words: Groundwater, use of groundwater for drinking, water supply.

INTRODUCTION:

For many centuries, the main source of water supply for the population of the Muynak region, both in the city of Muynak itself and in the villages, was the water of the Amu Darya River. At that time, both in quantity and quality, river water fully satisfied the needs of the population. The mineralization of river water ranged from 0.380 to 0.650 g/l and was considered to be good quality water. Even lake systems had low mineralization and their waters were used for drinking purposes.

In recent years, due to the discharge of large amounts of collector water into the river bed, the quality of water has deteriorated significantly, especially in the lower reaches of the Amu Darya River. In some years, in February and March, the mineralization of river water, especially in its lower reaches, increased to 2,300 mg/l, which exceeded the MPC by 2.0-2.3 times.

Along with the deterioration of water quality, starting from 1974, the occurrence of dry years has become more frequent. In years of critical low water and in years of average water availability, river water did not reach the Muynak region for a long period. During the period from 2000 to 2013, only two years turned out to be high-water (2005 - 2010); the remaining years can be classified as medium-water or low-water. In low-water years, not only do many lake systems usually dry up, but there is also a lack of water available for drinking purposes.

According to the structure of the soil, the upper horizon with a thickness of up to 50-70 m of the territory of the Muynak region is represented by alluvial deposits of the Quaternary period; they are composed of loams, sandy loams with layers of sand, which have low water permeability. At low horizons, at a depth of 300 - 600 m, aquifers are available and here the mineralization of groundwater is extremely high, up to 10 - 20 g/l, and they can only be used by installing expensive desalination plants. Currently, the main source of water supply for the population of the Muynak region is river water, groundwater of the upper layer, which people extract by installing manual pumping taps, and in critically low-water years they use imported water from neighboring areas.

Taking into account the peculiarities of the lithological composition and the presence of an aquifer, this area is classified as an unfavorable zone for the use of groundwater for drinking purposes. However, according to exploration surveys on the upper horizon in the channel strip of old rivers such as Kipchakdarya, Akdarya and other dry channels and channels, the presence of thin aquifers (up to 5 - 6 m) with a low filtration coefficient (0.9 - 1.5 m/day) was discovered. , which periodically feed on river water. They have low mineralization and are considered quite suitable for drinking purposes.

Based on these assumptions, scientific research work was carried out to justify the use of these groundwaters for water supply in the territory of the settlements of Kyzyljar and Shege.

Survey work was carried out, drilling was carried out to a depth of up to 20 m and, accordingly, a design justification was drawn up in accordance with the calculations of technical solutions.

METHODS:

In practice, groundwater reserves are extracted using mine wells, horizontal drainage galleries, karizs, and at greater depths of groundwater, selection is carried out using boreholes.

In any case, the suitability of groundwater or the choice of options for water supply is determined by the following requirements:

1. The water in the source must be suitable for drinking purposes (without or after purification).

2. The volume of water in the source tank must satisfy the needs of consumers. If there is a lack of volume, it can be compensated by creating a regulating tank.

3. The use of the source must be beneficial both technically and economically.

To assess the reserve and select a design scheme, water levels can be divided into statistical and dynamic.

The statistical reserve of the underground is a natural undisturbed state that can be extracted from the aquifer by pumping. This volume or horizon, depending on the nature of the food source or natural drainage, may fluctuate. Dynamic reserves are the flow of groundwater flowing through the aquifer, i.e. level position after pumping. For a constant water supply (balanced level), mainly dynamic reserves are important.

To calculate the water inflow to wells, there are various calculation schemes and formulas. The procedure for this calculation depends on the position of the filter in the aquifer, the pressure or unconfined groundwater and the nature of the vertical section, etc.

RESULTS:

Design values of water inflow to wells in the Kyzyldzhar village. According to the design studies for this area, the option of calculating a perfect well (Fig. 1) was adopted, the water inflow to which was determined by the formula:

$$Q = \frac{1,36K(2H - S)S}{\lambda gR - \lambda gr}, \text{ m}^3/\text{day}$$

where:	H	- thickness of the aquifer, m;
	S	- decrease in groundwater level, m;
	H - h	
	h	- layer of water on the outer surface of the well, m
	R	- radius of influence, m;
	r	- well radius, m;
	K	- filtration coefficient of the aquifer, m ³ /day.

The values of Rc can be approximately determined by the formula:

$$R = 2S\sqrt{HK}, \text{ m.}$$

In the project, the calculation was carried out in two versions: the first for different values of S with variable h and the second for different values of K_f.

Option 1. Water influx Q from a perfect well with aquifer thickness H, m and a decrease in the water horizon S, aquifers are sands with K_f = 1.35 m/day.

H	- 9,0 m;
S = H - h	- h = 2, h = 4, h = 6 m;
h	= 2, 4, 6 m
r	- 0,5 m;
K	- 1,35 m ³ /day.

The decrease in the water horizon was determined:

$$S_1 = H - h_1 = 9,0 - 2,0 = 7,0 \text{ m}$$

$$S_2 = H - h_2 = 9,0 - 4,0 = 5,0 \text{ m}$$

$$S_3 = H - h_3 = 9,0 - 6,0 = 3,0 \text{ m}$$

The influences were previously determined using the formula:

$$R_1 = 2S\sqrt{HK} = 2 \cdot 7\sqrt{9 \cdot 1,35} = 49 \text{ m}$$

$$R_2 = 2S\sqrt{HK} = 2 \cdot 5\sqrt{9 \cdot 1,35} = 35 \text{ m}$$

$$R_3 = 2S\sqrt{HK} = 2 \cdot 3\sqrt{9 \cdot 1,35} = 21 \text{ m}$$

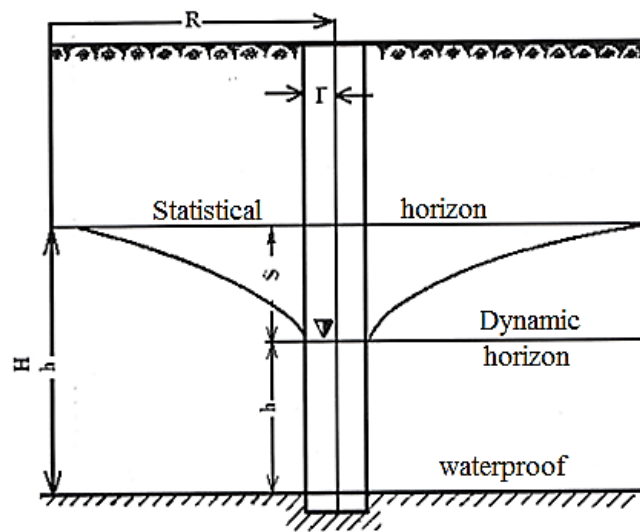


Fig - 1. Perfect well

The inflow from a perfect well is determined:

$$Q = \frac{1,36K(2H - S)S}{\lambda gR - \lambda gr} = \frac{1,36 \cdot 1,35(2 \cdot 9 - 7) \cdot 7}{\lambda g 49 - \lambda g 0,5} = \frac{139}{1,69 - (-0,301)} = 70 \text{ m}^3 / \text{day}$$

$$Q = \frac{1,36K(2H - S)S}{\lambda gR - \lambda gr} = \frac{1,36 \cdot 1,35(2 \cdot 9 - 5) \cdot 5}{\lambda g 35 - \lambda g 0,5} = \frac{117}{1,54 - (-0,301)} = 63,5 \text{ m}^3 / \text{day}$$

$$Q = \frac{1,36K(2H - S)S}{\lambda gR - \lambda gr} = \frac{1,36 \cdot 1,35(2 \cdot 9 - 3) \cdot 3}{\lambda g 21 - \lambda g 0,5} = \frac{82,62}{1,69 - (-0,301)} = 51 \text{ m}^3 / \text{day}$$

The second and inflow of water to the wells were determined (Table 1)

$$q = \frac{Q \text{ m}^3 / \text{cym.}}{T} = \frac{Q \text{ л / сек.}}{t} = \frac{70}{24} = \frac{70000}{86400} = 0,81 \text{ л / сек}$$

$$q = \frac{Q \text{ m}^3 / \text{cym.}}{T} = \frac{Q \text{ л / сек.}}{t} = \frac{63,5}{24} = \frac{63500}{86400} = 0,73 \text{ л / сек}$$

Table 1

Influence of water inflow to wells at different values of h

h, m	H, m	S, m	K, m ³ /sut	r, m	R, m	Q, m ³ /sut	q, m
2	9	7	1,35	0,5	49	70	0,81
4	9	5	1,35	0,5	35	63,5	0,734
6	9	3	1,35	0,5	21	51	0,59

From Table 1 it can be seen that as the value of h increases, the calculated value of q decreases. In Fig. 2 shows the dependence curves $S=f(q)$

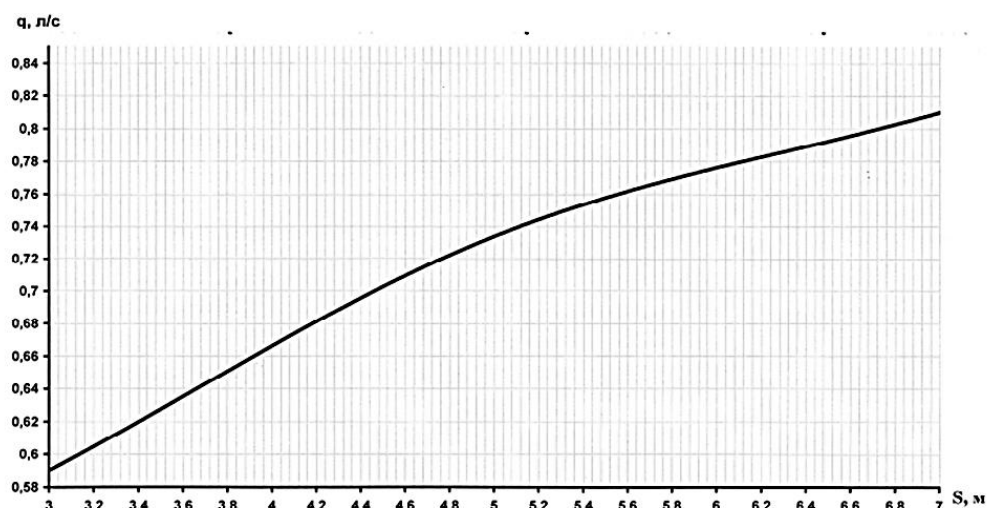


Figure 2. $S=f(q)$ curves

Table 2

Number of water consumers and their average daily values

Types of water consumption	Quantity water consumers	Water consumption rate	Average daily water consumption, l/day
Utilities sector			
Population	293	50	14650
Cattle	98	80	7840
MRS	196	8	1568
Total			24058

CONCLUSION:

Based on the studies conducted on the provision of drinking water to the population of the Muynak region, the following conclusions and practical proposals can be made.

1. Based on the results of actual research, it is possible to substantiate the real possibility of using groundwater for drinking purposes for the population of the region. To do this, it is necessary to look for the presence of an aquifer exclusively in the zone of channel deposits (sand) on the upper 20-meter horizon along the old channels of river sediments of the region under consideration.

2. Based on the design studies and construction of wells, as well as the results of experimental pumping, it can be noted that in the territory of the Kyzyl dzhar village, provided that the design operating mode is ensured, it is possible to obtain a well flow rate of up to 1 l/s. An increase in the flow rate can be achieved by increasing the power of the water receiving part, i.e. increasing the drilling diameter using the appropriate composition of filter media.

3. To ensure normal operation of the well, it is necessary to strictly adhere to the proposed pumping schedule.

4. In all likelihood, in order to obtain a reliable and higher water flow rate, it is necessary to drill in the very bed of the Kyzyljar tributary.

5. The use of groundwater at such low flow rates is a forced and expensive undertaking and can be used in critically low-water years.

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Rezyume: *Maqolada Mo'ynoq tumani aholisini ichimlik suvi bilan tamiynlash uchun yer osti suvlaridan foydalanish imkoniyatlarini ishlab chiqish boy'cha ilmiy-tadqiqot ishlari natijjalari taqdim qilingan. Tajriba uchastkada olib borilgan amaliy ishlarning natijjalari keng yoritilgan. Yer osti suvini olish va aholiga tarqatish bo'yicha hisob kitoblar haqida ma'lumotlar berilgan. Suvni chiqarish ekspluatatsion rejimi tuzilgan. Olib borilgan ilmiy-tadqiqot ishlar natijjalari asosida ishni foydalanish va ishlab chiqarishga tadbiriq etish bo'yicha xulosa va takliflar berilgan.*

Резюме: *В статье изложены результаты научно-исследовательских работ по обоснованию использования подземных вод для водоснабжения на территории населенных пунктов Муйнакского района. Широко освещены результаты фактических изыскательских работ на опытном участке. Представлены расчетные данные по откачке и подаче питьевой воды населению. Составлен эксплуатационный режим откачки. На основе полученных результатов даны заключения и практические предложения по использованию и внедрению проведенных работ.*

Kalit so'zlar: *Yer osti suvlari, yer osti suvlaridan ichimlik uchun foydalanish, suv bilan tamiynlash.*

Ключевые слова: *Подземные воды, использования подземных вод для питьевых, водоснабжение.*

UDC 620.9

IMPROVING ENERGY EFFICIENCY IN THE REPUBLIC OF UZBEKISTAN ON THE BASIS OF MODERN ENERGY-SAVING TECHNOLOGIES

Nasirov T.X., Khamidov SH.V., Tanirbergenov R.M.

Institute of Energy Problems of the Academy of Sciences of the Republic of Uzbekistan

Summary: The article is devoted to the issues of increasing energy efficiency in the Republic of Uzbekistan based on modern energy saving technologies. The current level of energy intensity of the economy and the reasons for the inefficient use of energy resources, which are an obstacle to achieving sustainable economic growth in the long term, are analyzed.

Key words: energy system, energy efficiency, energy saving, renewable energy, energy audit

Introduction

Ensuring energy efficiency helps strengthen the country's energy security, reduce the cost of industrial products and their competitiveness in the market, and solve environmental problems in energy production. Currently, an important task is the practical implementation of energy efficiency goals based on low-cost measures, supported by the necessary financial and human resources. Much remains to be done to create the institutional framework to promote energy efficiency goals. Available energy efficiency reserves cannot always be realized due to shortcomings in the legislative framework or their weak application. It is necessary to create conditions to attract investment in energy efficiency projects.

Main part

Based on the structure of electricity generation, by 2030, Uzbekistan's goal is to compensate for the growing electricity deficit by increasing the share of renewable energy sources to 25% of the total volume [1].

This will create unresolved problems of reducing the reliability of the energy system of Uzbekistan and the sustainability of parallel work with the United Energy System of Central Asia and Russia. [2].

At the same time, the existing technical potential for energy saving in Uzbekistan is at least 20% of the annual production of electricity and heat.

Energy intensity is presented as the ratio of energy resource consumption to GDP; it decreases with the development of energy-saving production technologies. The unit of measurement for energy intensity is koe/\$15p – kilogram of oil equivalent per US dollar at constant exchange rates, prices and purchasing power parity 2015 [3].

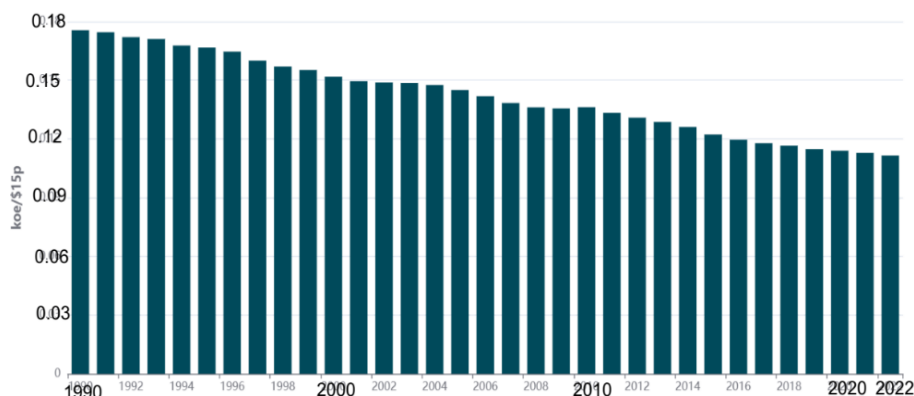


Fig. 1. Global trend in energy intensity koe/\$15p, 1990–2022

Globally, global energy intensity decreased by 1.2% in 2022; in the period 2009–2019 it was 1.9% per year. In 2022, global energy consumption increased by 2.1%, and GDP growth by 3%. At the same time, the values and trends of energy intensity differ significantly for different countries of

the world due to different economic structures. Countries with high specific energy consumption (koe/\$15p, Fig.1) include Iran – 0.251, Kuwait – 0.228, Venezuela – 0.206, Russia – 0.204, Ukraine – 0.193, South Africa – 0.187, Taiwan – 0.182, Uzbekistan – 0.179, Canada – 0.173, Nigeria – 0.161, China – 0.145, Kazakhstan – 0.1414. [3].

The high energy intensity of production and its low energy efficiency in Uzbekistan are a serious obstacle to the sustainable economic development of the country, and therefore, the problem of increasing the energy efficiency of production is a priority.

The energy intensity of GDP in Uzbekistan reaches 1 toe/1000 US dollars, which is 4–5 times more than in developed countries of the world. At the same time, primary energy consumption in Uzbekistan per person is approximately 5 times less than in the USA, and 2.5 times less than in Russia. The reasons for such a high current level of energy intensity of the economy are:

- ineffectiveness of existing economic incentives for energy conservation;
- relatively low level of domestic prices for energy raw materials and products of their processing and the resulting lack of interest at all levels of government and among the population in ensuring the rational use and economical consumption of fuel and energy;
- low equipment of energy consumers with technical means of accounting and control over the consumption of energy resources;
- high energy consumption of production processes due to the large share of outdated main production equipment;
- and most importantly, the absence at enterprises of production services for energy saving and energy efficiency;
- insufficient awareness of the population on energy saving issues.

Inefficient use of energy resources is the main obstacle to achieving sustainable economic growth of the national economy in the long term.

The reasons for this situation are well known. This is both the lack of interest in enterprise management and the inability of technical personnel to develop a feasibility study for measures to improve energy efficiency.

What needs to be done in this direction first? The practice of developed countries [5–8] shows that energy conservation measures should be an integral part of a comprehensive state program for managing an enterprise - industry - economy, only in this case the results of energy conservation will be significant and long-lasting.

Issues of saving fuel, heat and electricity should be considered in connection with saving total production resources, i.e., as an element of resource conservation. The effectiveness and priority of energy-saving measures should be determined based on not only energy, but also social environmental and economic assessments.

In terms of importance, the second component of the energy efficiency strategy (EUI), after pricing, considered to be the institutional aspect, which ensures coordination and motivation of all structures interested in EIE (manufacturers, designer's, builders, and investors).

The 3rd component of EIE is training and dissemination of information. All these components should have mechanisms of financial and economic incentives instead of an administrative and regulatory system of energy management and penalties.

The absolute priority among energy-saving measures both in the fuel and energy complex and among consumers is low-cost measures carried out by improving the organization of the functioning of measures, introducing a system of material incentives, and strict compliance with the rules of energy use.

A fundamental change in production technology usually requires large capital expenditures and pays off in 5–7 years or more, which will require significant investments. With limited financial resources, energy technologies occupy a special place in the technical competition for investments since they influence all other technologies.

Technical competition for innovative investments.

The realization of energy saving potential can be carried out based on modern energy saving technologies in the following directions [4]:

In energy:

- combined generation of heat and electrical energy (gas turbine and combined cycle plants);
- increasing the recovery rate of oil and gas and increasing the efficiency of their processing and transportation;
- coal enrichment at the mining site and the introduction of effective combustion technologies;
- adjustable electric drive, etc.

In the housing and communal services sector:

- equipping all consumers with energy monitoring and consumption devices;
- use of panels with improved heat-shielding properties;
- decentralized energy supply;
- use of heat pumps;
- application for lighting energy efficient (gas discharge and LED) lamps;
- use of low-energy household equipment, etc.

In the building materials industry:

- replacement of the technology of the wet method of producing cement clinker with a dry one;
- production of ceramic bricks with increased voids;
- production of products based on waste (ash, slag, etc.);
- increasing the efficiency of fuel use, recycling waste gases, etc.

In agriculture:

- advanced water use technologies;
- optimization of modes of main canals for machine irrigation;
- improving the structure of the agricultural machinery fleet, etc.

By transport:

The most important direction in energy saving is the introduction of renewable and alternative energy sources in all sectors of the economy with an increase in their share in the energy balance in accordance with the dynamics of the depletion of fossil fuels as the capacity of energy storage devices increases. If this does not work with existing renewable energy technologies and energy tariffs, then a solution should be sought in grant/interest-free investments.

In this case, the problems of reducing the environmental load on the environment are simultaneously solved.

With the involvement of foreign capital, it is advisable to create demonstration zones of high energy efficiency, which has been successfully implemented in many countries of Eastern Europe and Russia.

Based on the experience of advanced countries, it is advisable to create special structures responsible on a national scale for implementing state policy in the field of energy saving [5-7].

Energy management system. Solving any problems of energy saving and increasing the energy efficiency of production requires the creation and operation of a clear energy management system. The enterprise energy management system must have a direct connection between current monitoring and management (Fig. 2).

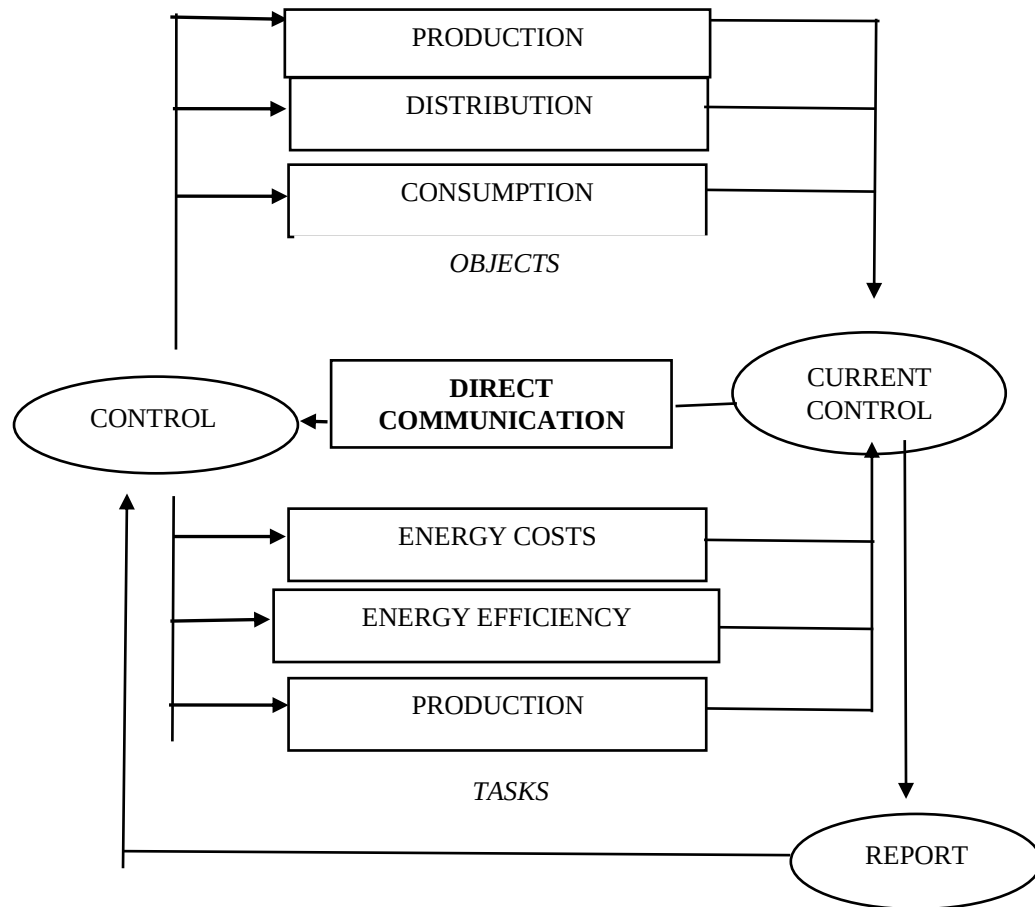


Fig. 2. Energy management system

In turn, setting and solving problems in energy management systems is impossible without a detailed energy audit (survey) of the current state of energy use at enterprises.

In Uzbekistan, energy surveys (energy audits) provided for by the Law of the Republic of Uzbekistan “On the Rational Use of Energy” have not yet been carried out in full. It's connected with: incomplete development of certain regulatory documents provided for by the Law; lack of trained specialists both in auditing and in production.

Energy management or energy management is based on control using instruments. The introduction of commercial energy metering devices for payment is only the first and necessary stage. A significantly larger volume of various stationary and portable devices is needed to establish ongoing monitoring of energy consumption and analyze opportunities for increasing energy efficiency. Not only large companies, but also small enterprises in developed countries today use programs for continuous monitoring of energy consumption with computer data processing (Monitoring@Targeting) and setting energy saving goals.

The costs required to conduct energy audits and organize energy saving work are not commensurate with the effect that can be obtained as a result of the implementation of recommendations and proposals. The economic effect of investments in this area, even in the best companies in the world with a high level of energy technology, is an order of magnitude greater than the volume of investments.

Thus, the solution to both problems (conducting audits and monitoring energy consumption) requires the purchase or in-house production of technical metering devices and control of energy consumption, as well as the training of specialists for audit and production services in energy management (energy management). Considering global experience, it is necessary to create energy

saving services at all large enterprises, coordinating their work with regional energy management centers for electricity, heat and gas supply.

In conclusion, we present some proposals from Uzbekistan specialists on energy saving and energy efficiency:

- Mandatory introduction of the position of energy manager at large enterprises with energy consumption in the amount determined by Government Decree in accordance with the Law on Energy Saving. At the same time, the energy manager must have a certificate of completion of a refresher course in accredited training centers in the areas of energy management, energy audit, energy saving and energy efficiency improvement (by industry). To train energy managers, it is necessary to create accredited training centers. Currently, work is underway with the JICA Foundation (Japan) to create a real training center at the Research Institute of Renewable Energy Sources under the Ministry of Energy of the Republic of Uzbekistan;

- Develop rules and mechanisms for concluding contracts for the supply of energy resources, rules that stimulate their savings.

- Development and implementation of mechanisms for a voluntary agreement between energy-intensive enterprises and regulators on energy saving, which establishes mutual obligations. This practice has become widespread in the EU. Voluntary agreements that provide incentives and incentives for energy conservation in the form of incentives and tax deductions are usually aimed at energy-intensive enterprises where mandatory energy management systems (EMS) and energy audits have a large impact on the result (for example, Denmark and Sweden);

However, these types of energy saving activities are difficult to quantify in advance and determine the savings results in order to set realistic targets for the Voluntary Agreement.

On the other hand, in the UK, Slovenia and Germany, tax deductions or exemptions, as well as deductions or exemptions from environmental duties, depend on the fulfillment of quantitative indicators;

- To stimulate the introduction of energy efficient technologies, approve a list of objects and technologies that relate to high energy efficiency objects and technologies, providing them with appropriate customs and tax benefits.

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Rezyume: *Maqola zamonaviy energiya tejovchi texnologiyalar asosida O'zbekiston Respublikasida energiya samaradorligini oshirish masalalariga bag'ishlangan. Iqtisodiyotning*

hozirgi energiya zichligi darajasi va uzoq muddatli istiqbolda barqaror iqtisodiy o'sishga erishishga to'sqinlik qiladigan energiya manbalaridan samarasiz foydalanish sabablari tahlil qilindi.

Резюме: Статья посвящена вопросам повышения энергоэффективности в Республике Узбекистан на основе современных энергосберегающих технологий. Проанализирован современный уровень энергоемкости экономики и причины неэффективного использования энергоресурсов, которые являются препятствием для достижения устойчивого экономического роста в долгосрочной перспективе.

Kalit so'zlar: energiya tizimi, energiya samaradorligi, energiyani tejash, energiya auditi.

Ключевые слова: энергосистема, энергоэффективность, энергосбережение, энергоаудит.

ADVANTAGES OF SASOL AND SHELL USING GTL TECHNOLOGY

Svaykosov S.O.

Karakalpak State University named after Berdakh

Summary: *Currently, products produced using gas-liquid technology (GTL) are considered to have relatively great advantages in terms of their environmental friendliness, operational properties and price. The article provides information about the technologies, processes and devices of the most advanced GTL companies in the world at the moment, as well as their principles of operation and comparative advantages.*

Key words: *GTL, Shell, Sasol, natural gas, methane.*

INTRODUCTION. The countries of the world produce different energy from different sources. Some of this energy comes from fossil resources such as coal, crude oil and natural gas, which are called sustainable energy sources. Some energy comes from industrial sources such as nuclear power. In addition, energy from natural sources such as solar energy, wind and waterfalls is called renewable energy sources.

The proven and potential reserves of natural gas on the planet at current production capacities were considered sufficient to ensure peace for more than 60 years. Most of the known large gas resources are located in closed or remote areas, which means that they are very far from consumers, such as the fields of Alaska and Siberia. Transporting natural gas and its products from these gas reserves is a difficult task, as they must be elite or liquefied through very long pipelines and transported as liquefied natural gas using tankers. Most of the world's natural gas is consumed by large industrialized countries.

GTL technology is capable of converting large volumes of natural gas into several barrels of liquid oil, which may be enough to meet the world's energy needs in the near future. GTL technology is of great economic importance to the countries and companies managing these vast natural gas reserves. GTL technology allows kata to economically develop these natural gas reserves, which are currently considered very far from world markets. GTL technology also helps to eliminate the need to burn natural gas associated with oil production in the fields, which, in turn, allows the development and production of oil fields as before, which is a problem of natural gas utilization in relevant fields around the world and has been closed by reducing the negative impact on the environment. The costs associated with these industrial operations range from combustible gases to valuable water with the GTL process.

THE MAIN PART. It is known for a long time that the gas to liquids technology (GTL) is one of the major available routs to produce clean middle distillates from natural gas. Use of (GTL) technology for chemicals and energy production is forecast to advance rapidly with increasing pressure on the energy industry from governments, environmental organizations and the public to reduce pollution, including the gaseous and particulate emissions traditionally associated with conventional petroleum-fuelled and diesel-fuelled vehicles.

In response there are initiatives by many companies worldwide to carry out R&D on the conversion of natural gas to green fuel, leading to the development of catalysts and a commercial Fischer-Tropsch system. The technological development of GTL has advanced remarkably since the beginning of the 1990s, with its economic viability being greatly improved.

However, it also clear that the commercial success of GTL technology has not yet been fully established, and returns from GTL projects will depend projections of market prices for petroleum products and presumed price premiums for the environmental advantages of GTL-produced fuels. Unit production costs will reflect the cost of the feedstock gas; the capital cost of the plants; marketability of by-products such as heat, water, and other chemicals (e.g., excess hydrogen, nitrogen, or carbon dioxide); the availability of infrastructure; and the quality of the local workforce.

The main industrial Fischer -Tropsch companies worldwide are Sasol, Shell, ExxonMobile, and Syntroleum.

There are other companies which are still conducting researches in GTL technology such as Chevron, Rentech, ConocoPhillips, Mossgas, FosterWheeler, Ivanho Energy, British Petroleum, Davy Process Technology and INFRA.

SASOL'S GTL TECHNOLOGY

Sasol is one of the largest industrial companies in South Africa. It was founded in 1950 by the South African government, then called South African Coal, Oil and Gas Corporation Limited. The name Sasol is derived from South African Synthetic Oil Limited. Sasol is a synfuel technology supplier established to provide petroleum products in coal-rich but oil-poor South Africa. The firm has built a series of Fischer- Tropsch coal-to-liquids (CTL) plants, and is one of the world's most experienced synthetic fuel organizations, and now marketing a natural gas-to-liquids (GTL) technology.

In 1951 the construction of the first production facility, (Sasol I), began in Sasolburg. The first plant started production in 1955. It produced fuels, waxes and gases from low-grade coal, using German Fischer-Tropsch technology. 5600 bbl/day of liquid fuels are manufactured by Sasol I. After the 1973 oil crisis, Sasol decided to build a second coal-to-liquids plant almost 100 km east of Sasolburg, in Secunda. The construction of the (Sasol II) facility started in 1976, and took 4 years. In 1982 (Sasol III) was built in Secunda next to Sasol two. The new two plants have an output of approximately a 50,000 bbl/day each.

Sasol has also developed the world's largest synthetic fuel project, the Mossgas complex at Mossel Bay in South Africa that was commissioned in 1993 and produces a small volume of 23000 barrels per day. In June 1999, Chevron and Sasol agreed to an alliance to create ventures using Sasol's GTL technology. The two companies have conducted a feasibility study to build a GTL plant in Nigeria that would begin operating in 2003.

Sasol has developed several types of Fischer-Tropsch technology to convert natural gas into synthesis gas using an autothermal process. It has commercialized four reactor types to convert synthesis gas into hydrocarbons, with the slurry phase distillate process being the most recent. These four reactors are divided into two categories according to the temperature of the reaction.

a- High Temperature Fischer-Tropsch (HTFT) reactors:

1) Synthol-Circulating Fluidized Bed (SCFB) reactor (Synthol): The fluid bed system (Synthol system) operates at temperature between 330 -350 °C, and is useful for the production of lighter hydrocarbons. It uses a promoted iron catalyst powder in circulating entrained flow design, as shown in Figure (1).

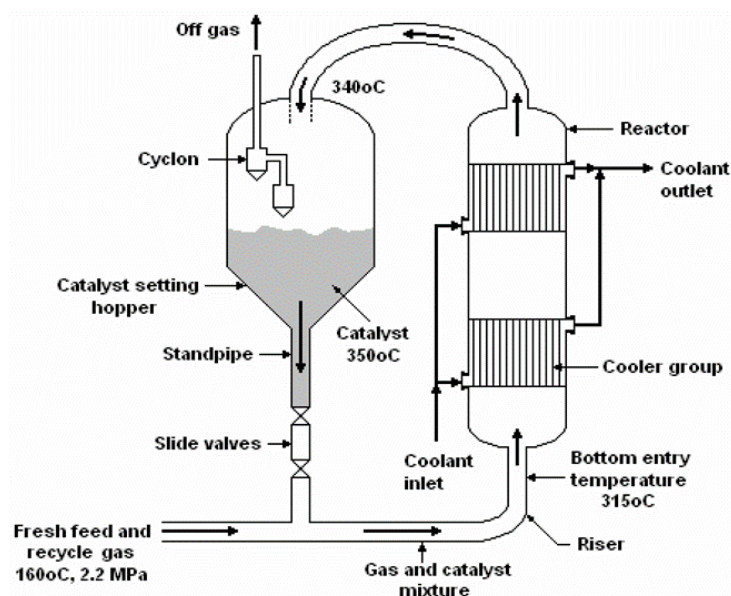


Figure (1): Synthol circulating fluidized bed (SCFB) reactor

Fresh feed gas mixed with 2 to 3 volumes of recycle gas enters at 160 to 200 °C and about 2.2 MPa. The gas entrains the catalyst which is added through slide valves at 340 to 350 °C. The suspension enters the fluidized bed reaction section where the Fischer-Tropsch and the gas shift reactions proceed at a temperature from 315 to 330 °C. Heat released by the exothermic reactions is removed by circulating coolant within tubes inside the reactor. In the Synthol system, oil is used as a circulating coolant, and is subsequently used to raise steam. The mixture of products, reactants, and catalyst enters the catalyst hopper where the decreased gas velocity causes most of the catalyst to settle out. The gas then passes through two banks of internal cyclones in series which separate out remaining catalyst from the off gas. The off gas is scrubbed with cooled recycle oil to condense out the heavier hydrocarbons products.

The Synthol reactor was complex and needed a complex support system to cope with the circulating catalyst loads and temperature difference especially during start up. This made it expensive. The large tonnages of catalyst circulated, caused relatively high pressure drops across the reactor system. At any time only a small fraction of the catalyst in the system was used for conversion purposes. The reactor systems were prone to erosion due to the high gas velocities in the reactor which operated in the transport bed mode. These and other disadvantages pushed Sasol to develop new generation of reactors.

A wide spectrum of hydrocarbons is produced from Synthol system, of which olefins and alcohols are the primary products. These products are unstable relative to paraffins. The extent to which the products initially formed exit the reactor depends on their residence time within the catalyst particles and other reactor characteristics. Table (1) shows a typical Synthol reactor product slate for the general range of operating conditions discussed.

Constituent	Molar formula	Mass %
<u>Gases</u>		
Methane	CH ₄	11
Ethene	C ₂ H ₄	4
Ethane	C ₂ H ₆	6
Propene	C ₃ H ₆	11
Propane	C ₃ H ₈	2
Butene	C ₄ H ₈	8
<u>Liquids</u>		
C ₅ - C ₇	C ₅ -7H ₁₂₋₁₆	8
Light oils	C ₈ H ₁₆	33
Heavy oils	C ₂₀ H ₄₂	6
Alcohols	C ₂ -4H ₆₋₈ O	9
Acids	C ₂ -4H ₄₋₈ O ₂	2
Total		100

Table (1): Representative selectivities for Fischer-Tropsch. reactions in Synthol entrained reactor.

The capacity of the Synthol-Circulating Fluidized Bed (SCFB) reactor is 6500 bbl/day, and nineteenth Synthol reactors were used commercially by Sasol in the period from 1955 to 2000.

2) The Sasol Advanced Synthol (SAS) reactor: The Synthol system disadvantages are eliminated when using (SAS) reactor that makes use of conventional solid-gas fluidization. . For that reason between 1998 and 2000 the 16 Synthol (CFB) reactors with capacities of 6,500 bbl/day, still in use, were replaced by eight (SAS) reactors, four 8 m diameter reactors with capacities of 11,000 bbl/day each and four 10.5 m diameter reactors with capacities of 20,000 bbl/day. Two different

capacity reactors were used to fit in with the train configuration used with the then existing (CFB) reactors. The capital cost of these reactors is about 40% of that of equivalent (CFB) reactor system. The (SAS) reactor, as shown in Figure (2), is a vessel containing a fluidized bed consisting of reduced, fused iron oxide catalyst. Synthesis gas is bubbled through the bed where it is catalytically converted to hydrocarbons that are in the vapor phase at the process conditions of about 340 °C and 25 bar.

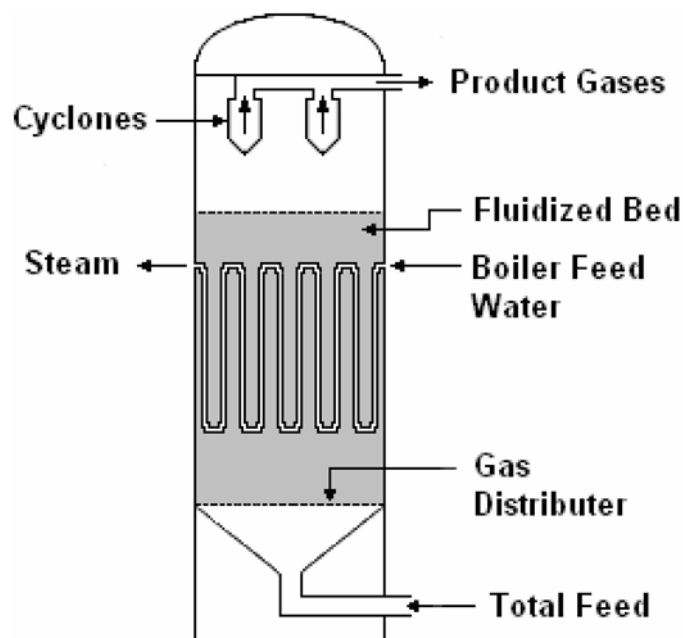


Figure (2): Sasol's Advanced Synthol (SAS) Reactor.

The heat produced from the exothermic conversion reaction is removed by passing water through tube coil installed inside the reactor, which also produces heated steam needed for the reaction. The major advantages of the (SAS) reactor over the (CFB) reactor are its simplicity, ease of operation and low operating cost due to elimination of the catalyst recycle. Catalyst consumption is reduced to about 40% and maintenance costs to about 15% of that of the (CFB) system. In general, higher conversions are obtained at higher gas loads.

b- Low Temperature Fischer-Tropsch (LTFT) Reactors:

1-Multi-Tubular Fixed Bed (MTFB) reactor: The multi tubular fixed bed reactor which have been used since world war II are still used by Sasol in their Arge process, and by Shell in the Shell middle distillate synthesis process. The (F-T) reaction takes place over an iron based catalyst (Sasol) in a reactor which resembles a tubular heat exchanger, as shown in Figure (3), with the catalyst packed in the tubes. The heat is removed through the tube walls to generate steam on the shell side of the reactor. The interaction between the generation of heat and heat removal through the walls gives rise to axial and radial temperature profile.

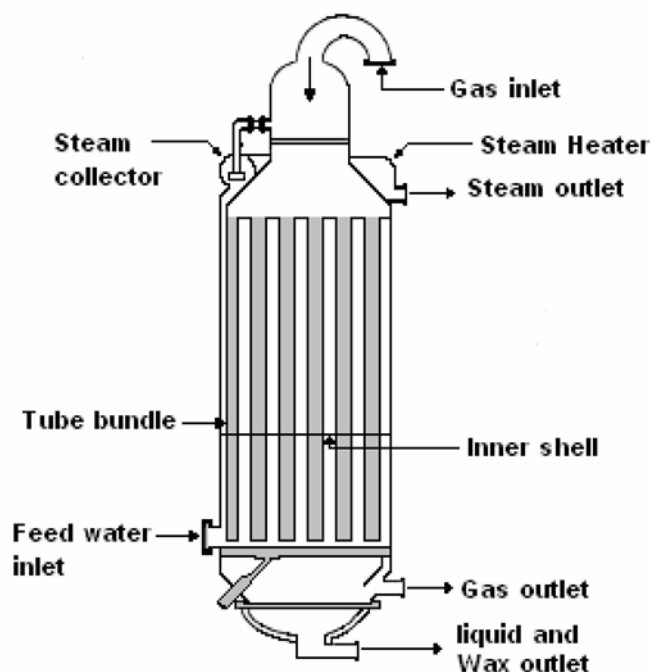


Figure (3): The tubular fixed bed reactor (Arge).

The axial temperature peaks are associated with the highest conversion rates. In effect this means that in the first meters of the 10 to 12 meters long bed, most of the reaction takes place and that after the peak relatively little conversion is achieved and catalyst is under utilized. It is also possible to distribute the conversion more evenly over the tube length by either reducing the activity of the catalyst or by reducing the average temperature or by combination of the two. In order to obtain good conversion, a high average temperature is required but this is subject to a maximum temperature for the peaks above which selectivities are negatively affected and the catalyst may be damaged especially in the extreme case of temperature run-aways. Efficient heat removal and effective temperature control at higher levels of temperature is therefore very important. Heat transfer in the bed and through the walls is much improved by increasing the gas and liquid flows in the bed. In the case where this is achieved by gas recycle, the conversion per pass is decreased but the overall conversion benefits in a large way by the recycle of the reagents and the higher reaction rates possible at higher average tube temperature. This comes at the cost of recompression of the recycle gas.

This reactor is complex and expensive. The scale up of the reactor is mechanically difficult and is complicated by the fact the iron-based catalyst has to be replaced periodically and the design of the reactor has to provide for this. This replacement is cumbersome and maintenance and labor intensive. Cobalt-based catalyst has a long life and replacement is a less important factor.

2-Slurry Phase (SP) reactor: The Slurry Phase (SP) reactor as shown in Figure (4), consists of a vessel containing slurry consisting of process derived wax with catalyst dispersed in it. Synthesis gas is bubbled through this slurry bed and is converted to hydrocarbons. The heat generated is passed from the slurry to the cooling coil inside the reactor to generate steam. The light hydrocarbon in the vapour phase are removed from the freeboard in the top of the (SP) reactor with the unconverted reactants and condensed in the downstream condensing train. The heavier liquid hydrocarbons are mixed into the slurry from which they must be removed by means of a Solid Separation Process. In the case of Sasol this is achieved by internal devices, in a proprietary separation process developed by Sasol. The successful development of an effective and relatively cheap liquid solid separation step was crucial to the development of the (SP) reactor.

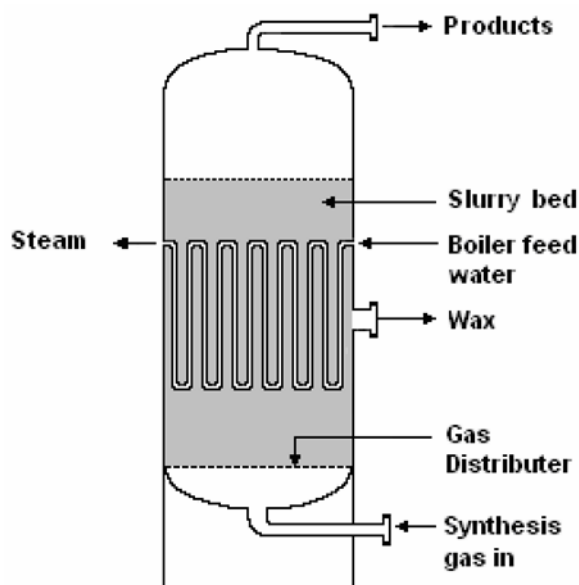


Figure (4): The Slurry Phase Reactor.

Precipitated catalyst, especially iron-based catalyst, tends to be weak. It is important that the catalyst is strong enough to prevent break up which would make the liquid-solid separation more difficult and in the extreme, impossible. A most significant process characteristic of the (SP) reactor is that it is well mixed and can operate virtually isothermally. The absence of axial and radial temperature gradients as in (MTFB) reactor, allows for much higher average operating temperature in the (SP) reactor and therefore higher reaction rates. As all the catalyst is at more optimal process conditions, the yields per reactor volume are high even through the catalyst concentration in the (SP) reactor is lower than that for the (MTFB) reactor. Because the reactor is well mixed, the catalyst tends to see outlet gas concentrations. This has a disadvantage in terms of conversions in a once through system. Through staging inside the reactor and operating reactors in series, the disadvantages of well mixed reactor behaviour can be reduced to large extent. The pressure drop across the (SP) reactor is less than 1 bar. The (SP) reactor allows for on-line catalyst withdrawal and addition which is not feasible with (MTFB) reactor. This is especially important for Fischer-Tropsch reactors that use iron based catalyst which must be replaced periodically. On line catalyst renewal also reduces maintenance costs. Where use of cobalt catalyst, which has a longer life, this is obviously less important, but in principle the addition and withdrawal features can also be used for reactivation of cobalt catalyst if required. Because of the isothermal nature of the reactor and the much smaller pressure drops across the reactor, the control of the reactor is much simpler and operating costs are much reduced. The easier control of average catalyst life through regular catalyst renewal, allows for easier control of the process selectivities and hence the quality of the products. This is especially important for iron based catalyst.

SHELL'S GTL TECHNOLOGY

The Royal Dutch Shell has carried out R&D since the late 1940s on the conversion of natural gas to liquids. The group Gas & Power business processes is in the forefront of the development of the gas to liquids (GTL) industry. In 1973 it started research on a modified low- temperature Fischer-Tropsch (F-T) process, leading to the development of the Shell Middle Distillate Synthesis (SMDS) route. In 1983 the first pilot plant of the (SMDS) process was built. Unlike other (F-T) synthesis routes aimed at gasoline as the principal product, (SMDS) focuses on maximizing yields of middle distillates, notably naphtha, kerosene, and gas oil. This has come about not just as a result of the abundant supply of economically priced gas but because of the global development of fuel supplies and the need to improve local air quality in many cities around the world. At the same time, increased efficiencies in the process, the ability to build bigger plants to capture economies of scale based on operational experience, have combined to make Gas to Liquids (GTL) commercially viable. The economics of (GTL) hinge on the availability of low cost gas and the cost to manufacture and

distribute (GTL) products. Shell's (GTL) process, the Shell Middle Distillates Synthesis (SMDS), is currently used in Shell's Bintulu plant in Malaysia with 12,000 bbl/day capacity. This is the world's first and only integrated low-temperature (F-T) plant.

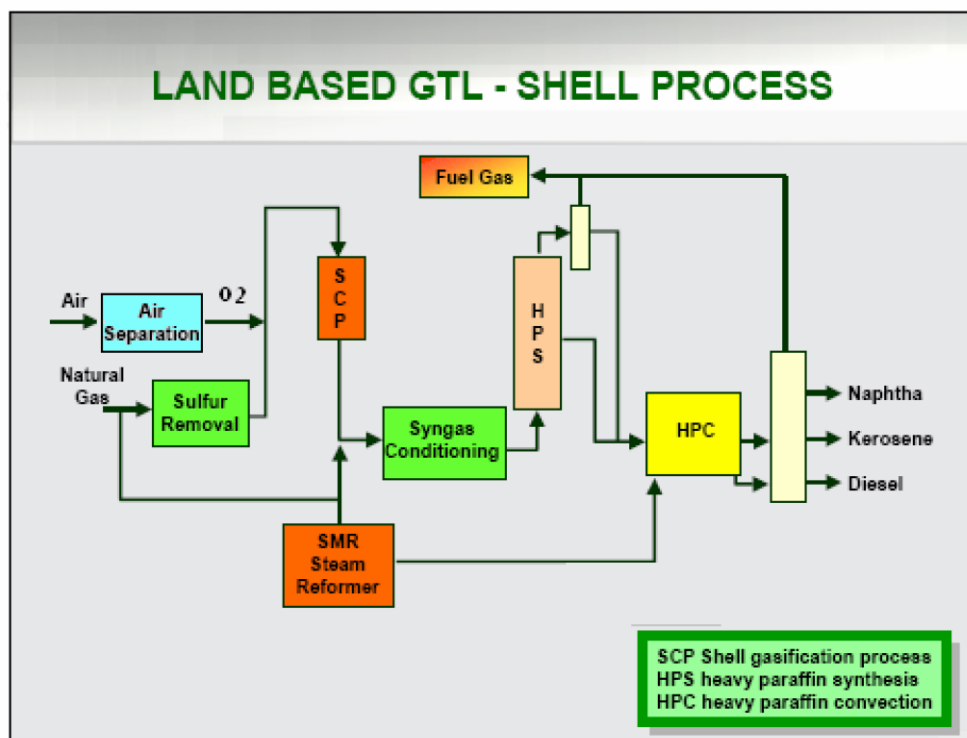


Figure (5): Diagram of the (SMDS) Technology.

The three main process stages used in (SMDS) are common to most (GTL) technologies. The process consists of three steps:

- The production of synthesis gas with a H₂/CO ratio of 2.
- Synthesis gas conversion to high molecular weight hydrocarbons via (F-T) using a high performance catalyst.
- Products Upgrading by Hydrocracking and Hydroisomerisation to maximize the middle distillate yield.

The products are highly paraffinic and free of nitrogen and sulfur. Synthesis gas can be produced from natural gas in several ways. The most suitable way for (SMDS) was using the Shell Gasification Process (SGP) with oxygen taken from an adjacent air separation unit. Used in commercial plants since 1956, the process has several advantages. It is a direct process without the need for a catalyst; it has very high process efficiency and is highly reliable as well as cost effective. The synthesis stage is the key to the commercial success of the (GTL) process. Here the synthesis gas reacts on an (F-T) catalyst to produce paraffinic hydrocarbons and water. High yields of desirable middle distillates products are essential for low unit cost. Traditional high-temperature (F-T) catalysts based on iron and cobalt are best suited for production of motor gasoline and other light products. The way the catalyst is deployed in the synthesis stage is also very important. The (SMDS) process offers several distinct advantages. First, the design is comparatively simple to scale up, a crucial factor for large-scale commercial plant applications and, second, the catalyst can be regenerated in-situ. Another advantage is the ability to operate at lower temperatures with maintained reactor productivity, which results in better levels of production of higher paraffins and lower synthesis gas consumption.

Building on research and development work and the operational experience of using a new catalyst at Bintulu, Shell has developed a new second-generation catalyst, which when used in the (SMDS) process produces yields of more than 90% C₅ selectivity. In the final stage of the (SMDS) process the raw synthesis product is hydrocracked over a proprietary catalyst and the output

fractionated. In this stage, oxygenated compounds are removed and the long chain paraffins are cracked and isomerised to produce middle distillates with a small proportion of gaseous products.

(SMDS) products are crystal clear and odorless liquids of a high quality and with some unique properties. (SMDS) kerosene has excellent combustion properties, stability and water shedding qualities. (SMDS) gas oil has properties that exceed all anticipated future gas oil requirements anywhere in the world. It has a high cetane, low density and negligible sulphur and polyaromatics content. In automotive applications, (SMDS) gasoil can be used either as a blend or as a neat product. As a blending component, it can bring fuels which are below specification up to the required standard and grade.

(SMDS) technology can also produce specialty chemicals, such as waxes, solvents and lubricant feedstock. The Bintulu plant, in fact, produces wax so pure that the US Food and Drug Administration have approved it for use in the international food packaging industry.

Five years of operational experience with the Bintulu plant has confirmed the (SMDS) process on a commercial scale. Experience gained during ramp-up and ongoing operations provide a sound basis for the scale-up from 12,000 to 70,000, and then to 110,000 bbl/day for the second- generation (SMDS) plants. The Bintulu plant suffered an explosion in the air separation unit, which was caused by forest fires which brought about prolonged local hazy air conditions. This was unrelated to the (SMDS) technology. Lessons learned from this event were shared industrywide to avoid re-occurrence in air separation units elsewhere.

The Bintulu plant was subsequently rebuilt, and the improved performance during the second start-up validated the value of prior experience. There are other driving forces behind the current interest in (GTL). Major gas reserves are in many cases not located in the same places as major crude oil reserves. So the increased use of gas as a liquid fuel has tended to diversify energy supply sources. PricewaterhouseCoopers, conducted with the support of Shell, shows that compared with crude oil refining systems, SMDS systems have 50% less effect on air acidification, significantly less impact on smog formation and have no greater impact on global warming. To ensure that the total environmental impact was assessed, the study utilized a comprehensive wells-to-wheels methodology in accordance with ISO standards. So, being both economically viable and meeting the growing market for clean fuels, the time for commercial applications of low-temperature (F-T) synthesis has now arrived.

CONCLUSION.

The continuous developments of the GTL technologies have had its big and active effects in improving the performance of the GTL projects, decreasing their costs, and increasing their profitability. These effects helped in promoting the GTL industry because it became more economic. Most of the GTL specialized companies have succeeded as a result of their researches to overcome all the difficulties which were making this technology non-economic. As a result of this, the barrel of the GTL products becomes economically competitive to that produced from petroleum refiners.

The successes in finding and using cheap catalysts, as well as using air instead of free Oxygen as an oxidizing agent in Fischer-Tropsch synthesis process have helped in promoting this industry, and making it more economic.

The inventing and using of the Moving Slurry Phase reactor (SP) by Sasol, and the Shell Middle Distillate Synthesis (SMDS) by Shell, were turning points in the development of the GTL technology. These two technologies have practically proved their effectiveness, and all the other technologies created by other companies are in fact only developments of these two technologies.

The success which has been achieved by some companies like Alchem and Syntroleum in inventing small land and marine, fixed and mobile GTL units of low capital cost, is a great accomplishment which will have its direct impact in promoting this technology in the future. This development will enable the investment of the remote and stranded gas fields however their reserves are small. The possibility of renting such small units will also enable the countries which cannot afford the establishment of big GTL plants to invest their natural gas fields.

Despite of all the progresses which the GTL technology has achieved, it still needs more developments and improvements in order to make its products more competitive, and to occupy a confident place among the other industries.

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Rezyume: Hozirgi kunda gazdan suyuqlikga texnologiyasi (GTL) dan olinadigan mahsulotlar o'zining ekologik tozaligi, ekspluatatsion xossalari va narxi bo'yicha nisbatan katta afzalliklarga ega hisoblanadi. Maqolada GTL bo'yicha hozirgi vaqtda dunyodagi eng oldinda turuvchi kompaniyalarning texnologiyasi, jarayonlari va qurilmalari hamda ularning ishlash printsiplari, nisbatan afzalliklari haqida ma'limotlar keltirilgan.

Резюме: В настоящее время продукция, получаемая по газожидкостной технологии (GTL), считается имеющей сравнительно большие преимущества по своей экологичности, эксплуатационным свойствам и цене. В статье представлена информация о технологиях, процессах и устройствах самых передовых на данный момент компаний мира по GTL, а также их принципах работы, сравнительных преимуществах.

Kalit so'zlar: GTL, Shell, Sasol, tabiiy gaz, metan.

Ключевые слова: GTL, Shell, Sasol, природный газ, метан.

ON THE BREAKING LOAD OF THE MAIN WEAVES

Yusupova Z., Khasanov B.K., Shin I.G.

Tashkent Institute of Textile and Light Industry

Summary: *The article presents a comparative assessment of the strength of the main weave fabrics based on the results of experimental studies. The ambiguous effect of the number of bonds in the weaves on the breaking load of tissues has been revealed and, in addition to the classical view of the influence of the number of bonds, it is proposed to consider the frequency and degree of bending of the warp threads on the strength of tissues through the exhaustion of some reserve of elastic properties of the material due to more intense pre-deformation during tissue formation.*

Key words: *fabric, strength, strength, interlacing, plain, twill, satin, breaking load, line density, twist, thickness*

Textiles and other materials have a variety of geometric, mechanical, physical, and chemical qualities that are determined by their raw material composition and structure. These attributes must be considered while manufacturing and using goods for different purposes. Textile material requirements vary and are influenced by several factors. The following categories-technological, operational, artistic, and economic-can be conditionally applied to them.

Adherence to technological specifications guarantees superior quality in manufactured goods. The mechanical qualities of materials, such as strength, stiffness in bending and stretching, drape, fraying, and thread separation in textiles and seams, dictate the needs for technology.[1-5] The way a fabric responds to different forces that are applied to it can cause deformations such as stretching, bending, compression, and torsion, which affect its mechanical qualities. These pressures come in different strengths, and in certain situations, they may cause the fabric to completely break. The cloth can be deformed by applying forces smaller than tensile once or more times.

One of the most crucial characteristics that affects fabric quality is strength. The breaking load, or the maximum force a rectangular sample of cloth with specified dimensions can bear at the point of rupture, is what defines tensile strength. The primary criterion used to evaluate the mechanical qualities of textiles is strength,[6,7] even though the pressures they undergo during sewing and wearing only make up a tiny portion of the breaking forces.

When assessing fabrics according to the standard, the tensile strength of the fabric is the main indicator of strength. The tensile strength is associated with the breaking load, which is determined on tensile testing machines PT-250, RM-200, etc. The strength of the fabric depends on the strength of the fibers, the structure of the yarn and fabric, the nature of the fabric finish. Since different fibers have different strength, this is reflected in the strength of the fabric. Fabrics made of high-density yarn, high-twist yarn, twisted yarn (in two or three folds) are characterized by increased strength.

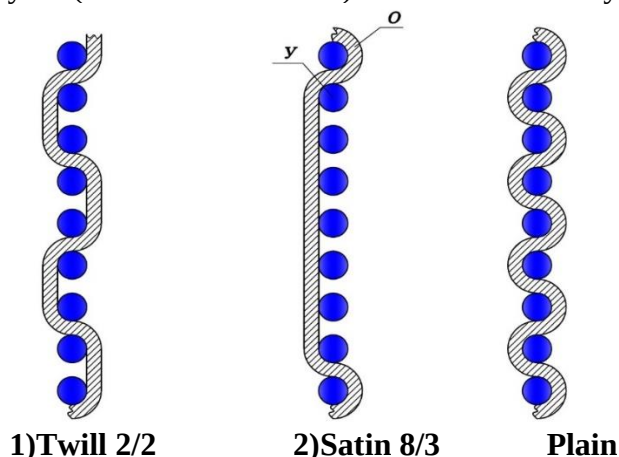
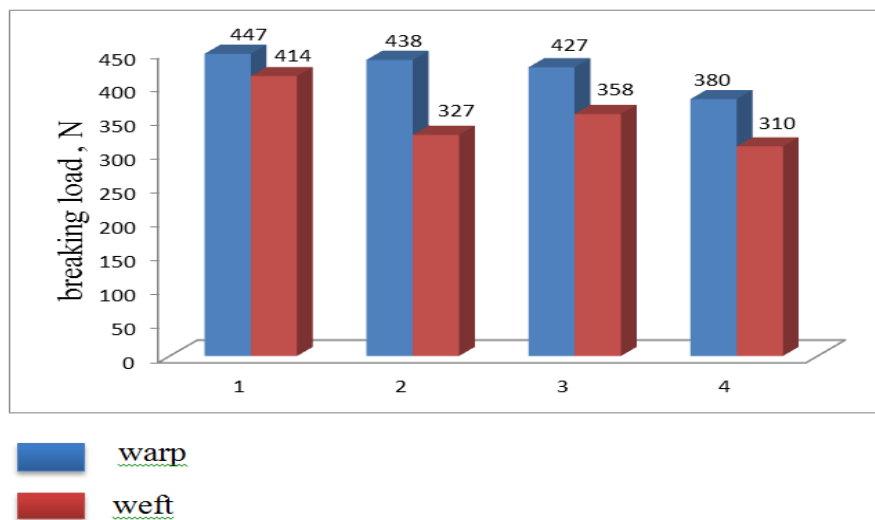


fig.1. Longitudinal portions of the primary weave fabrics

Characteristics of the main weaves

The structure of fabrics and products made from them is determined by three groups of characteristics [1]: structural elements (threads, fibers), their relative arrangement and connections between elements. The main characteristics of the fabric structure include: type and linear density of threads, fabric weave, number of warp and weft threads per 10 cm of fabric, filling, porosity, structural phases, supporting surface.

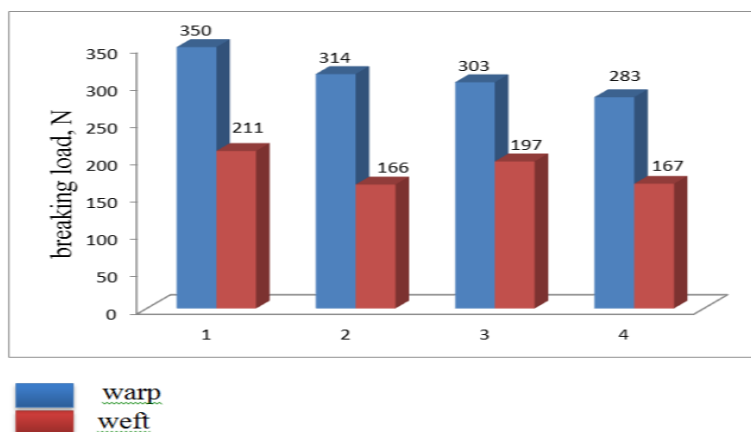
A fabric's interlacing, which is defined as the pattern of mutual overlap between the longitudinal warp and transverse weft threads, influences the fabric's qualities as well as its look (breaking load, breaking elongation, air permeability, etc.). Therefore, the tensile load PP of cotton trimmed fabrics with the same raw material composition of threads and threading parameters is, according to [8], the values presented in the form of histograms in pigs. 2 and 3. This is dependent on the type of main (simple) weaves (Fig. 1), namely plain, twill, and satin (satin).



Plain	twill 1/3	twill 2/2	satin
$\delta=0,38 \text{ mm}$	$\delta=0,47\text{mm}$	$\delta=0,47\text{mm}$	$\delta=0,53 \text{ mm}$
$P_O/P_U=298/223$	$P_O/P_U=294/219$	$P_O/P_U=290/221$	$P_O/P_U=279/224$

Fig..2 Breaking load values Pp of cotton trimmed yarn fabrics: warp 25, weft 29.4

The general trend is that the breaking load of plain weave fabrics is greater than that of twill and satin weave fabrics. At the same time, if the breaking load of twill is inferior to linen by 2 - 4.5%, then for satin with the specified fabric characteristics (thickness, density of warp and weft threads by 1 dm) the breaking load is already 15% less. In the weft direction, the relative difference in breaking load is more significant and amounts to 21.0; 13.5 and 25.1% (pic.2)



Plain twill 1/3 twill 2/2 satin
 $\delta=0,28$ mm $\delta=0,34$ mm $\delta=0,0,34$ mm $\delta=0,37$ mm
 $P_O/P_U=322/261$ $P_O/P_U=324/259$ $P_O/P_U=311/265$ $P_O/P_U=314/262$

Fig.3 Breaking load values PP of yarn-trimmed cotton fabrics: weft 11.8 tex, warp 15.4 tex

The difference in the breaking load values is more noticeable and amounts to 10.3, 13.4, and 19.1% in the warp direction, and 21.3, 6.6, and 20.9% in the weft direction, as a result of the warp and weft thread thickness decreasing (fig. 3), while maintaining the indicated tendency to reduce the breaking load of fabrics of twill and satin weave in relation to plain weave.

As follows from the works [9,]10, the above data from experimental studies of the breaking load of fabrics of different weaves are confirmed and it is indicated that "... plain weave, under strong equal conditions, allows us to produce the most durable fabrics, since it provides the largest number of connections between the warp threads and duck..." ([9], p.321). The same reason for the increased strength is noted by V.E. Zotikov and others ([10], p. 421)

However, it is necessary to point out significant contradictions in the explanations for the increased strength of plain weave fabrics in relation to twill and satin weave fabrics, relating to the influence of bonds between threads on the tensile load of fabrics. So, on the one hand, the largest number of connections in plain weave contributes to the production of more durable fabrics, on the other hand, the connections between threads, for example, with satin (satin) weave are smaller than with plain or twill weave, then due to the increased density of threads they are intertwined more often , which can provide good strength (according to G.M. Kukin and others) [1].

Experimental research and discussion

It is quite obvious that the number of connections depends on the number of intersections or on the type of weave, where plain weave dominates in terms of the number of connections due to its structure (fig. 1).

In order to resolve this contradiction in explaining the increased strength of plain weave in relation to other types of main weaves, experimental studies of specially produced fabrics for breaking load were carried out using standard methods (table)

Table 1

Experimental data on the breaking load of fabrics of various weaves with given technological parameters and raw material composition

№	interlacing	Fibrous composition	Tex warp	Twist	Thread density n/dm		Breaking load on warp,N
					warp	weft	
1	Twill 2/1	50%PE50% V	36,2	664	360	300	836
2	Plain	50%PE50% V	36,2	664	360	230	633
3	Twill 2/2	50%W50%P E	22,7x2	664	300	200	767
4	Twill 2/2	50%W 50%PE	22,7x2	664	300	220	751
5	Twill 2/2	50%W 50%PE	22,7x2	664	300	222	740
6	Twill 2/2	50%W 50%PE	22,7x2	664	300	270	714
7	Satin8/3	50%W 50%PE	22,7x2	664	300	210	760
8	Satin8/3	50%W 50%PE	22,7x2	664	300	250	730

9	Satin 8/3	50%W 50%PE	22,7x2	664	300	300	687
10	Plain	50%W 50%PE	22,7x2	664	300	170	633
11	Plain	50%W 50%PE	22,7x2	664	300	210	610
12	Plain	50%W 50%PE	22,7x2	664	300	220	393

For maximum objectivity, when comparing the results of testing the tensile load of fabrics, the input factors were taken as constant: the fiber composition of the yarn is 50% wool + 50% polyester, the thickness of the warp threads is 22.7x2 tex, the twist $K = 664$ kr/meter, the density of the warp threads is $P_O = 300$ in 1dm.

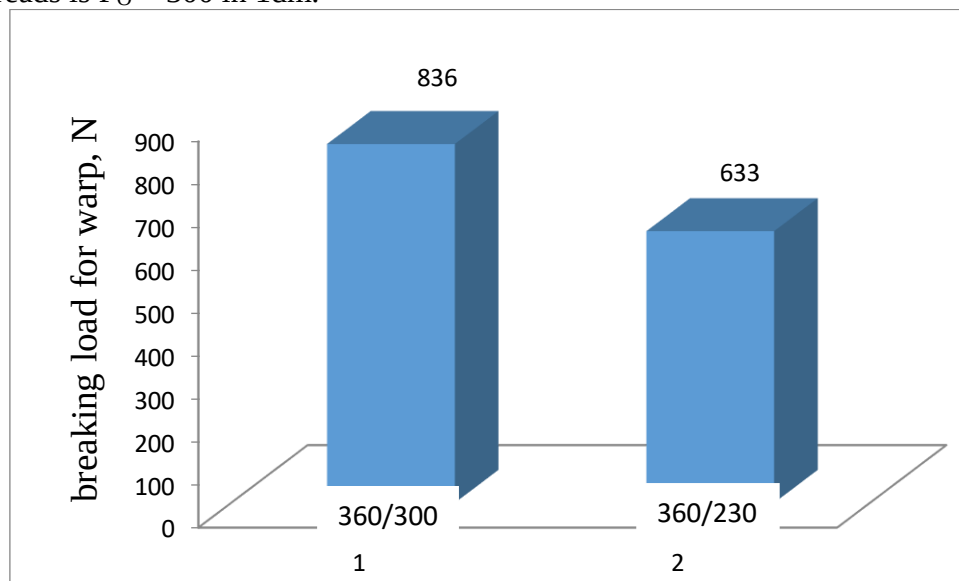
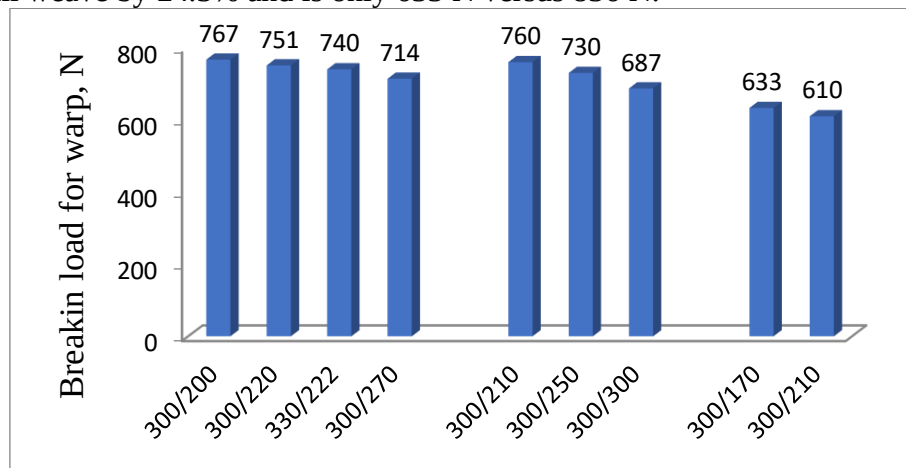


Fig. 4 Breaking load values for the PP warp weave twill 2/1 (1) and plain (2) with a fiber composition of 50% PE + 50% B, warp thread 36.2 tex, twist $K = 664$.

Experimental studies of the breaking load based on weaves of twill 2/1 and plain with a fiber composition of 50% polyester + 50% viscose (Fig. 4) showed that with a linear density of warp threads of 36.2 tex and twist $K = 664$ kr/meter, the breaking load plain weave fabric is significantly inferior to twill weave by 24.3% and is only 633 N versus 836 N.



Twill 2/2 satin 8/3 plain

Fig. 5. Breaking load values for warp fabrics of different weaves with the same fiber composition 50% Wool + 50% Polyester, warp threads 22.7x2 tex, twist K=664 cr/meter with different densities of weft threads per 10 cm.

A similar trend of a lower value of the breaking load of plain weave was established in relation to twill 2/2 and sateen 8/3 (Fig. 5). Thus, the breaking load PP = 633N for plain weave is less than that of twill and satin by 11.3...17.4% and 7.9...16.7%, and for the value PP = 610N - by 14.6, respectively. 20.5% and 11.2...19.7%. This pattern was obtained with the same density of warp threads equal to 300 n/dm, linear density of warp threads 22.7x2 tex and twist K=664 kr/meter with equal density of weft threads.

It was experimentally revealed that for all weaves under consideration, with increasing weft density of the fabric, the breaking load decreases: for twill by 7%, satin by 10% and plain by 3.6%.

In plain weave, each warp and weft thread is intertwined with a large bending angle, thereby creating a more stressed state due to increased preliminary deformation during fabric formation. Therefore, the potential for elasto-plastic deformation when exposed to an external tensile load, for example, during a tensile test, should be less than that of twill and sateen weaves. The warp and weft threads in these weaves bend much less (Fig. 1), i.e. the threads are in a less stressed state and

are therefore capable of significant elastic-plastic deformations (Fig. 6c-satin). Figure 6 shows photographs of torn tissue samples. In the event that the plain weave (Fig. 6, a) and twill (Fig. 6, b) fabric samples were torn, resulting in comparatively smooth edges, the sateen sample (Fig. 6 c),

owing to its high deformation capacity, was identified by a fracture pattern: at the point of destruction, intact warp thread elongation is visible alongside destroyed fibers, causing the weft threads to lose their prior orientation.

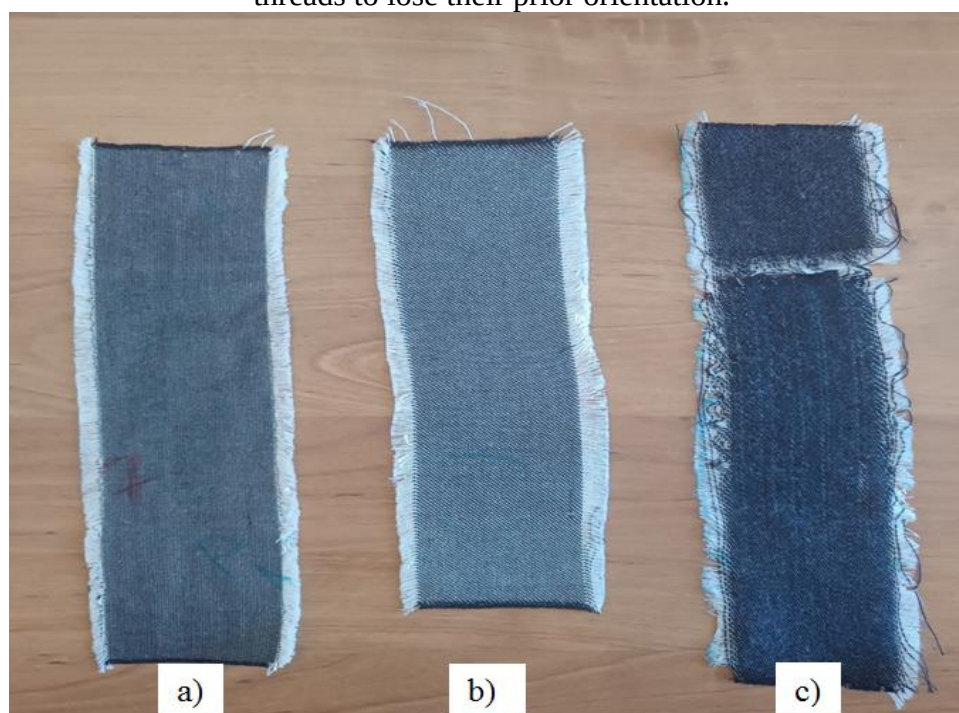


Fig. 6. Experimental samples of fabrics after stretching on a tensile testing machine:
a) plain; b) twill; c) satin

Conclusion

1. An analysis of literary sources devoted to the study of the tensile strength of cotton trimmed fabrics showed that under simple approximately equal conditions (raw material composition, fabric thickness, density of warp and weft threads, linear density of warp and weft threads) plain weave fabrics have increased strength in relation to twill 1/3 and twill 2/2, respectively, by 2.0 and 4.5% on the basis. It is difficult to accept these ratios as a pattern, since the experimental error can significantly exceed these indicators.

2. The number of bonds, depending on the number of intersections of the warp and weft threads in the fabric and forming one or another type of weave, has an ambiguous effect on the strength of the fabric.

3. The findings of the aforementioned experimental investigations on the primary weaves' fabric strengths support the theory that the degree, kind, and quantity of bends made during the creation of a certain weave determine the warp threads' overall strength as well as the strength of the fabric. More frequent and extreme bending of the thread wears down its elastic-elastic characteristics, which lowers the thread's deformability and decreases its capacity to support breaking stresses. Because of this, plain weave has a lower breaking load than other weave kinds.

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Rezyume: Maqolada eksperimental tadqiqotlar natijalariga ko'ra asosiy to'quv matolarining mustahkamligini qiyosiy baholash keltirilgan. To'quvdagi bog'lanishlar sonining matolarning cho'zilish yukiga noaniq ta'siri aniqlandi va bog'lanishlar sonining ta'siri bo'yicha klassik nuqtai nazardan tashqari, egilish chastotasi va darajasini hisobga olish taklif qilindi. mato hosil bo'lishida kuchliroq dastlabki deformatsiya tufayli materialning elastik-elastik xususiyatlarining ma'lum bir zaxirasini yo'qotish orqali matolarning mustahkamligi bo'yicha iplar.

Резюме: В статье представлена сравнительная оценка прочности тканей главных переплетений по результатам экспериментальных исследований. Выявлено неоднозначное влияние число связей в переплетениях на разрывную нагрузку тканей и в дополнении классическому взгляду на влияние числа связей предложено рассматривать частоту и степень изгиба нитей основы на прочность тканей через исчерпание некоторого запаса упруго-эластических свойств материала за счет более интенсивной предварительной деформации при тканеформировании.

Kalit so'zlar: gazlama, mustahkamlik, to'quv, tekislik, to'qmoq, atlas, uzilish yuki, chiziqli zichlik, burama, qalinlik

Ключевые слова: ткань, прочность, переплетения, полотняное, саржа, сатин, разрывная нагрузка, линейная плотность, крутка, толщина

THE RESULTS OF VERTICAL MOVEMENT OF OPERATING EARTH DAM

Ospanova D.K.

Karakalpak State University named after Berdakh

Summary: *This article presents the results of the vertical subsidence of the earth dams that are being used. The results show that since the expropriation period, sedimentation has averaged 4 mm per year.*

Keywords: *earth dam, operation, vertical movement, safety, hydraulic structures.*

One of the leading places in the world is the application of efficient and cost-effective technologies for the design, construction and use of earth dams. "Given the presence of more than 45,000 dams worldwide", the design and construction of earth dams necessitates the introduction into practice of new methods improved in ensuring safety and stagnation during the period of use [1-3].

The world is carrying out research work aimed at studying, identifying and eliminating the causes of violations, failures and destructive phenomena of earth dams, designing and building, ensuring safety during the period of Use, developing new scientific and technical solutions to increase the strength of the ground.

Natura observations should be carried out, which will provide an opportunity to monitor the safety of each exploited earth dams. The composition and volume of natura observations are determined by design instructions, regulatory documents depending on the class of the structure, the characteristics of the engineering and geological structure of the floor, the environmental situation, etc. Natura observations developed when designing earth dams, as a rule, are constantly adapted to the period of exploitation. Violation of the rules of operation of earth dams can lead to their deposition and displacement.

In cooperation with the state inspectorate "Davsuvkhojaliknazorat", a second cycle of monitoring the subsidence and horizontal deformation of the dam was carried out. Observations were carried out at an average water otmetka of 648.12 m at the earth dam of the reservoir.

Nivelirlash with I-discharge was replaced by ii-discharge, since it was carried out with a new device "Dini-12", the accuracy of which is two times higher than that of previous devices. The main technical characteristic of nivelir is presented in his special book. II-discharge nivelirning was carried out between rappers in fragments and when approaching the observation gallery of the water extractor in straight and reverse directions, according to the sinking stamps of the dam top.

The height indicator of the top of the dam is related to how much the dam floor and body are seated. The results of the sinking of the body in the anchor flood-reservoir earth dam are shown in figure 1.

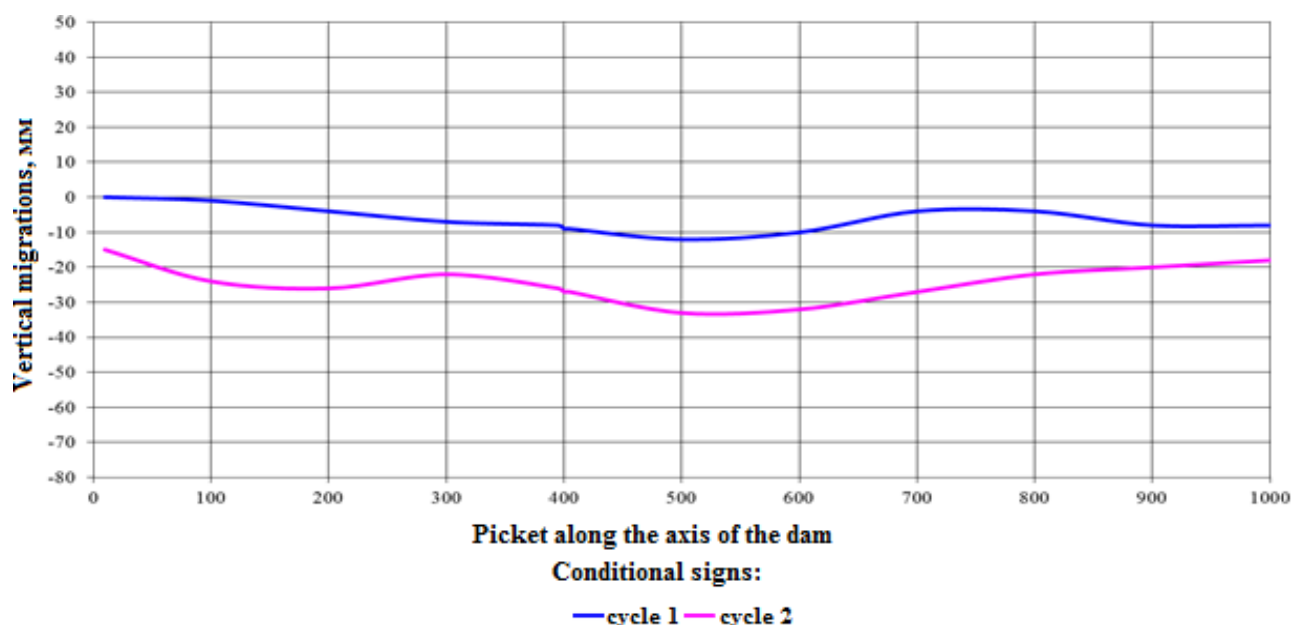


Fig. 1. Vertical migrations of dam hill

Based on the available graphic and analytical data, the following follows: the subsidence of the dam hill increased from 15 mm to 33 mm during the observation period from the side (shore) side towards the middle part. The subsidence was an average of 4 mm per year.

From this it can be concluded that the results of the vertical subsidence of the earth dam of the anchor flood-reservoir in use are observed based on the established rules. The results of vertical sinks indicate that the structure provides stability.

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Rezyume: Ushbu maqolada foydalanilayotgan er to'g'onlarining vertikal cho'kishi natijalari keltirilgan. Natijalar shuni ko'rsatadiki, ekspropriatsiya davridan boshlab cho'kma yiliga o'rtacha 4 mm.

Резюме: В статье представлены результаты вертикальной просадки используемых земляных плотин. Результаты показывают, что с момента отчуждения осадконакопление в среднем составляло 4 мм в год.

Kalit so'zlar: tuproqli to'g'on, ekspluatatsiya, vertikal harakat, xavfsizlik, gidrotexnik inshootlar.

Ключевые слова: земляная плотина, эксплуатация, вертикальное перемещение, безопасность, гидротехнические сооружения.

COMPARATIVE ANALYSIS OF CLUSTERIZATION ALGORITHMS

Tursinbayev N.Sh., Jalgasbaeva Q.X.

*Nukus branch of Tashkent University of Information Technologies
named after Muhammad al-Khwarizmi*

Summary: Clusterization algorithms are vital tools in data analysis, allowing for the organization and interpretation of large datasets by grouping similar data points. This paper reviews various clusterization algorithms, including their principles, mathematical foundations, applications, and performance metrics. We aim to provide a comparative analysis to assist researchers and practitioners in selecting the appropriate algorithm for their needs.

Keywords: clusterization, k-means, hierarchical clustering, performance metrics, density-based clustering

1. INTRODUCTION

Clusterization is a fundamental technique in machine learning and data mining that involves grouping a set of objects in such a way that objects in the same group or cluster are more similar to each other than to those in other groups. This paper discusses various clustering algorithms, exploring their mechanisms, mathematical underpinnings, advantages, and limitations. Understanding these algorithms is crucial for effective data analysis and pattern recognition.

2. MAIN PART

2.1. Definition of Clusterization

Clusterization refers to the process of partitioning a dataset into distinct, non-overlapping groups, where items within each group are more similar to each other than to those in other groups. Mathematically, given a set of n data points $\{x_1, x_2, \dots, x_n\}$, clusterization aims to partition these points into k clusters $C = \{C_1, C_2, \dots, C_k\}$ such that:

$$\forall x_i, x_j \in C_m, \text{similarity}(x_i, x_j) > \text{similarity}(x_i, x'_j) \text{ for all } C_{m'} \neq C_m$$

where $\text{similarity}(x_i, x_j)$ measures how similar two data points x_i and x_j are.

2.2. Importance of Clusterization

Clusterization is used in various fields such as biology, marketing, and image processing for tasks like customer segmentation, gene expression analysis, and object recognition.

3. TYPES OF CLUSTERIZATION ALGORITHMS

3.1. Partitioning Methods

K-Means Clustering - The K-Means algorithm partitions the dataset into k clusters by minimizing the sum of squared distances between data points and their respective cluster centroids. The objective function is given by:

$$J = \sum_{i=1}^k \sum_{x \in C_i} |x - \mu_i|^2$$

where μ_i is the centroid of cluster C_i and $|\cdot|$ denotes the Euclidean distance.

- K-Medoids Clustering

The K-Medoids algorithm minimizes the sum of dissimilarities between data points and a set of k representative data points medoids. The objective function is:

$$J = \sum_{i=1}^k \sum_{x \in C_i} d(x, m_i)$$

where m_i is the medoid of cluster C_i and $d(x, m_i)$ is the dissimilarity measure between data point x and medoid m_i .

3.2. Hierarchical Methods

- Agglomerative Hierarchical Clustering

In Agglomerative Hierarchical Clustering, clusters are formed based on a distance matrix. The distance between two clusters C_i and C_j can be computed using various linkage criteria such as:

- Single Linkage: $\text{distance}(C_i, C_j) = \min_{x \in C_i, y \in C_j} \text{distance}(x, y)$
- Complete Linkage: $\text{distance}(C_i, C_j) = \max_{x \in C_i, y \in C_j} \text{distance}(x, y)$
- Average Linkage: $\text{distance}(C_i, C_j) = \frac{1}{|C_i||C_j|} \sum_{x \in C_i} \sum_{y \in C_j} \text{distance}(x, y)$
- Divisive Hierarchical Clustering

Divisive Hierarchical Clustering recursively splits the dataset into smaller clusters. The splitting criterion often involves maximizing the variance between clusters.

3.3. Density-Based Methods

- DBSCAN Density-Based Spatial Clustering of Applications with Noise

DBSCAN groups points based on density. A point is classified as a core point if it has at least minPts points within its neighborhood of radius ϵ . The density reachability is defined as:

$$\text{Reachability}(p, q) = \text{distance}(p, q) \leq$$

- OPTICS Ordering Points to Identify the Clustering Structure

OPTICS extends DBSCAN by providing a reachability plot, which orders the data points based on their reachability distances and core distances.

3.4. Model-Based Methods

- Gaussian Mixture Models GMM

GMM assumes data is generated from a mixture of Gaussian distributions. The probability density function for a GMM is:

$$p(x) = \sum_{i=1}^k \pi_i \mathcal{N}(x | \mu_i, \Sigma_i)$$

where π_i is the mixing coefficient, μ_i is the mean vector, and Σ_i is the covariance matrix for the i -th Gaussian component.

- Hidden Markov Models HMM

HMMs are used for clustering sequences. The joint probability of a sequence $O = (o_1, o_2, \dots, o_T)$ is given by:

$$P(O) = \sum_Q P(O, Q) = \sum_Q \left(\prod_{t=1}^T P(o_t | q_t) \right) P(Q)$$

where Q is a sequence of hidden states and $P(o_t | q_t)$ is the emission probability of observing o_t given state q_t .

4. COMPARATIVE ANALYSIS

4.1. Performance Metrics

- Silhouette Score

The silhouette score for a data point x is defined as:

$$s(x) = \frac{b(x) - a(x)}{\max\{a(x), b(x)\}}$$

where $a(x)$ is the average distance between x and other points in the same cluster, and $b(x)$ is the minimum average distance between x and points in any other cluster.

- Davies-Bouldin Index

The Davies-Bouldin Index is given by:

$$DB = \frac{1}{k} \sum_{i=1}^k \max_{j \neq i} \left(\frac{S_i + S_j}{d(C_i, C_j)} \right)$$

where S_i is the average distance between points in cluster C_i , and $d(C_i, C_j)$ is the distance between the centroids of clusters C_i and C_j .

- Calinski-Harabasz Index

The Calinski-Harabasz Index is defined as:

$$CH = \frac{\text{tr}(B_k)}{\text{tr}(W_k)} \times \frac{n - k}{k - 1}$$

where $\text{tr}(B_k)$ is the trace of the between-cluster dispersion matrix, $\text{tr}(W_k)$ is the trace of the within-cluster dispersion matrix, and n is the number of data points.

4.2. Application Scenarios

- K-Means: Suitable for well-separated clusters and large datasets.

- DBSCAN: Ideal for datasets with noise and varying densities.

- GMM: Effective for datasets with overlapping clusters.

5. CONCLUSION

Clusterization algorithms are essential tools for data analysis, each with its strengths and weaknesses. The choice of algorithm depends on the specific characteristics of the dataset and the goals of the analysis. Future research may focus on hybrid approaches that combine the strengths of different algorithms to improve clustering performance and adaptability.

Moreover, advancements in machine learning and computational power have opened the door to developing more sophisticated clustering methods that can handle high-dimensional, noisy, or sparse data. Incorporating deep learning techniques, such as autoencoders or reinforcement learning, may provide more robust clustering models that can automatically detect patterns in complex datasets. As the amount of data grows, scalable and efficient clustering algorithms will continue to be a crucial area of research.

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Rezyume: Klasterlash algoritmlari ma'lumotlarni tahlil qilishda muhim vosita bo'lib, katta ma'lumotlar to'plamlarini o'xshash ma'lumotlar nuqtalarini guruhlash orqali tartibga solish va izohlash imkonini beradi. Ushbu maqolada turli xil klasterlash algoritmlari, jumladan, ularning printsiplari, matematik asoslari, ilovalari va ishlash ko'rsatkichlari ko'rib chiqiladi.

Резюме: Алгоритмы кластеризации являются жизненно важными инструментами в анализе данных, позволяя организовывать и интерпретировать большие наборы данных путем группировки схожих точек данных. В этой статье рассматриваются различные алгоритмы кластеризации, включая их принципы, математические основы, приложения и показатели производительности.

Kalit so'zlar: klasterlash, k-o'rtacha, ierarxik klasterlash, ishlash ko'rsatkichlari, zichlikka asoslangan klasterlash.

Ключевые слова: кластеризация, k-средние, иерархическая кластеризация, метрики производительности, кластеризация на основе плотности.

AN OVERVIEW OF BLOCKCHAIN TECHNOLOGY

Allanazarov A.B¹, Baymuratova S.J².

*¹Nukus branch of Tashkent University of Information Technologies named after
Muhammad al-Khwarizmi*

²Real School learning center

Summary: As data breaches and privacy concerns become more prevalent in the digital age, blockchain technology presents a robust solution for securing user data. This paper explores how blockchain can be leveraged to enhance data privacy and security. Through its decentralized, transparent, and immutable nature, blockchain technology offers a novel approach to data protection, reducing reliance on centralized systems vulnerable to attacks.

Keywords: blockchain, data protection, cryptographic hash, decentralization, Merkle trees.

INTRODUCTION

In today's digital world, the security of user data has become a paramount concern. With increasing incidents of data breaches, cyber-attacks, and privacy violations, traditional data security systems are being tested to their limits. Centralized databases, which are the backbone of most organizations, are vulnerable to single points of failure and exploitation by malicious actors.

Blockchain technology, initially popularized by cryptocurrencies like Bitcoin, has evolved into a multi-purpose technology with potential applications in diverse fields. The decentralized nature of blockchain, coupled with its inherent security features, makes it an ideal candidate for protecting sensitive user data. This paper explores the application of blockchain technology in safeguarding user information and ensuring privacy, introducing mathematical concepts to explain its cryptographic security.

BLOCKCHAIN FUNDAMENTALS

Blockchain is a decentralized ledger system that records transactions across a network of computers (nodes). It operates on the principle of distributed consensus, where each node holds a copy of the ledger, ensuring that no single entity controls the data. Key features of blockchain include:

- Decentralization: No central authority governs the system, reducing the risk of a single point of failure.
- Immutability: Once data is written onto the blockchain, it cannot be altered or deleted without altering all subsequent blocks, which is computationally infeasible.
- Transparency: All transactions are visible to network participants, but sensitive information can be encrypted to preserve privacy.
- Consensus Mechanisms: These algorithms ensure that all network participants agree on the validity of transactions before they are added to the blockchain.

APPLICATION OF BLOCKCHAIN IN DATA PROTECTION

Decentralized Data Storage

One of the primary ways blockchain enhances data security is through decentralized storage. Traditional cloud systems store user data in centralized servers, making them vulnerable to hacks or system failures. Blockchain-based systems store encrypted user data across a distributed network, eliminating the vulnerability of a central server.

Cryptographic Hash Functions

Blockchain employs cryptographic hash functions to secure user data. A hash function, denoted as $H(x)$, takes an input (x) and produces a fixed-length output. The most common hash functions used in blockchain systems are SHA-256 (Secure Hash Algorithm 256-bit), where for any input (x), the output (y) is given by:

$$y = H(x)$$

This ensures that even a small change in (x) results in a dramatically different output (y), a property known as the "avalanche effect." Additionally, the hash function is one-way, meaning that

given (y), it is computationally infeasible to retrieve (x). This is critical in blockchain systems, as it allows for data integrity checks without revealing the original data.

Merkle Trees for Data Integrity

Merkle Trees are a fundamental mathematical structure used in blockchain to ensure data integrity. They enable efficient and secure verification of data within large datasets. A Merkle Tree is a binary tree where each leaf node represents the hash of a data block (D_i), and each non-leaf node is the hash of the concatenation of its child nodes.

Let ($D_1, D_2, \dots, D_n$) be the data blocks, and ($H(D_i)$) represent the hash of each block. The root (R) of the Merkle Tree is computed as:

$$R = H(H(D_1 || D_2) || H(D_3 || D_4))$$

where ($||$) denotes concatenation. If any block (D_i) is altered, the root hash (R) will change, thus allowing participants to verify data integrity by only storing the root hash rather than the entire dataset.

Public-Key Cryptography

Blockchain also employs public-key cryptography (asymmetric encryption) to ensure data confidentiality and access control. Each user is assigned a pair of cryptographic keys: a public key (K_{pub}) and a private key (K_{priv}). Data encryption and decryption follow these formulas:

- For encryption of data (M), we use the public key (K_{pub}):

$$C = E_{K_{pub}}(M)$$

- For decryption, we use the private key (K_{priv}):

$$M = D_{K_{priv}}(C)$$

In the context of blockchain, when a user wishes to send encrypted data, they encrypt the data using the recipient's public key. Only the recipient, possessing the corresponding private key, can decrypt the message, ensuring confidentiality.

MATHEMATICAL MODEL OF BLOCKCHAIN SECURITY

Probability of Attack on Blockchain

The security of a blockchain is often associated with its consensus mechanism, particularly Proof of Work (PoW). In PoW, miners compete to solve a cryptographic puzzle, with the solution being a hash value that satisfies a condition (e.g., starting with a certain number of leading zeroes). The probability (P) of a miner solving the puzzle is proportional to their computational power relative to the total network power. For a miner with computational power (p) in a network with total power (P_{total}), the probability of solving the puzzle is:

$$P_{solve} = \frac{p}{P_{total}}$$

To ensure blockchain security, a majority attack, where an adversary control more than 50% of the network's computational power, is required to alter past blocks. The probability (P_{attack}) of successfully executing a majority attack decreases exponentially with the depth of the target block and the time it takes to confirm transactions.

$$P_{attack} = \left(\frac{p}{P_{total}} \right)^n$$

where (n) is the number of subsequent blocks confirming the transaction, demonstrating that as (n) increases, the likelihood of a successful attack diminishes, making blockchain increasingly secure over time.

Challenges in Blockchain Data Protection

Despite its potential, blockchain is not without challenges. Scalability remains a critical issue, as the size of the blockchain grows linearly with each new block added. Additionally, the computational intensity of consensus mechanisms like Proof of Work can lead to high energy consumption. Privacy, while enhanced by encryption, can also be a concern as transaction metadata remains visible on the blockchain.

CONCLUSION

Blockchain technology offers a novel and mathematically robust approach to protecting user data. By employing cryptographic hash functions, public-key cryptography, and decentralized data storage, blockchain minimizes the risks associated with centralized data storage systems. Mathematical models, such as those based on hash functions and Merkle Trees, form the foundation of blockchain's security architecture. While challenges exist, the integration of blockchain into data protection frameworks holds significant promise for the future of secure data management.

Rezyume: Raqamli texnologiyalar davrida ma'lumotlarning sizib chiqishi va maxfiylik muammolari tobora keng tarqalgan bo'lib, blokcheyn texnologiyasi foydalanuvchi ma'lumotlarini himoya qilish uchun ishonchli echimni taqdim etadi. Ushbu maqola ma'lumotlar maxfiyligi va xavfsizligini yaxshilash uchun blokcheyn qanday ishlatilishini ko'rib chiqadi.

Резюме: В цифровую эпоху все чаще встречаются утечки данных и проблемы конфиденциальности, технология блокчейн представляет собой надежное решение для защиты пользовательских данных. В этой статье рассматривается, как блокчейн может быть использован для повышения конфиденциальности и безопасности данных.

Kalit so'zlar: blokcheyn, ma'lumotlarni xavfsizligi, kriptografik xesh, demarkazsizlashtirish, Merkle daraxtlari

Ключевые слова: блокчейн, защита данных, криптографический хэш, децентрализация, деревья Меркла.

**OPERATIVE AND REASONABLE USE OF IRRIGATION WATER IN THE
ENVIRONMENT OF THE REPUBLIC OF KARAKALPAKSTAN**

Kurbanbaev S¹, Turlibaev Z.²

¹*Karakalpak branch office of the Scientific-research Institute of irrigation and water problems,*

²*Karakalpak State University named after Berdakh*

Summary: *There is an acute shortage of water resources in the region under consideration. This is especially reflected when irrigating agricultural crops. In order to mitigate the consequences, it is necessary to search for alternative options for saving water resources. The article presents scientific research, including complex water-saving measures when irrigating crops for the conditions of the Republic of Karakalpakstan. On the irrigated territory of the farm, a demonstration site has been created in the complex, where various types of resource-saving technologies for irrigation and leaching of saline lands are tested and implemented. Taking into account the characteristics of this region, various types of irrigation of agricultural crops were tested at the scientific site, including the equipment and technology of furrow irrigation and irrigation with drip irrigation systems. When using various technologies, significant water savings were obtained compared to traditional irrigation, including: - the rate of land leaching was 2700 m³/ha, which is 850 m³/ha lower or 25% lower than the average value of the experimental indicators of previously carried out leaching; - the irrigation rate when using the drip irrigation system was 2793 m³/ha, while saving water resources by 35-44% than the rate with traditional irrigation. Based on the results obtained, recommendations for the introduction of irrigation technologies for the conditions of the Republic of Karakalpakstan were formed. A number of demonstration seminars and courses on organizing water-saving technologies for irrigation of agricultural crops were conducted.*

Keywords: *Research, landfill, irrigation technology, furrow irrigation, drip irrigation, counter irrigation, irrigation film, water saving, irrigation systems.*

INTRODUCTION.

Water conservation today is the main principle of the transition to integrated water resources management and the basis for rational water use. The main objectives of water conservation are: saving irrigation water, increasing the efficiency of use of irrigation water, improving the productivity of water and land use, etc.

The use of water-saving technologies helps save water resources, improve soil fertility and is carried out in the following main areas:

- reduction of water supply intensity;
- improving the quality of irrigation by increasing the uniformity of moisture;
- formation of a favorable habitat for plants;
- taking into account the physiological characteristics of plants when developing and choosing irrigation methods;
- creation of a closed water cycle;
- improving the quality and reuse of drainage and waste water.

In all studies of drip irrigation systems (DIS), water savings range from 40 to 60% compared to furrow irrigation. Water savings are achieved by eliminating water losses due to deep filtration and filtration that forms soil subsidence during furrow irrigation with water discharge at the end of the field.

The worsening water management situation determines the real need for the accelerated implementation of the transfer of irrigated agriculture to highly developed, effective resource-saving technology and irrigation techniques. This scientific and technical problem, which is of great economic importance, is especially relevant for the Republic of Karakalpakstan, where, despite the centuries-old history of irrigated agriculture, resource-saving irrigation technologies are still poorly

developed. In this regard, the main attention in this work is on the problems of introducing new resource-saving technologies.

A huge amount of ongoing research on irrigation techniques and technologies requires generalization, testing and implementation in agricultural use on the basis of an experimental site in the field. Field agricultural experience - research carried out in the field allows you to conduct research as close as possible to production conditions and draw reliable conclusions and make recommendations for the widespread use of one or another tested technology. The main objective of the field experiment is to establish differences between the experimental options, quantify the effect of various factors, conditions or methods of influencing the plant yield and its quality; in this particular case, the results of studies of the influence of a particular irrigation technology on the growth, development and formation of the cotton crop and Before conclusions and recommendations for production (if any can be proposed) can be drawn, they must be tested under comparative field experience. All this makes field experience the main, most important method of research in agricultural production.

RESEARCH METHODOLOGY.

Field research was carried out within the territory of the farm. Parameter measurements were carried out on the basis of geodesy techniques (theodolite and leveling measurements) when determining the parameters of irrigation and reclamation areas, indicators of soil differences using soil research methods, and when determining the degree of salinity, the express method of electrical conductivity was adopted.

The determination of water flows supplied for irrigation of agricultural crops was carried out using the generally accepted hydrometric method; in particular, all irrigation canals of the experimental site were equipped with control structures. Shandor measuring 0.40 x 0.50 and a SANIIRI tray (Yartsev) for which the incoming water was recorded (Fig. 1).

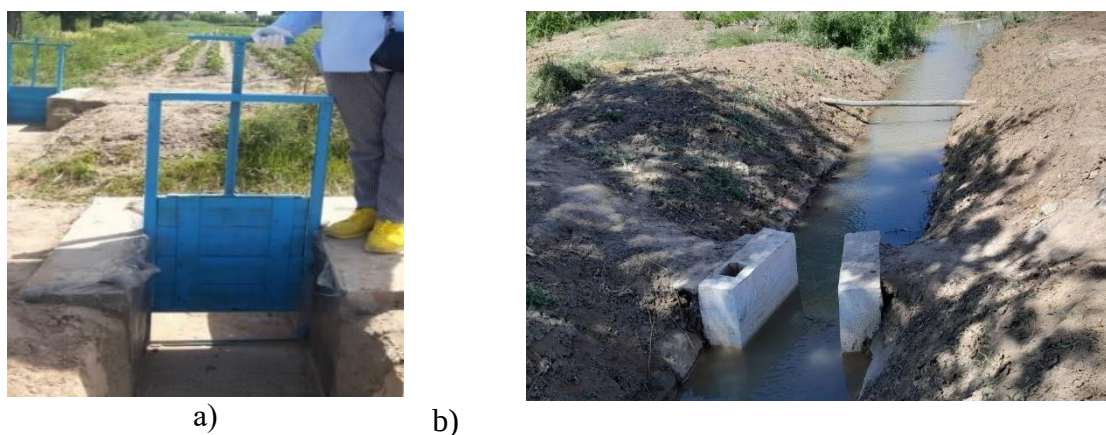


Figure 1 – Shandor a), SANIIRI tray (Yartsev)

All these structures were used to record the flow of water for irrigation.

RESULTS AND DISCUSSION.

Object of research: The results of the above studies were obtained on an experimental plot on the basis of a farm located in the Kegeyli region of the Republic of Karakalpakstan.

Main part: In irrigation practice, there are three methods of irrigation: surface, sprinkling and drip (subsoil). Each of these methods has its own advantages and disadvantages. The main and promising method of irrigation, despite all its shortcomings, for the conditions of the Republic of Karakalpakstan still remains surface irrigation. In recent years, numerous works have been carried out to rationalize and study the possibilities of its effective use.

The tense water management situation in recent years in the lower reaches of the Amudarya River, expressed in the lack of water resources for irrigation of agricultural crops, forces us to consider the acceptability of using subsoil and drip irrigation, where there is an acute shortage of water (even on the basis of weakly mineralized groundwater).

At the established experimental production site, cotton variety S-4727 was sown, an obsolete cotton variety (the variety was bred in 1950, zoned in 1961), but nevertheless it recommended itself well in production conditions, both in terms of salt tolerance and good fiber quality.

When conducting research at the pilot plant, three resource-saving technologies of furrow irrigation and drip irrigation of cotton were tested.

Ordinary irrigation - furrow irrigation is used everywhere in the production conditions of the Republic of Karakalpakstan. At the same time, depending on the slope of the terrain, watering is carried out on one side and the main disadvantages are: high labor costs, long duration of watering time, large volume of vertical filtration, with low water flow rates in the furrow (up to 0.4 - 0.5 l/s), which ultimately leads to excessive consumption of irrigation water and an increase in groundwater levels.

Irrigation through a furrow can be successfully used both separately and in combination with counter irrigation. This option gives the expected results on soils of medium and light texture. When irrigating through a furrow, a slight slope close to the ground surface is allowed (0.0003 - 0.0005) and water is supplied through the furrow.

When using irrigation through a furrow, soil aeration improves throughout the growing season and thereby reduces the amount of inter-row tillage and allows you to get a high yield with minimal water consumption.

Counter irrigation combined with concentrated water supply. In this case, watering is carried out from both sides through one side temporary sprinklers (temporary sprinklers are cut using a ditch digger, and one side of the roller is developed manually to supply water along the furrows). Water is supplied simultaneously from both sides. At the same time, the furrow length and watering time are reduced by 1.5 - 2.0 times. A prerequisite for this is good planning with a zero slope.

Irrigation using anti-filtration film - the main conditions for the use of this technology are the use of technology on sandy soil, and also preferably on lands with deep groundwater levels. The use of this technology helps retain soil moisture for a long period, and the film coating also prevents the growth of weeds in the furrows. This irrigation technology can be combined with the above irrigation technologies.

Drip irrigation is an irrigation method in which an amount of water is delivered to the soil layer where the main root system of the plant develops while maintaining crops. With drip irrigation, it is possible to water at rates of 300-400 m³/ha, taking into account the type of crop, water consumption, irrigation rate, duration and frequency of irrigation, and stages of crop development. There is no excess moisture in the active soil layer. With this method of irrigation, the efficiency of the irrigation method is increased due to the fact that mineral fertilizers are supplied dissolved in the soil along with water using a special device for applying fertilizers. With drip irrigation, you can constantly provide the plant with water and nutrients depending on its needs. As a result of supplying water saturated with mineral fertilizers to crops throughout the entire irrigation period through a drip irrigation system, it is possible to ensure an acceptable (optimal) water-nutrient regime in the subsoil layer. As a result, the crop is not stressed in terms of nutrients and water requirements during development stages, the crops are provided with water and nutrients, and the resources used when watering the crop are not wasted.

Groundwater level monitoring

During the experiment, an observation well was installed at the experimental site and systematic observations were made of changes in the groundwater level at the experimental site, where various furrow irrigation technologies were tested. Data on groundwater levels are given in table. 1.

Table 1

Average monthly groundwater level according to the operating level for the observation period

№ samplin g point	IX	X	XI	XII	mine r g/l	I	II	III	IV	V	VI	VII	VII I	mine r g/l
	2021					2022								
1	25 9	21 1	27 3	28 5	3,81 0	32 9	24 6	32 9	18 1	18 9	26 6	27 9	309	3,92 0

The current year 2022, just like the previous year 2021, was low in water, autumn-winter leaching of the soil was not carried out on the farm, spring leaching was also carried out at low rates in connection with this, as can be seen from the data in the table. 1, the groundwater level was quite low, below the 200 cm mark, even after irrigation, the groundwater level rarely rose above the 150 cm mark.

Taking this into account, it can be argued that groundwater practically did not participate in the water consumption of cotton at the pilot plant, since if groundwater lies at a depth of 2-2.5 m, its contribution to the water regime of root-inhabited horizons is small.

The mineralization of groundwater in the experimental area is quite high and ranges from 2.7 g/l to 3.9 g/l.

The groundwater level was low enough from the surface of the earth and could not have a sufficient negative effect on plants, and also did not contribute to secondary salinization of the soil.

Monitoring soil moisture changes

When solving certain engineering, reclamation (irrigation and drainage) and agrotechnical measures, the assessment of natural soil moisture resources is of utmost importance. Especially in the process of crop formation, the main role is played by maintaining optimal moisture in the root layer of the soil.

For the selected area in 2022, humidity sampling points were established for each option, according to which systematic observations were made of the nature of humidity changes, both in depth and in area. Soil moisture was normal only in the month of May, however, on other dates in all irrigation options, drying of the soil was observed on the top layer, which is associated with the lack of water for irrigation and an extreme increase in air temperature from late June to early August, which could not but affect on soil moisture, especially the top layer up to 40 - 60 cm layer.

Cotton is considered a relatively drought-resistant plant. Cotton responds very well to irrigation, and yields increase sharply. The year 2023 was an average year during the growing season; the first watering of cotton began in early July.

The maximum value of the irrigation norm according to option IV turned out to be equal to 3045.0 m³/ha, the smallest according to option II is 2332.0 m³/ha, however, the frequency of irrigation increases here, since watering is carried out through one furrow; watering is carried out with small irrigation norms, so there is a need to supply additional water supply.

According to the analysis of the experience, the most economical option was irrigation through a furrow, however, one of the disadvantages of this technology can be considered an increase in the frequency of irrigation. This technology can be recommended for the first irrigation of cotton, when the plants do not need a large amount of water; then it can be combined with other irrigation options, be it counter-forced irrigation or irrigation with an anti-filtration film.

After all the technical preparations were completed, watering of cotton began at the pilot plant with a drip irrigation system. With each irrigation, water was supplied to the fields in several cycles depending on the needs of the plants. So the first test watering was carried out in three cycles on 06/30, 07/05. and 07.07. 23 years the norm is 394 m³/ha. The second watering started on July 11. with a rate of 551 m³/ha, during the third irrigation the number of water supply cycles was increased and the supply rate was accordingly increased to 1061 m³/ha, the increase in cycles and water supply rates is explained by the abnormally high air temperature during this period of time, when the air

temperature warmed up to 43 – 45⁰C, which provoked an increase in the share of evaporation from the soil surface. The fourth and all subsequent irrigations, there were 7 in total, were carried out in a standard mode with rates ranging from 249 to 415 m³/ha. In total, 2793 m³/ha were supplied to the pilot plant with drip irrigation during the growing season. According to the results of research in 2023, the following advantages of drip irrigation were identified: only the root part of the cotton plant is moistened; water losses due to cotton transpiration are reduced; the concentration of cotton irrigation on the irrigated plot is eliminated; There are no water losses due to vertical discharge and good reclamation conditions are maintained.

CONCLUSION:

1. Water savings when using various options of furrow irrigation relative to the control option amounted to 179 m³/ha in option I, 713 in option II, and 150 m³/ha in option III. Can be seen that the most economical option was irrigation through a furrow, however, one of the disadvantages of this technology can be considered an increase in the frequency of irrigation. This technology can be recommended for the first irrigation of cotton, when the plants do not need a large amount of water; then it can be combined with other irrigation options, be it counter-forced irrigation or irrigation with an anti-filtration film.

2. With drip irrigation, in comparison with traditional irrigation technology, the following savings in water resources have been identified, according to the irrigation regime according to NPO “Cotton”, with traditional cotton irrigation technology, a norm of 5000 m³/ha is required (VII hydromodular region), i.e. According to the results of studies with drip irrigation, savings of about 44% of water resources were obtained; according to Sredazgiprovodkhopok, the irrigation rate of cotton is 4300 m³/ha, respectively, saving water resources of about 35%. It follows from this that with proper operation of the drip irrigation system in production conditions, it is possible to achieve savings in water resources of the order of 25 - 30%.

Cotton yield according to monitoring results

Harvesting and accounting for crops require special attention and accuracy, since yield during an experiment is the main criterion for assessing the conduct of a particular study. As has already been mentioned above, due to technical reasons, drip irrigation on the site was not possible; watering was carried out in the usual way along furrows; therefore, the data presented here can serve for a comparative analysis of next year's research.

The date of the first harvest on the experimental field has not yet been carried out; therefore, the calculated biological yield was determined on the experimental plot. The yield calculation was carried out in the same way as in experiments with furrow irrigation technologies.

As can be seen from the data in table. 2, the highest yield is expected from field No. 1, field No. 2 is in second place in terms of productivity, field No. 3 is expected to have the smallest yield, this can be explained by the fact that the soil of this field is the most saline

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Rezyume: Ushbu maqolada so'nggi yillarda suvning qayta-qayta tanqisligi suvni tejash va suvdan tejamkor foydalanishning qat'iy rejimi talablarini taqozo etmoqda. Qishloq xo'jaligi ishlab chiqaruvchilariga suvni qat'iy tejash va samarasiz suv yo'qotishlariga qarshi kurashish zarurligini tushunishni boshlash kerak, ya'ni. fermer xo'jaliklaridan, chunki suvdan oqilona foydalanish va dala darajasida suvni tejash sug'orish suvini sezilarli darajada tejash imkonini beradi. Sug'orish suvidan samarali foydalanishda sug'orish texnologiyasini tanlash muhim rol o'ynaydi, bu sug'orishning dala maydoni bo'ylab tuproq namligini talab qilinadigan vaqt oralig'ida va minimal mehnat sarfi bilan etarli darajada bir xilda ta'minlash talablariga javob beradi. usul oxir-oqibat sug'orish paytida katta miqdorda suv yo'qotishlariga va sug'orish paytida ko'p vaqt sarflashga olib keladi. Bu holat tadqiqotni taqozo etadi, shu maqsadda Amudaryoning quyi oqimi sharoitlari uchun sug'orish texnikasi va texnologiyalarining optimal variantlari o'rganilib, tanlab olingan hamda yuqorida aytilganlarning barchasini hisobga olgan holda sinov maydonchasi tashkil etildi; Bu ishda g'o'zani jo'yaklar bo'ylab sug'orishning yer usti usuli va tomchilatib sug'orishning ilg'or resurs tejovchi texnologiyalarini joriy etish muammolariga e'tibor qaratildi.

Резюме: В данной статье повторяющиеся в последние годы маловодье диктует требования жесткого режима водосбережения и экономного использования воды. Понимание необходимости жесткого водосбережения и борьбы с непродуктивными потерями воды необходимо начинать прививать с производителей сельскохозяйственной продукции, т.е. с фермерских хозяйств, так как рациональное водопользование и водосбережение на уровне поля могли бы сэкономить значительное количество оросительной воды.

Немаловажную роль в эффективном использовании оросительной воды играет выбор технологии полива, отвечающий требованиям обеспечения достаточно равномерного по площади поля увлажнения почвы в требуемые сроки и при минимальной затрате труда, несовершенство же поверхностного способа полива в итоге приводит к большим потерям воды при поливах и большим затратам времени при проведении полива.

Такое положение требует проведения исследований, с этой целью был организован полигон, на котором изучены и выбраны оптимальные варианты техники и технологии полива для условий низовий Амударьи и учитывая все вышеперечисленное, основное внимание в настоящей работе акцентировалось на проблемы внедрения совершенных ресурсосберегающих технологий поверхностного способа орошения по бороздам и капельного орошения хлопчатника.

Kalit so'zlar: Tadqiqot, poligon, sug'orish texnologiyasi, jo'yakli sug'orish, tomchilatib sug'orish, qarshi sug'orish, sug'orish plyonkasi, suvni tejash, sug'orish tizimlari

Ключевые слова: Исследования, полигон, технология орошения, полив по бороздам, капельное орошение, встречный полив, ирригационная пленка, водосбережение, оросительные системы

SYNTHESIS AND PHYSICO-CHEMICAL PROPERTIES OF O-g-C₃N₅/AgCl COMPOSITE

Sidrasulieva G.B., Aytmuratova A.E., Usnatdinova S.P., Kattaev N.T., Akbarov H.I.
National University of Uzbekistan

Summary: The article presents the results of the synthesis and physico-chemical properties of the nanoscale compound O-g-C₃N₅/AgCl. The structure and size characteristics of the resulting O-g-C₃N₅/AgCl composite photocatalyst have been researched using IQ-spectroscopy, X-ray analysis, and methods of dynamic scattering of light.

Key words: graphite carbon nitride, nanoparticle, composite, photocatalyst, hydrodynamic dimension.

Introduction:

Currently, in the context of the depletion of resources, the energy crisis and a number of environmental problems present a number of tasks to chemical scientists. Most of the environmental problems are caused by water pollution caused by toxic organic compounds [1]. An effective and promising way to overcome such problems is to use a photocatalyst.

In this regard, photocatalysts with environmentally friendly, economically advantageous and renewable semiconductor properties are gaining importance. In particular, photocatalysts are used in the photocatalytic decomposition of organic dyes, in the field of electrochemistry as semiconductors, in the extraction of hydrogen gas from water, in the decomposition of antibiotics, in the reduction of CO₂ to organic compounds, and also as effective sensors for gases [2-3]. Therefore, it is an important urgent task to synthesize nanoscale modifications of graphitic carbon nitride with improved properties and photocatalytically active in the visible light field and composites with metal oxides and salts, as well as to study their physicochemical properties. The purpose of this research work is to study the synthesis and physicochemical properties of the composite of oxygen-doped graphitic carbon nitride (O-g-C₃N₅) with AgCl salt.

Experiment part.

Synthesis method of O-g-C₃N₅/AgCl composite. To do this, we first synthesized 50 mg of (O-g-C₃N₅) and added 0.038 g of KCl, 0.085 g of AgNO₃ to 20 ml of distilled water and stirred for 30 minutes. A light brown substance was formed, the resulting product was washed several times with distilled water, and then the product - O-g-C₃N₅/AgCl was dried [6].

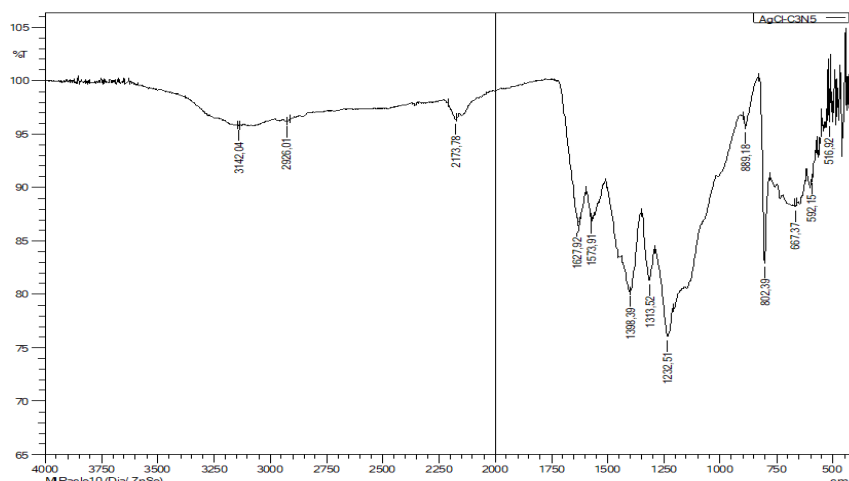
IR-Fure-spectroscopy (Bruker, Germany) is performed by measuring the samples in the wavenumber range of 400-4000 cm⁻¹ in the form of pellets mixed with KBr and compacted under pressure.

X-ray phase analysis (XRD) was performed on a multifunction X Pert Pro (Malverin Panaltical, The Netherlands) powder diffractometer at a wavelength of 1.54056 Å (CuKα). Measurements were made in the range of 10-80° with 1 second imaging duration and 0.01° scanning step.

Diffusion reflection spectroscopy (DFS) was performed on an Eye One Pro (il Pro) mini spectrometer (X-Rite Switzerland).

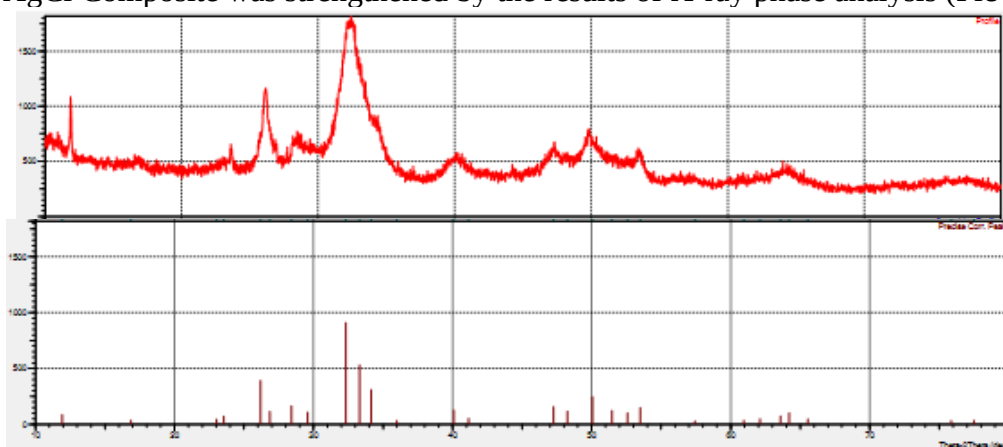
Discussion of the obtained results.

There are several methods for the synthesis of oxygen-doped carbon nitride O-g-C₃N_x, which use different precursors [4]. In particular, O-g-C₃N₅ was obtained by thermal processing of 3-amino-1,2,4-triazole in the presence of KBr at a temperature of 500°C for 3 hours in air [5]. In recent years, doping (g-C₃N₅) with metal oxides, salts, and synthesizing new composite materials with complex properties is a promising method. Therefore, in this research work, a new composite O-g-C₃N₅/AgCl was obtained by doping O-g-C₃N₅ with AgCl in the presence of air.



Pic. 1 Fourier IR spectrum of O-g-C₃N₅/AgCl photocatalyst

The newly synthesized Composite O-g-C₃N₅/AgCl was identified using IR - spectroscopy and compared to the IR-spectrum of O-g-C₃N₅ (Pic 1). The IR-spectrum of the O-g-C₃N₅/AgCl composite photocatalyst is very similar to the IR-spectrum of O-g-C₃N₅, with less strong displacements indicating that there is an interaction between AgCl and O-g-C₃N₅. In particular, in the area of 324.27 cm⁻¹, there is a wide band belonging to the collective symmetric and antisymmetric oscillations of the groups– NH₂ and – OH (N–H i(O–H)). Signals in areas 472.56, 667.37 cm⁻¹, as well as 1228.66 and 1568.13 cm⁻¹ belong to the heptazine ring. In addition, in the area of 1625.99 cm⁻¹, a polosa associated with group s(N) is observed. The IR spectrum of the O-g-C₃N₅/AgCl Composite indicates the presence of peaks belonging to O-g-C₃N₅ and AgCl. The IR spectrum of the O-g-C₃N₅/AgCl Composite was strengthened by the results of X-ray phase analysis (Pic 2).



Picture 2 diffractogram of O-g-C₃N₅/AgCl photocatalyst

The O-g-C₃N₅/AgCl Composite exhibits an AgCl-specific diffraction state that allows the hypothesis that the AgCl phase is conserved even within the composite.

Table 1.

Dimensions of O-g-C₃N₅/AgCl Composite crystallites

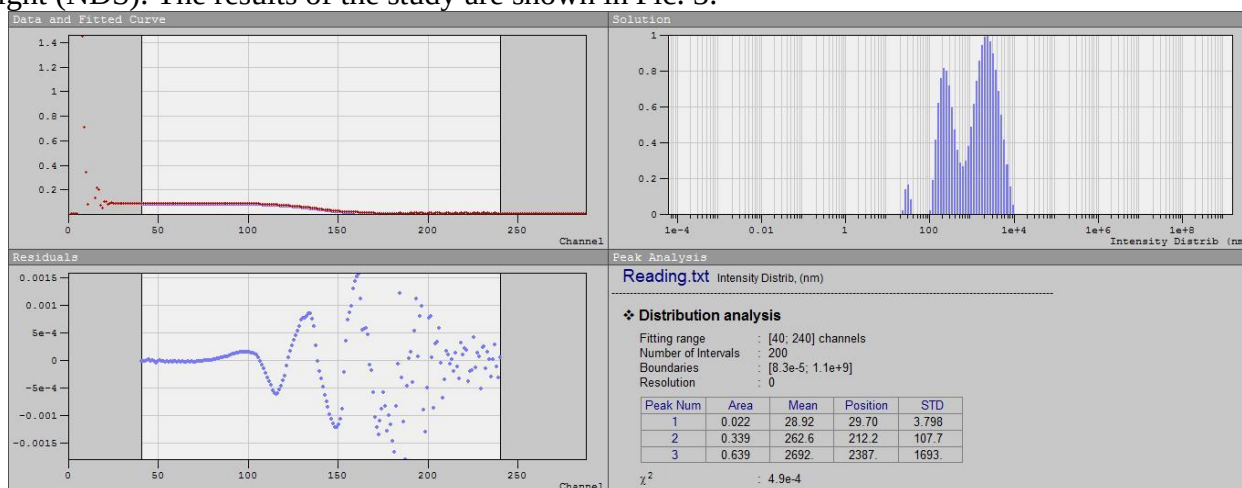
№	2θ(°)	d (Å)*	I/I ₁	B (FWHM)	D, nm
1.	26.1916	3.39968	43	0.78950	10.80
2.	28.4255	3.13738	18	0.85600	10.00
3.	32.3206	2.76762	100	1.53720	5.62
4.	34.1387	2.62427	34	1.41600	6.13
5.	47.2695	1.92140	17	1.40000	6.47
6.	50.0632	1.82053	27	1.88000	4.87

Using Sherrer's formula, it is possible to determine the dimensions of the crystallites of the phases contained in the composite.

$$D = \frac{K\lambda}{\beta \cos \theta}$$

Where D is the crystallite size, nm; K is the Sherrer constant, λ is the X-ray radiation wavelength (0.15418 nm for Cu) and β is the half-height reflex width, θ is the diffraction (Bragg) angle. From the results of the calculation using the Sherrer formula, it can be concluded that a structural change is taking place in the composite with respect to O-g-C₃N₅. Composite crystallites have dimensions (values in the range of 5-10 nm).

The formation of nanoparticles of O-g-C₃N₅-containing graphicymonic carbon nitride and O-g-C₃N₅/AgCl composite from volumetric materials under the influence of ultrasound. For the purpose of obtaining nanoparticles, volumetric materials were dispersed in an aqueous-isopropyl alcohol environment using ultrasound with a frequency of 50 kGts for 6 hours. After dispersion, the hydrodynamic dimensions of the particles were determined by the method of dynamic scattering of light (NDS). The results of the study are shown in Pic. 3.



Pic. 3. Hydrodynamic dimensions of O-g-C₃N₅/AgCl Composite

NDS analysis shows that O-g-c3n5 consists of 45.17 nm (34 %) and 209.1 nm (65.3%) in hydrodynamic resolution, while O-g-C₃N₅/AgCl Composite consists of 28.92 nm (2.2 %), 262.6 nm (33.9 %) and micron-level (63.9 %) particles. It should be noted that when the suspension is diluted, the increased polydispersion and dimensions of the particles remain in the samples, which indicates that the actual size of the particles is smaller than the hydrodynamic size.

Conclusion. A newly composed O-g-C₃N₅/AgCl nanoscale composite based on 3-amino-1,2,4-triazole was synthesized. The composition and structure properties of the O-g-C₃N₅/AgCl Composite have been researched using modern physical chemical research methods.

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Rezyume: *Maqolada nanoo'lchamli O-g-C₃N₅/AgCl kompoziti sintezi va fizik-kimyoviy xossalarini o'rganish natijalari keltirilgan. Olingan O-g-C₃N₅/AgCl kompozit fotokatalizatorning tuzilish va o'lcham xususiyatlari IQ-spektroskopiya, rentgenfazaviy tahlil va nurning dinamik sochilishi usullari yordamida tadqiq etilgan.*

Резюме: *В статье представлены результаты синтеза и физико-химические свойства наноразмерного композита O-g-C₃N₅/AgCl. Структуру и размерные свойства полученного композитного фотокатализатора O-g-C₃N₅/AgCl исследовали методами ИК-спектроскопии, рентгенофазового анализа и динамического светорассеяния.*

Kalit so'zlar: *grafitsimon uglerod nitridi, nanozarracha, kompozit, fotokatalizator, gidrodinamik o'lcham.*

Ключевые слова: *графитоподобный нитрид углерода, наночастицы, композитный фотокатализатор, гидродинамический размер.*

UDK 626/627.82

**PERMISSIBLE FLOW VELOCITIES FOR IMPROVING OPERATION AND
RELIABILITY OF THE ANASAY MAIN CANAL**

Bazarov D.R¹, Saparov A.B², Saparov B.B³, Norkulov B.E¹.

¹“Tashkent Institute of Irrigation and Agricultural Mechanization Engineers” National Research
University, ²Karakalpak Institute of Agriculture and Agrotechnology

³Nukus Mining Institute at Navoi State Mining and Technological University

Summary: The article discusses solutions for improving the operational regime, assessing the operational reliability and technical condition of the Anasay main canal based on field observations and research, and provides the calculated values of average speeds to improve the throughput, reliability and performance of the canal for further optimal water supply of irrigated areas.

Key words: Irrigation systems, reliability, hydraulic efficiency, Anasay main canal, construction, speed, siltation, erosion, canal deformation, efficiency, repair.

Assessing the operational reliability of objects using statistical data is one of the most pressing problems in reliability theory. Theoretical and experimental testing of the reliability of a number of objects of irrigation systems requires the development of certain systematic techniques, as well as the implementation of organizational measures for collecting statistical data and planning tests [1,4].

To ensure high reliability of canals, it is necessary to take such a calculated value of the average speed V , at which neither erosion nor siltation will occur in the canal. At unacceptably high speed values ($V \geq V_{dop}$), the sides and bottom may be subject to destruction (this also applies to canals with hard clothes) and erosion. At unacceptably low speeds ($V \leq V_{nez}$), sediment suspended in the water may fall out in the canal and the canal will gradually silt up. Siltation can occur not only in earthen, but also in concrete canals.

The permissible non-erosive average speed (V_{dop}) is understood as the highest value of the average speed of water movement at which the flow cannot cause erosion (destruction) of the riverbed that is unacceptable for normal operation.

The non-silting speed (V_{nez}) is taken to be the lowest value of the average speed at which the flow is capable of transporting the sediment contained in it without settling [2,3,5].

Anasay main canal. The Anasay canal takes water from the Takhiatash hydro complex, the right-bank water divider - Dvoynik, (the head structure) was commissioned in 1986. The length of the canal is 13,5 km. the calculated (design) capacity of the canal is 342.0 m³/sec.

A water dividing barrier structure was built at the end of the canal at PC 135÷00 [1,4,7].

Many sections of the canal have not been brought to the design level, are silted, and the actual value of the head water flow today is 95.0 m³/s (2022).

Based on field studies, figs. 1,2,3 show general data on the state of reliability of the Anasay main canal.



Fig.1. Destruction of the concrete lining of the Anasay main canal

From the histogram in fig.2, it should be noted that only 22,6% are in good condition, 58,7% are in satisfactory condition, and 18,7% are in unsatisfactory condition.

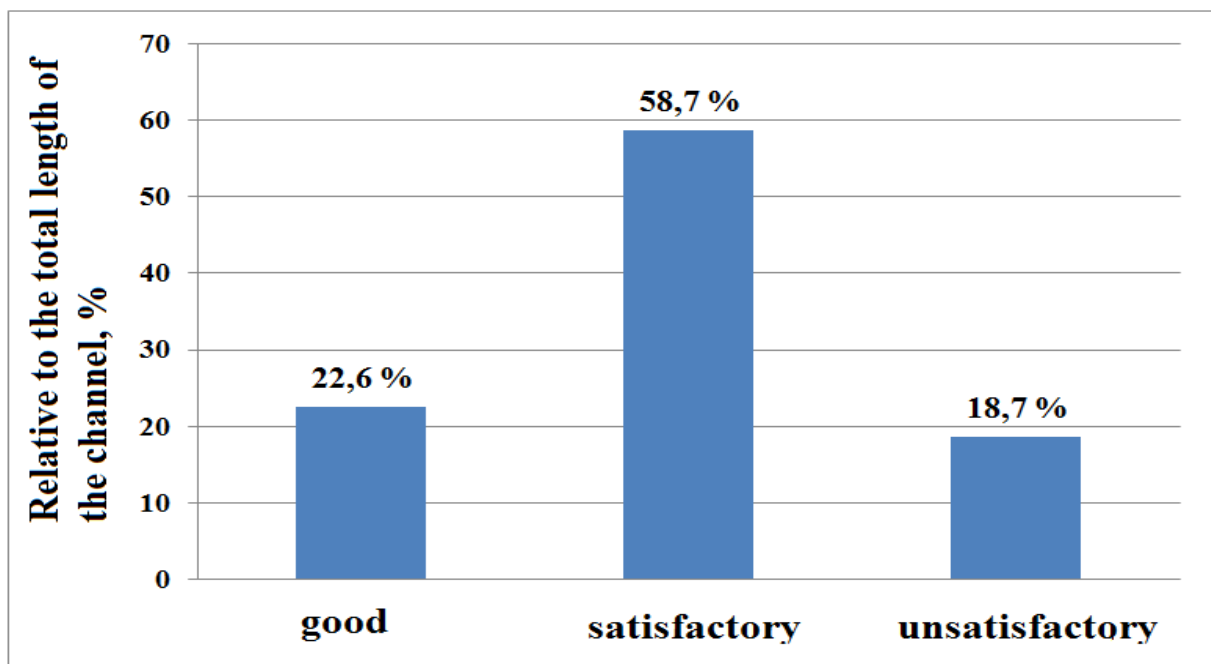


Fig.2. Technical condition of the Anasay main canal

18.7% of the canal is characterized by poor technical condition, which requires major and current repairs, as well as their reconstruction after design and research work.

The histogram in Fig. 3 indicates that the Anasay main canal (about 80%) has an efficiency from 0,60 to 0,88 and only 10% from 0,90 and above. The standard value of the efficiency of the main canal must be at least 0,90, since the efficiency characterizes both the throughput and losses during the operation of the canal, this in turn indicates that the analyzed canal has low hydraulic efficiency and reliability.

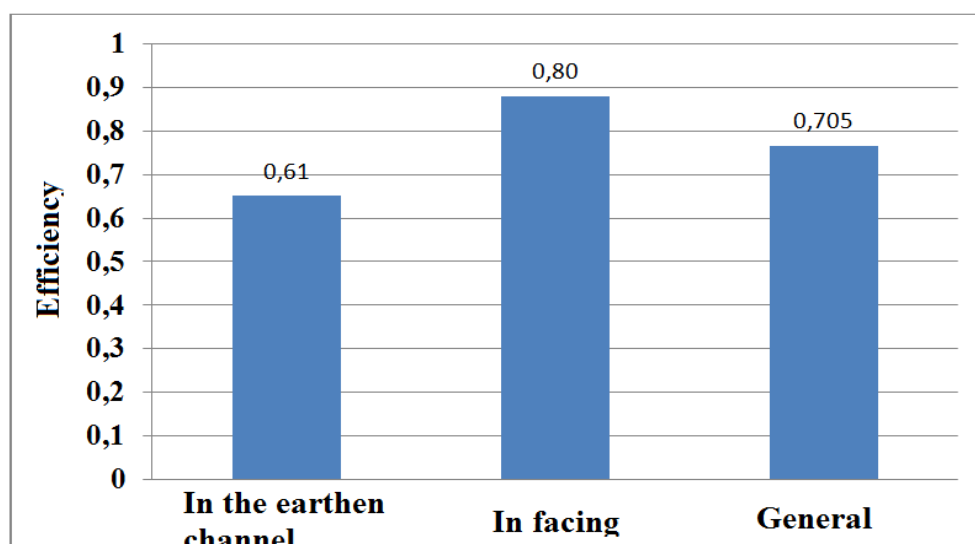


Fig. 3. Efficiency of the Anasay main canal

Among the main impact factors affecting the performance of both canals in the earthen canal and in the lining, it is especially necessary to highlight the overgrowth of canals with aquatic vegetation, erosion, deformation of canals, siltation, untimely maintenance and repair stages, destruction of slabs in the lining, which to a certain extent influence them. efficiency and reliability [1,2,3,6].



Fig. 4. Siltation of the Anasay main canal (2023)

From figs. 1 and 4 it is clear that characteristic measures to reduce the hydraulic efficiency and operational reliability of the surveyed canal are the Anasay main canal in the earthen canal, where there is significant overgrowth with aquatic vegetation, siltation, erosion of the banks, as well as violation of the integrity of concrete slabs and their connections in the main water intake and the end distribution section.

The results of field studies of the actual values of the efficiency of canals of irrigation systems in the right bank zone of the lower reaches of the Amudarya river showed that their average value for main canals is 0,829, which is 7 % lower than the minimum requirements of regulatory documents. At the same time, the efficiency of main canals in a concrete canal is 0,790, which is 11% lower than the requirements of regulatory documents, and for lined canals the average efficiency is 0,870, which is also lower than the required value for lined canals according to the recommendations of regulatory documents by 8-10 %.

To ensure high reliability of canals, it is necessary to take such a calculated value of the average speed at which neither erosion nor siltation will occur in the canal.

Let us first consider the permissible non-erosion velocities in non-cohesive soils, since in the conditions of irrigation systems of the lower reaches of the Amu Darya River, earthen canals are built in non-cohesive soils.

A non-cohesive soil is considered homogeneous if $d_{95}/d_5 < 5$, where d_5 and d_{95} are the diameter of particles, less than which the soil contains 5 % and 95 % by weight, respectively.

For non-cohesive soils, the permissible non-erosion velocities are found using the formulas proposed by C. E. Mirtskhulava.

For homogeneous non-cohesive soils at depth h .

$$\begin{aligned} g_{dop} &= \lg \frac{8,8h}{d} \sqrt{\frac{2m}{0,44\rho n} [g(\rho_{gr} - \rho)d + 2C_{un}^N k]}; \\ u_{\Delta dop} &= 1,25 \sqrt{\frac{2m}{0,44\rho n} [g(\rho_{gr} - \rho)d + C_{un}^N k]}. \end{aligned} \quad (1)$$

where g_{dop} is the cross-sectional average permissible non-erosive flow velocity, m/s; $u_{\Delta dop}$ - permissible non-erosive bottom flow velocity at the height of the roughness protrusions Δ , m/s; ρ_{gr} , ρ - material density of soil and water particles, kg/m³; d - average (weighted average) diameter of soil particles, m; C_{un}^N - fatigue tensile strength of non-cohesive soil, Pa, this parameter takes into account the appearance of noticeable adhesion forces when the soil is fine-grained (at $d < 0,25$ mm); m is the coefficient of operating conditions, which takes into account (for canals laid in non-cohesive soils) the influence of sediment in a colloidal state on the erosive ability of the flow; when the content of clay particles in the water is less than 0,1 kg/m³, the coefficient $m=1$, when the presence of these particles in the water is 0,1 kg/m³ or more; n is the overload coefficient, taking into account the change in the erosive ability of the flow under the influence of the pulsating nature of velocities and other cases of probable excess of loads on soil particles over the calculated values; k - is a coefficient characterizing the probability of deviation of adhesion forces from the average value; it can be taken equal to $k=0,5$.

Non-silting speeds. The average non-silting velocity g_{nez} corresponds to the state when the turbidity of the stream ρ_n (i.e., the sediment content per unit volume of water) is equal to its transport capacity ρ_t . The transporting capacity of a stream is the maximum amount of sediment contained in a unit volume of water that the stream is capable of transporting without sedimentation.

Let us present the formulas for ρ_t proposed by E.A.Zamarin for watercourses where turbidity ρ_n does not exceed 5-6 kg/m³. The hydraulic sediment size W is the speed at which a sediment particle uniformly falls in still water.

According to Zamarin:

At $0,0004 < W < 0,002$ m/s

$$\rho_t = 11g \sqrt{\frac{g}{m}} \sqrt{Ri} \quad (2)$$

At $0,002 < W < 0,008$ m/s

$$\rho_t = 0,22 \left(\frac{g}{w} \right)^{3/2} \sqrt{Ri} \quad (3)$$

From (2) or (3) with appropriate values of W , one can find the average non-silting speed $\mathcal{G}_{nez}$.

Hydraulic fineness depends on the size and shape of sediment particles and on the kinematic viscosity of water. In calculations, W is usually taken as the weighted average value of the hydraulic sizes for each fraction.

So, when designing and operating a canal, it is necessary to ensure that the average speed is within

$$\mathcal{G}_{dop} \geq \mathcal{G} \geq \mathcal{G}_{nez} \quad (4)$$

but in this case the average speed cannot be greater than $\mathcal{G}_{gn}$, corresponding to the conditions of the hydraulically most favorable profile, i.e. $\mathcal{G}_{gn} = (C\sqrt{R})_{gn} \sqrt{i}$. Thus, if $\mathcal{G}_{dop} > \mathcal{G}_{gn}$, then the average speed should be limited within

$$\mathcal{G}_{gn} > \mathcal{G} > \mathcal{G}_{nez}.$$

At the same time, determining a reliable and efficient average flow rate in canals is still an important problem that needs to be solved.

This problem is solved by using the mean velocity formula to prevent siltation in canals proposed by Aballianz-Rossinsky to determine the optimal hydrodynamic flow parameters using optimal hydraulic control methods [1,2,5].

$$\mathcal{G}_{sr} = \sqrt{\frac{A_0}{\alpha}} \cdot \sqrt[4]{\frac{x}{B} \cdot \frac{b}{R}} \quad (5)$$

$$h_{sr} = \frac{0,00015 \cdot \rho_{sr}^2 \cdot A_0^2}{\alpha^6 \cdot R^2 \cdot b^4} \cdot \frac{B}{x} \quad (6)$$

$$b = \frac{\rho_{sr} \sqrt[3]{24 \cdot \rho_{sr}^2}}{162 \cdot \alpha^3 \cdot \sqrt{R} \cdot \sqrt[3]{24 \cdot \rho_{sr}^2}} \quad (7)$$

where: R - hydraulic radius (m); B - canal width (m); x - wetted perimeter (m); b - canal width along the bottom (m); ρ_{sr} - average water turbidity (kg/m³).

As a result, the optimal values h_{sr} and $\mathcal{G}_{sr}$ for $\mathcal{G}_{optim}$ were obtained

where: $\mathcal{G}_z \leq \mathcal{G}_{optim} \leq \mathcal{G}_{dop}$; here: $\mathcal{G}_{nez} \leq \mathcal{G}_{dop} \leq \mathcal{G}_{nr}$.

The flow rate has been optimized, which makes it possible to increase the efficiency and reliability of water management in irrigation canals [1,2,3].

Conclusions: Conducted field studies for the parameters of the Anasay main canal showed that if the characteristics of the canal dam are unfavorable and correspond to a critical state during operation, there will be a high probability of a structure failure. Applying the above formulas during operation will greatly serve to improve and reliability of the main canal.

Their current condition satisfies the requirements of operational reliability, but in the near future there may be a possibility of siltation and erosion of the banks; therefore, it is necessary to increase the amount of funding for sewer cleaning work.

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7. А.Б.Сапаров А.Т.Джуманазарова Б.Б.Сапаров Рекомендации по модернизации магистрального канала с учётом изменённой водности водоисточника. Современные проблемы рационального природообустройства и водопользования [Электронный ресурс]: материалы международной научной конференции (15 ноября 2022 г, г. Красноярск) / Краснояр.гос.аграр.ун-т.-Красноярск, 2023.-166 с.

Rezyume: Maqolada dala kuzatuvlari va tadqiqotlari asosida Anasay magistral kanalining ekspluatatsion rejimini yaxshilash, ekspluatatsiya ishonchliligi va texnik holatini baholash bo'yicha echimlar muhokama qilinadi va kanalning suv o'tkazuvchanligi, ishonchliligi va ishlashini yaxshilash uchun o'rtacha tezliklarning hisoblangan qiymatlari keltirilgan bo'lib sug'oriladigan maydonlarni suv bilan ta'minlash optimallasadi.

Резюме: В статье рассматривается пути решения для улучшения эксплуатационного режима, оценка эксплуатационной надёжности и технического состояния магистрального канала Анасай по натурным наблюдениям и исследованиям, приведены расчетные значения средних скоростей по улучшению пропускной способности, надёжности и работоспособности канала для дальнейшего оптимального водообеспеченности орошаемых площадей.

Kalit so'zlar: Irrigatsiya tarmoqlari, ishonchlilik, gidravlik samaradorlik, Anasay magistral kanali, inshoot, tezlik, loyqa sho'kishi, yuvilish, uzanlar deformatsiyasi, FIK, tamirlash.

Ключевые слова: Ирригационные системы, надёжность, гидравлическая эффективность, магистральный канал Анасай, сооружение, скорость, заиление, размыв, деформация русел, КПД, ремонт.

ANALYSIS OF EXISTING DESIGNS OF BAG TEARS FOR MUNICIPAL SOLID WASTE

Khankelov T.K.¹, Mukhamedova N.B.¹, Kosimbetov B.E.²

¹Tashkent State Transport University, ²Karakalpak State University named after Berdakh

Summary: The article is devoted to determining the place and role of bag breakers for municipal solid waste (MSW) in a comprehensive waste recycling system. An analysis of existing designs of bag breakers for solid waste made it possible to develop a set of requirements for such devices. Generalized efficiency criteria have also been developed, characterizing primarily the energy and mass nature, as well as the quality of the work performed.

Key words: bag breaker, municipal solid waste, technological scheme, efficiency.

The improving quality of life of people and the growth of the urban population, as well as the pursuit of additional profit on the part of manufacturers through small packaging of goods, have led to a significant increase in the volume of solid waste, as a result of which their negative impact on the environment has increased. Currently, in order to reduce the negative impact of solid waste on the environment, in particular, issues related to crushing and sorting, as well as their use in the form of secondary raw materials, remain relevant. It is known that the crushing operation is a key link in the system of complex waste processing and, in this regard, in many developed countries special attention is paid to the creation and production of highly efficient and flexible crushing machines used for tearing bags.

Currently, numerous studies are being carried out by foreign companies and research centers on the development and creation of effective machines for tearing bags that meet the requirements of manufacturability, reliability and especially energy efficiency. In addition, it should be noted that mechanization and automation of preparatory operations, in particular, the operation of tearing bags, increases not only the efficiency of the preparatory operation, but also significantly increases the productivity of waste sorting.

The development strategy of New Uzbekistan for the period 2022-2026 specifically notes the implementation of the following tasks: "...improving the system for assessing environmental pollution, monitoring the environment, forecasting the degree of environmental pollution. Information support for the state environmental control body, monitoring the state of pollution sources and their impact on the environment" and "... increasing the percentage of solid waste collection to 100 percent, increasing the percentage of waste recycling by 2026 from 21 percent to 50 percent". When performing the above tasks, in particular, research related to the crushing of waste, taking into account its morphological and fractional composition, is relevant [1].

In the works of L.Ya. Shchubov, the patterns of solid waste separation in technologies for their complex processing were studied [2,3]. However, these works do not cover the development of machines for tearing bags in a system for complex processing of solid waste.

A.M. Gonopolsky and others [4] investigated issues related to the disposal of food waste at the point of generation. In the course of the research, the design of the crusher was developed and the main design and technological parameters were justified. A comprehensive evaluation of the crusher design was carried out to meet the requirements. But these works also do not address issues regarding the design of package breakers.

Issues related to the selection and calculation of the main parameters of various designs of crushers for grinding solid waste are considered in the works of B.V. Klushantseva, A.I. Kosareva, Yu.A. Muizemnek [5]. The results obtained in determining the force and energy parameters showed that experimental and practical calculations differ greatly.

The works of T.K. Khankelov et al. [6,7] considered the issues of analyzing crusher designs, developing generalized efficiency criteria, as well as issues of substantiating the main parameters of crushers for crushing solid waste, but these works did not consider issues related to the analysis of existing designs package tearers for the purpose of their rational choice.

In addition, the fact of the relevance of the development and selection of package breaker designs is confirmed by the fact that in many Internet sites offering various designs of these machines, information on the main design and technological parameters is missing [8].

In connection with what was discussed above, we can conclude that research aimed at the development and creation, as well as evaluating the effectiveness of package ruptures for solid waste, are relevant.

The main parameters of package breakers for solid waste are determined from data on accumulation volumes, morphological and fractional composition of waste.

Therefore, when designing and creating designs for bag breakers, it is necessary to take into account the above properties of waste. For example, when determining the diameters of the rolls, the size of the bags that need to be torn is decisive, or the volume of waste accumulation also affects the productivity values.

Based on the initial data and properties of the waste, the designs of breakers may differ from each other in purpose or design.

Figure.1 shows the design of the Netmus package breaker



Figure.1. Package Breaker DKZ-B 50/M3 from Netmus

The device consists of a hopper from which waste is transported along a conveyor floor through dosing walls, the task of which is to distribute the waste in an even layer. The movement of solid waste is ensured by a chain conveyor. At the upper end of the device there is a gear mechanism that tears the bags without crushing the contents or deforming the contents for further sorting. The mechanism automatically adjusts its position in height, depending on the size of the packages, using a hydraulic drive. The frequency converter provides feed rate control.

The advantages of this device are:

- preservation of the qualities and (purity) of solid waste components;
- high performance;
- full automation of the packet tearing process;
- uniform supply of source material to the sorting table.

And the disadvantages include:

- high energy and material consumption;
- large dimensions;
- complexity of design.

Table 1 presents the technical characteristics of the brand's bag breaker DKZ-B 50/M3

Table 1

Technical characteristics of bag breaker brand DKZ - B 50/ M 3

Specifications	Units	DKZ - B 50/ M 3
Horizontal mobile floor		
Floor length	mm	6200
Engine power / rpm	kW; Hz; rpm	2.2; 50; 5
C conveyor speed	m / min	From 0.2 to 7.5
Inclined mobile floor		
Floor length	mm	3000
Engine power / rpm	kW; Hz; rpm	2.2;50;7
C speed of floor movement	m / min	
Tearing and sorting device		
Number of breaking elements	pieces	10
Engine power / rpm	kW; Hz; rpm	4; 50; 36
Dimensions (LxWxH) (including railings on walking platforms)	mm	9510x3680x4270
Productivity (depending on the type and fraction of waste)	kg	1,500 to 2,000
Horizontal conveyor volume	m ³	50
Weight	kg	9300
Certificates		EU, RF
The equivalent sound pressure level at a distance of 1 meter from the machine and 1.5 m from the floor does not exceed 85 dB		
Belt Chain Conveyor (Optional)		
Tape width	mm	3000
Tape length	mm	4000
Power (electric transmission)	kW	1.5
Belt speed	m/s	0.6(0.8)

Figure 2 shows a general view of the RODTECH package breaker

The machine consists of a hopper, the dimensions of which are matched to the parameters of plastic bags. The machine body is made of low-carbon steel grade 20, which has good mechanical properties and a guaranteed chemical composition. Has a separate drive for each shaft.



Figure.2. General view of the «RODTECH» package breaker

The bagged material is fed into the bag breaker using a conveyor belt for uniformity. Drums that rotate in opposite directions effectively open the bags and release the contents. Which is unloaded from the bottom of the machine onto a conveyor belt.

The design is easy to use and can be used for solid waste (fractions up to 300-400 mm), organic waste, mixed materials in bags, waste paper in bags.

Depending on customer requirements, it is equipped with carrier for loading and unloading material.

The advantages of this machine include:

- compact design;
- separate drive for each drum;
- ease of maintenance;
- simplicity of design.

The disadvantages include:

- low productivity;
- impossibility of replacing worn teeth;
- rapid clogging of working parts.

An analysis of the advantages and disadvantages of the above designs, as well as literary sources, made it possible to develop a list of requirements for the designs of bag breakers for solid waste.

Conclusion

1. Equipping the waste sorting complex with bag rippers contributes to the complete automation of the process of preparing waste for its preliminary sorting. Which, in turn, significantly increases the productivity of the complex.

2. When designing or choosing the design of a bag breaker, it is necessary to take into account the properties of waste, such as: accumulation volume, morphological and fractional properties, as well as their moisture content. In addition, the choice of the type and size of the bag breaker is influenced by the customer's initial data.

3. The main requirements for the design of a bag breaker include: energy and material consumption of the machine; soft tearing of bags, without deformation of the contents in the bags; reliability of design, etc.

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Rezyume: Maqolada qattiq maishiy chiqindilarni (QMCh) qayta ishlashning kompleks tizimida paketlarni parchalagich o' rni va vazifasi aniqlangan. Paketlarni parchalagichlar mavjud konstruksiyalari tahlili, paket parchalagichlarga bo'lgan talablarni shakllantirish imkonini bergan.

Резюме: В статья рассматриваются места и роли разрывателей пакетов для твердых бытовых отходов(ТБО) в системе комплексной мусоропереработки. Анализ существующих конструкций разрывателей пакетов для ТБО позволил разработать комплекс требований предъявляемых к подобным устройствам.

Kalit so'zlar: paketlarni parchalovchi, qattiq maishiy chiqindi, texnologik sxema, samaradorlik

Ключевые слова: разрыватель пакетов, твердые бытовые отходы, технологическая схема, эффективность.

PROPERTIES OF NATURE: MATERIAL CHARACTERISTICS OF LIGHT TO OBTAIN A COLD PULSE

Saparov B.B., Mambetov A.K., Dauletov K. A.

Nukus Mining Institute at Navoi State Mining and Technological University

Summary: The phenomena of diffraction and interference indicate the wave nature of light, while the phenomena of the photoelectric effect and the Compton effect indicate its corpuscular nature. The momentum and wavelength of a photon connects the properties of light in those phenomena where it behaves as a wave with the properties of light in those phenomena in which it behaves as a particle (wavelength and momentum).

Key words: particle momentum, speed of light in vacuum, particle rest mass, photon, corpuscular and wave properties, point in space, corpuscular nature, wave.

As was known, dualism occurs in optical phenomena. The phenomena of diffraction and interference indicate the wave nature of light, while the phenomena of the photoelectric effect and the Compton effect indicate its corpuscular nature.

Using the previously well-known formulas [1,2], we will find the relationship between the wavelength of the photon and its momentum.

According to relativistic theory, the energy and momentum of a particle are related by the relation:

$$W = c\sqrt{p^2 + m^2c^2} \quad (1)$$

where: W - is the particle energy; p - is the particle momentum; c - is the speed of light in vacuum; m - is the rest mass of the particle.

Since the photon has no rest mass, for the photon we will have:

$$\varepsilon_\phi = cp_\phi \quad (2) \Rightarrow p_\phi = \frac{\varepsilon_\phi}{c} \quad (3)$$

ε_ϕ - photon energy; p_ϕ - photon momentum;

Planck's formula for photon energy:

$$\varepsilon_\phi = h\nu_\phi \quad (4) \text{ и } \varepsilon_\phi = h\frac{c}{\lambda_\phi} \quad (5)$$

h - Planck's constant; ν_ϕ - photon frequency; λ_ϕ - photon wavelength;

Considering (2) and (5) together, we obtain:

$$p_\phi = \frac{h}{\lambda_\phi} \Rightarrow \lambda_\phi = \frac{h}{p_\phi} \quad (6)$$

Formula (6) connects the properties of light in those phenomena where it behaves like a wave with the properties of light in those phenomena in which it behaves like a particle (wavelength and momentum).

Louis de Broglie hypothesized that dualism is characteristic of all natural phenomena (not only optical ones)*

De Broglie formula

$$\lambda = \frac{h}{p} \quad (7) \quad \lambda = \frac{h}{mv}$$

where:

$$p = m v \quad (8)$$

p - is the particle momentum; m - is the particle mass; v - is the speed of particle movement; λ - is the wavelength that is associated with a particle moving at speed.

The meaning of de Broglie's idea: any material object (any particle) has both corpuscular and wave properties. It is difficult for the human mind to accommodate such concepts as wave-particle. After all, a particle is an object that can be concentrated at some point in space, and a wave is infinitely distributed in space.

*(In the 20s of the 19th century, Hamilton drew attention to the remarkable analogy between geometric optics and Newtonian mechanics. It turns out that the basic laws of these two different fields can be represented in a mathematically identical form. These and other considerations led Louis de Broglie to the assumption of the existence wave properties of elementary particles.)

However, de Broglie's idea was brilliantly confirmed experimentally. Beams of electrons, protons, and even neutral atoms exhibited interference and diffraction phenomena, like light or X-rays. Moreover, the diffraction of electron beams was discovered in the experiments of Davisson-Kensman and Davisson-Jermer even before de Broglie formulated his idea.

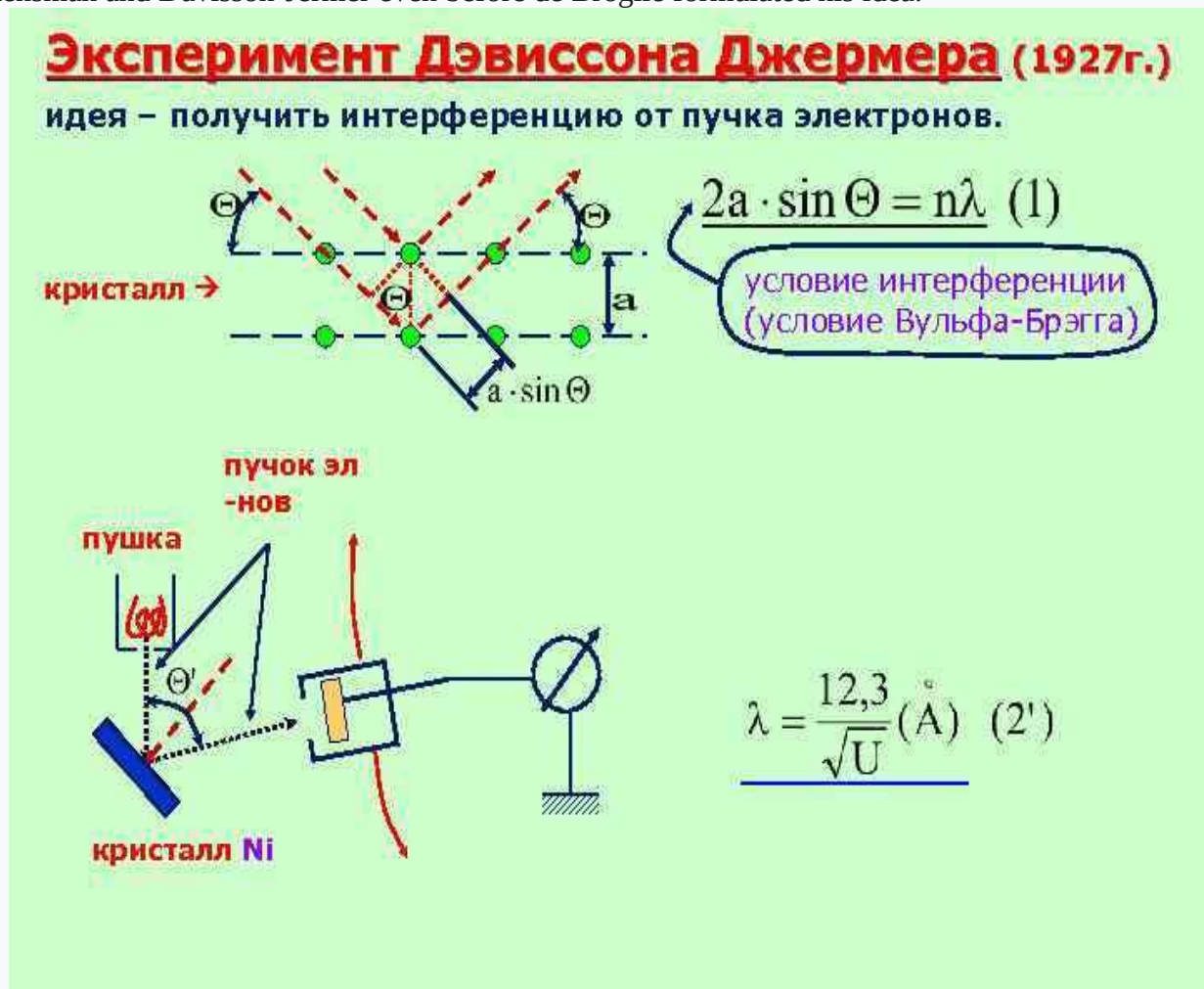


Fig. 1. Diagram of the Davisson-Jermer experiment (thermal-electron emission: electrons fly out from the surface of the metal when the metal is heated)

In an electron gun, electrons are ejected from the surface of a heated metal filament (cathode) and form an electron cloud around the filament. A high voltage is applied between the cathode and anode. The electrons are accelerated in the electric field and fly out of the gun at high speed. The speed of electrons can be changed by changing the voltage between the cathode and anode.

Next, a beam of electrons emitted from the gun is reflected from the nickel crystal and enters the collector. The intensity of the reflected electron beam is determined by the current strength in the galvanometer.

The speed of electrons in the incident beam can be calculated from the law of conservation of energy. The work done when an electron passes through an electric field is equal to

$$A = eV \quad (9)$$

where: A - is the work done by the field when an electron passes between the cathode and anode; e - is the value of the electron charge ($e = -1,6 \cdot 10^{-13}$ kl); V - gun voltage;

This work is converted into kinetic energy of the electron.

$$A = \frac{m_e v^2}{2} \quad (10)$$

m_e - electron mass (kg); v - is the speed acquired by the electron.

Solving (9) and (10) together, we obtain

$$eV = \frac{m_e v^2}{2} \quad (11)$$

$$v = \sqrt{\frac{2eV}{m_e}} \quad (12)$$

Using de Broglie's formula, you can calculate the wavelength that is associated with an electron moving at speed.

$$\lambda = \frac{h}{p} = \frac{h}{m_e v} \quad (13)$$

Substituting (12) into (13), we get

$$\lambda = \frac{h}{m_e \sqrt{\frac{2eV}{m_e}}} = \frac{h}{\sqrt{2em_e}} \cdot \frac{1}{\sqrt{V}}; \frac{h}{\sqrt{2em_e}} = 1,225 \cdot 10^{-9} \quad (14)$$

If we substitute the numerical value of the constant factor* into formula (14) and express V in volts, then

$$\lambda = \frac{1,225 \cdot 10^{-9}}{\sqrt{V}} \text{ м} \quad (15)$$

For each value of V , using formula (15), you can calculate the corresponding value of λ . For example, for $V = 150 \text{ V}$ $\lambda \approx 10^{-10} \text{ m} = 1 \text{ \AA}$ (- a non-system unit of length used in X-ray structural analysis of crystals - angstroms measure the lattice constant).

This wavelength corresponds to “soft” X-rays, which are used to study the structure of crystals. The authors suggest the Bedini generator of two batteries shows the nature of dualism where the battery receives a charge in the form of a pulse of cold current.

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Rezyume: Difraksiya va interferensiya hodisalari yorug'likning to'lqinli tabiatini, fotoelektr effekti va Kompton effekti hodisalari esa uning korpuskulyar tabiatini ko'rsatadi. Fotonning impulsi va to'lqin uzunligi yorug'lik o'zini to'lqin sifatida ko'rsatadigan hodisalardagi yorug'lik xususiyatlarini zarracha sifatida harakat qiladigan hodisalardagi yorug'lik xususiyatlari bilan bog'laydi (to'lqin uzunligi va impuls).

Резюме: Явления дифракции и интерференции указывают на волновую природу света, а явления фотоэффекта и эффекта Комптона — на его корпускулярную природу. Импульс и длина волны фотона связывают свойства света в тех явлениях, где он ведет себя как волна, со свойствами света в тех явлениях, в которых он ведет себя как частица (длина волны и импульс).

Kalit so'zlar: zarracha impulsi, yorug'likning vakuumdagi tezligi, zarrachaning tinch massasi, foton, korpuskulyar va to'lqin xossalari, fazodagi nuqta, korpuskulyar tabiat, to'lqin.

Ключевые слова: импульс частицы, скорость света в вакууме, масса покоя частицы, фотон, корпускулярные и волновые свойства, точка в пространстве, корпускулярная природа, волна.

UDC 662.62:54,661.47

STUDY OF RHEOLOGICAL PROPERTIES OF SOLUTIONS WHEN PRODUCING SODIUM HUMATES

Yunusova. M.V¹., Erkaev A.U²., Kucharov B.Kh¹., Yulbarsova M.V¹.,
Zakirov B.S¹., Reymov A.M³.

¹*Institute of General and Inorganic Chemistry of the Academy of Sciences
of the Republic of Uzbekistan*

²*Tashkent Institute of Chemical Technology*

³*Karakalpak State University named after Berdakh*

Summary: Issues of the current state are considered and research on the production of humic preparations, which are used as regulators of plant growth and development, is observed. With the production of sodium humates of a certain chemical composition of the original samples of Angren coal and coal oxide. The processes of release of humic acids have been studied depending on the duration of the process; a change in the viscosity of solutions of sodium humates depending on the temperature in the corresponding compounds has been established, as well as a decrease in density with a change in temperature.

Keywords: Humic substances, humatpotassium, coal waste, humic acids, oxidation, nitric acid, humate sodium, solid and liquid phases, acids, decomposition and filtration

Introduction. One of the sources of coal use is its chemical processing with the use of humic preparations, which are used as plant growth and development regulators, silage feed preservatives, biologically active preparations for animal diets and mineral fertilizers, as well as for medicinal purposes in physiotherapy and veterinary medicine [1-3].

Humic acid is the most important organic component in subsequent waters, soils, peat, brown coal, oxidized coal, shale and sapropel [4-6]. The structural composition of humic acids allows them to perform several important functions: the accumulation of nutrients and microelements necessary for plant growth occurs; improve the circulation of nutrients in a live mode; protection from adverse environmental factors and strengthening the immunity of plants and animals; increase photosynthetic productivity; effectively reduce heavy metals [7,8].

The authors [9,10] studied the process of oxidation of Angren brown coal with nitric acid in a mixture of acetic acid. The coal was processed in a chemical mortar by adding coal:acetic acid from 1:0.05 to 1:0.2 for 30 minutes, while the coal was treated with acetic acid, stable in coarse form. Then the brown coal treated with acetic acid is subjected to oxidation with nitric acid at a concentration of 10÷30%, the process is carried out at a temperature of 40°C for 120 minutes and the weight ratio of coal:HNO₃ = 1:2. The optimal conditions for the oxidation process have been identified: concentration HNO₃-30%, carbon ratio: CH₃COOH:HNO₃ = 1:0.2:2, hour temperature - 40°C, time - 2. The amount of non-oxidized organic part of the original brown coal is 17.3 %. The amount (OC) of oxidized coal increases to 124.2% due to the organic part of the original coal. The content of humic acid in oxidized coal increases to 66.1%.

In works [11,12], the process of oxidation of brown coal from the Angren deposit with nitric acid was studied depending on various parameters and in various aspects. The process of coal oxidation is carried out at a concentration of nitric acids of 10–40%, a temperature of 30–60°C, a holding time of 30–120 minutes and a weight ratio of organic substances and nitric acid monohydrate from 1:0.4 to 1:2. Under optimal conditions, the oxidation degree of coal is 65.5%. The resulting oxidation products included 57.2% humic acid, 9.7% water-soluble acids, and 34.4% residual chars on organic coals.

Materials and methods. Extraction process with cooling OU: NaOH (10% solution), equal to 1:15; temperature 20-25°C and stirring for 60 minutes. To obtain the first batch of 4 fractions of

HA (humic acid) samples, the efficiency was increased for 24 (12, 6 and 3) hours, then after separating the liquid part, the system was thickened. The liquid part was acidified with 40% nitric acid to pH 0.80-0.85.

The resulting precipitate was separated using a centrifuge at 2000 rpm for 15 minutes. The wet sediment was dried in a drying apparatus at a temperature of no more than 90°C. Based on the obtained dry mass, the yield of HA was calculated.

1500 ml of distilled water was added to the remaining thick mass, and the process was continued 12, 6 and 3, thus obtaining four groups of humic acids and calculating the output fractions. The second and third compounds were formed in the same way, differing only in the duration of the gradual decrease, in hours: in II - 12, 6 and 3; in III - 6 and 3. The first fraction was obtained gradually over 3 hours.

Results and discussion. The chemical composition of the initial samples (Angren coal and OC) is given in Table 1, from which it can be seen that in coals of the Angren deposit with a moisture content of 9.047%, the coal content is 48.46%. The content of ash and substances (AS) in Angren coal is 9.2 and 81.76%, respectively. This figure in the educational institution is 1.455 and 50.09%, respectively. The content of humic acids (HA) in Angren coal and coal oxide ranges between 17 and 33%, respectively.

Table 1. Chemical composition of the initial samples of Angren coal and OC.

Sample no.	Sampling location	Content, mass%				
		Moisture	Ash	OVU	GK	UNNON
1	Source coal	9.04	9.2	81.76	17	4.99
2	Coal oxide	48.46	1455	50.09	33	8.99

Table 2 shows the data obtained during the process of isolating humic acids depending on the duration of the process. The data presented in Table 2 show that in option I, in the decreasing stage from 3 to 24 hours, the degree of yield of humic acids ranges from 7.75-21.55%, therefore it should be noted that the highest yield of humic acids is observed in the sample 2., and in variants of experiments II and III, respectively, is observed in samples 6 and 9, with the yield being 31.16-56.43%.

Table 2. Study of the process of humic acid release depending on the duration of the process

Options	No. try	Share of HA yield, %	Humidity HA, %	Duration deceleration, hour
I	1	16.47	38.87	24
	2	21.55	54.57	12
	3	7.75	19.79	6
	4	20.43	48.95	3
II	5	17.19	47.43	12
	6	31.16	68.88	6
	7	15.94	45.33	3
III	8	15.54	40.83	6
	9	56.43	99.44	3
IV	10	27.19	56.23	3

*Weight of sodium humate solution is 1500 g.

**pH of HA solution and acidified solution are 13.28-13.84 and 0.80-0.85, respectively.

Table 3

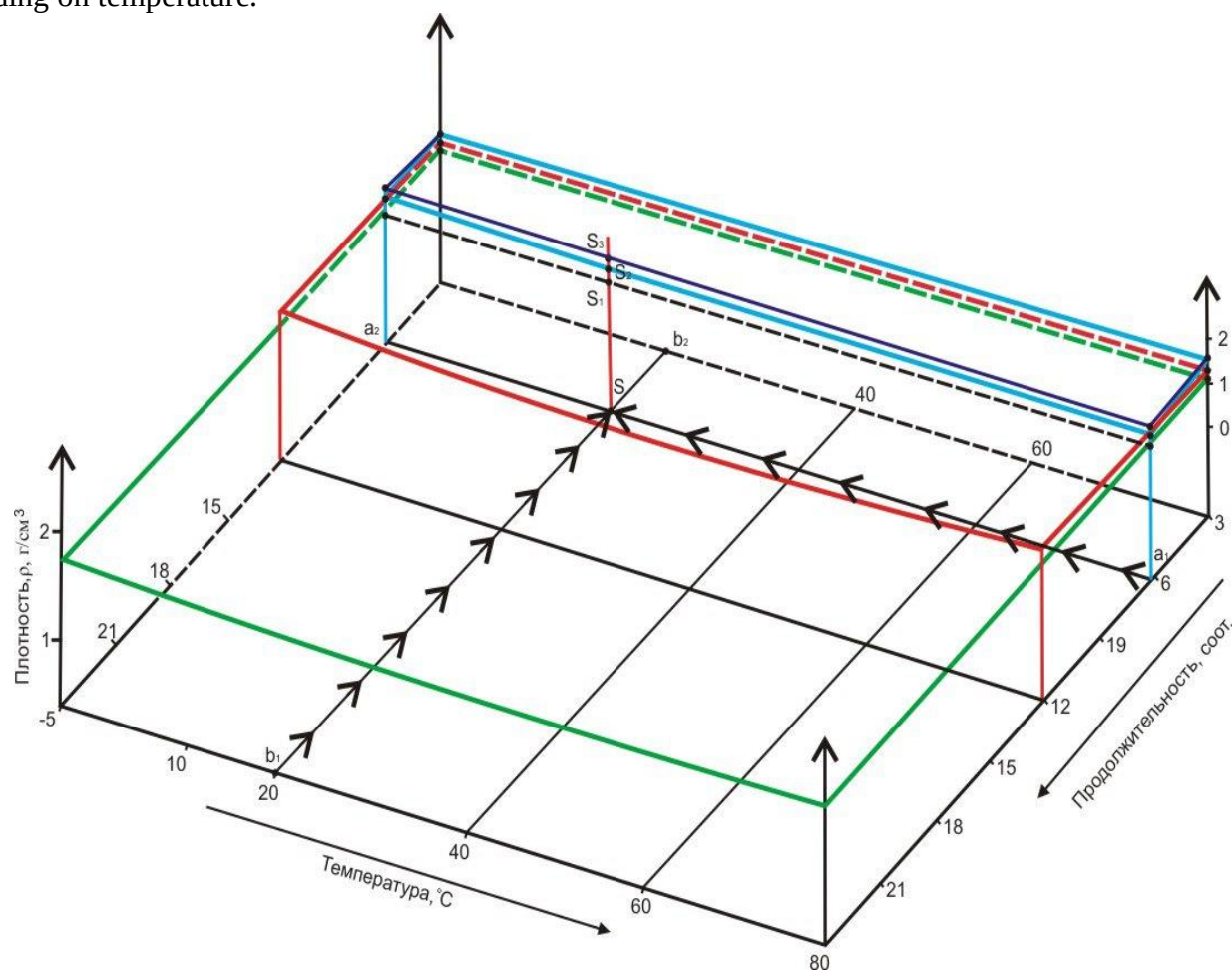
Change in viscosity of sodium humate solutions depending on temperature

The trial numbers	Temperature °C

correspond to the table. 2	-5	0	5	10	20	40	60	80
1	1852	1763	1612	1528	1388	1167	1098	1006
2	1950	1894	1830	1662	1466	1210	1131	0.969
3	1718	1656	1614	1592	1399	1181	1073	0.981
4	1735	1684	1656	1637	1120	1112	1084	1000
5	1646	1559	1553	1536	1332	1128	1073	0.941
6	1785	1749	1735	1695	1458	1265	1115	1037
7	1409	1318	1282	1291	1215	1070	0.953	0.908
8	1726	1559	1545	1,511	1405	1246	1134	1017
9	1620	1665	1637	1578	1335	1.165	1109	1017
10	1807	1741	1763	1637	1355	1207	1087	0.972

From the data in Table 3 it follows that the viscosity of sodium humate solutions at -5°C in all samples ranges from 1620-1950 mm^2/s . And with an increase in temperature from -5 to 80°C , a decrease in the viscosity of sodium humate solutions is observed, for example, in samples 1–5, the viscosity is in the range of 0.941–1.006 mm^2/s . In samples 6-10 at 20°C this indicator fluctuates in the ranges of 1.215-1.458 mm^2/s .

The figure shows a nomogram for determining changes in the density of sodium humates depending on temperature.



Drawing. Nomogram for determining changes in the density of sodium humates depending on temperature

As can be seen from the dependence diagrams, at a constant temperature at the initial stage (I-stage) of the decrease, a decrease in the density of coal oxide is observed in a period of time from 24 to 6 hours. Further, it is possible to enhance the increase in density in the following stages: in II - from 12 to 3 hours, III - from 6 to 3 hours and IV-4 slowing down the suspension of oxidized coals. For example, at a temperature of 20°C the suspension decreases from 1094 to 1084, from 1097 to 1002, from 1098 to 1064 g/sm³, respectively, at I, II, II stages of reduction. But only in stage IV the light remains unchanged, with a volume of 1.095 g/sm³. A change in density in such relevant indicators over time leads to a gradual compaction of the suspension itself and an increase in the number of particles at low stages.

In general, the decrease in density remains with a change in temperature within the range of - 5 ÷ 80 °C from 1.105 to 1.060; from 1.118 to 0.979; from 1124 to 1045 and from 1114 to 1065 g/sm³, respectively, at the stages of gradual increase studied. This phenomenon is a solution of volume with its constant and constant mass.

Conclusion. Thus, this article indicates the sign of obtaining sodium humates of a certain chemical composition of the initial samples of Angren coal and coal oxide. The processes of release of humic acids have been studied depending on the duration of the process and changes in the viscosity of a solution of sodium humates have been established depending on the temperature in the corresponding compounds.

The data obtained serve to develop a basic technological scheme for sodium humate with subsequent agrochemical tests.

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Rezyume: O'simliklarning o'sishi va rivojlanishini regulyator sifatida qo'llaniladigan gumus preparatlarini ishlab chiqarish bo'yicha tadqiqotlarning hozirgi holati va istiqbollari masalalari ko'rib chiqiladi. Natriy gumatlarini olish uchun Angren ko'mir va ko'mir oksidining dastlabki namunalarning kimyoviy tarkibi aniqlandi. Humik kislotalarning ajralib chiqish jarayonlari jarayonning davomiyligiga qarab o'rganildi, natriy humatlari eritmasining yopishqoqligining tegishli diapazonlardagi haroratga qarab o'zgarishi, shuningdek, harorat oshishi bilan zichlikning pasayishi.

Резюме: Рассмотрены вопросы современного состояния и перспективы исследований по получению гуминовых препаратов, которые используются в качестве регуляторов роста

и развития растений. С целью получения гуматов натрия определён химический состав исходных образцов Ангренского угля и окиси угля. Исследованы процессы выделения гуминовых кислот в зависимости от продолжительности процесса, установлено изменение вязкости раствора гуматов натрия в зависимости от температуры в соответствующих диапазонах, а также снижение плотности с увеличением температуры.

Kalit so‘zlar: gumus moddalar, gumat kaliy, ko'mir chiqindilari, hūmik kislotalar, oksidlanish, nitrat kislota, natriy gumati, qattiq va suyuq faza, kislota, parchalanish va filtrlash.

Ключевые слова: гуминовых вещества, гуматкалий, угольных отходов, гуминовых кислот, окисления, азотной кислоты, гуматнатрия, твёрдая и жидкая фаза, кислоты, разложения и фильтрация.

UDK: 661.169.23:661.741.1

INVESTIGATION OF COMPONENT INTERACTIONS IN THE SYSTEM OF COPPER ACETATE MONOHYDRATE, TRIETHANOLAMINE, AND WATER

Orazbayeva A.A., Zakirov B.S., Kucharov B.Kh., Orakbayev A.A.

*Institute of General and Inorganic Chemistry, Academy of Sciences of the Republic of Uzbekistan,
Tashkent*

Summary: *This study investigates the mutual influence of components in the system of copper acetate monohydrate, triethanolamine, and water using the method of isomolar series. An analysis of changes in refractive index, density, viscosity, and pH of the medium was conducted as the content of triethanolamine was varied. The results reveal two inflection points corresponding to 30% and 70% triethanolamine content, indicating complex interactions among the system's components. These findings are important for understanding the chemical behavior of this system and may have applications in the development of new materials.*

Keywords: *Copper acetate monohydrate, Triethanolamine, Isomolar series component interactions, refractive index, density, viscosity, pH*

Introduction: In recent decades, the issue of crop resistance to diseases and adverse environmental conditions has garnered increasing attention from scientists and agronomists. One promising direction in this area is the development of plant growth stimulators with additional fungicidal properties. These compounds not only stimulate plant growth but also protect them from pathogenic microorganisms, making them particularly valuable in modern agricultural practices.

The synthesis of plant growth stimulants has traditionally been focused on the development of compounds that promote biomass accumulation and enhance crop yield. However, integrating these compounds with fungicidal properties necessitates a more sophisticated approach, as it requires an in-depth understanding of the interaction mechanisms between the active components and pathogenic organisms. One such approach involves the utilization of triethanolamine, which, in conjunction with copper compounds, demonstrates significant fungicidal activity.

Copper is a pivotal element in plant physiology, playing an essential role in various biological processes, including photosynthesis, respiration, and antioxidant defense. It acts as a cofactor for several critical enzymes, such as Cu/Zn-superoxide dismutase and cytochrome c oxidase. Nevertheless, both copper deficiency and excess can adversely affect plant growth and development. Therefore, the regulation of copper homeostasis in plants is of paramount importance for maintaining their health and ensuring optimal productivity [2].

The importance of investigating the interactions within the system comprising copper acetate monohydrate, triethanolamine, and water stems from its relevance to the chemical industry and the advancement of novel materials. This study aims to analyze the physicochemical parameter variations induced by altering the triethanolamine concentration and to elucidate the interaction dynamics among the components.

Seed treatments endowed with fungicidal properties play a crucial role in preventing the proliferation of pathogenic fungi and other harmful organisms, thereby enhancing seed germination rates and providing protection to emerging seedlings.

To establish the physicochemical basis for the synthesis of seed treatments involving acetic and formic acids, the by-product (LF) generated during the production of synthetic food-grade acetic acid, mono-, di-, and triethanolamines, copper carbonate, cuprous oxide, and monoethanolammonium acetate (in both mono- and di-substituted forms), it is essential to conduct comprehensive studies on their solubility within complex systems.

Methodology: The isomolar series method was employed to investigate the system. Key physicochemical properties, including refractive index, density, viscosity, and pH, were meticulously

measured under varying ratios of copper acetate and triethanolamine. All experimental procedures were carried out at ambient temperature utilizing standard laboratory equipment..

To determine the mutual influence between copper acetate monohydrate and triethanolamine, the system $N(C_2H_4OH)_3-(CH_3COO)_2Cu-H_2O$ was studied using the isomolar series method.

Results and Discussion: The isotherms of refractive index, density, viscosity, and pH of the medium exhibit two inflection points, corresponding to 30.0% and 70.0% triethanolamine content (Figure 1). These inflection points likely indicate significant changes in the interaction dynamics between the components, possibly due to the formation of different coordination complexes or changes in the solvation environment. The first inflection at 30.0% may suggest the initial formation of a complex between triethanolamine and copper ions, while the second inflection at 70.0% could indicate a saturation point or a shift towards the predominance of a different complex species. Further analysis of these points will provide insights into the molecular interactions and structural configurations within the system.

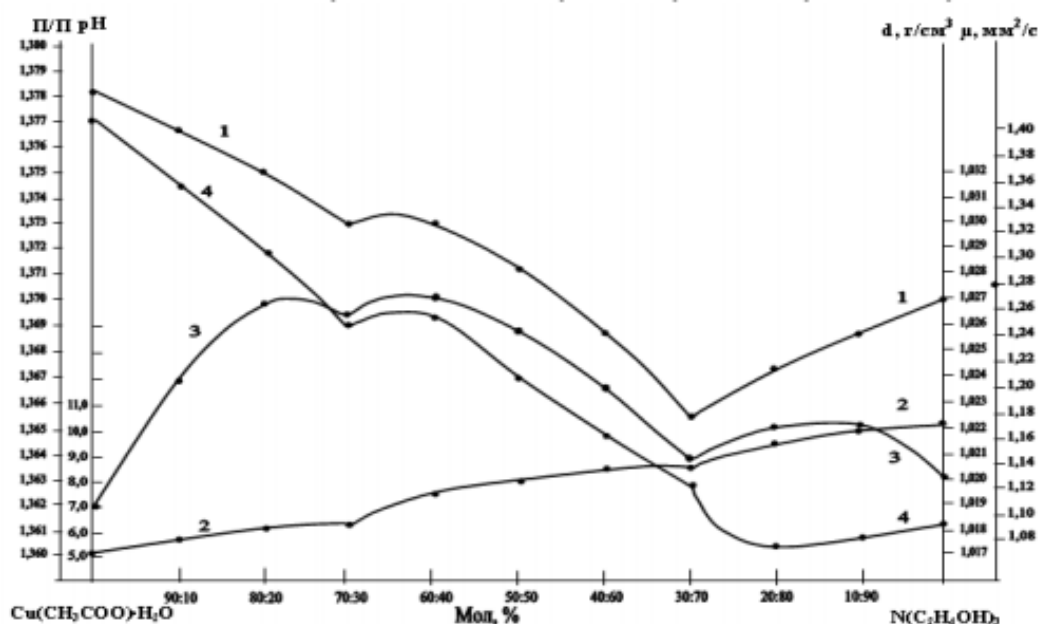


Figure 1. The $N(C_2H_4OH)_3-(CH_3COO)_2Cu-H_2O$ System

Figure 1 depicts a graph that explores the behavior of a chemical system consisting of copper(II) acetate $(CH_3COO)_2Cu \cdot H_2O$ and triethanolamine $N(C_2H_5OH)_3$ in aqueous solution.

Graph Axes:

- **Horizontal Axis (Abscissa):** Represents the molar percentage of the system's components, ranging from pure copper(II) acetate on the left to pure triethanolamine on the right. This axis essentially maps the shift in composition as the system transitions from one component to the other.
- **Left Vertical Axis (Ordinate):** Indicates the pH values of the system, which reflect the acidity or alkalinity as the relative concentrations of the components change.
- **Right Vertical Axis:** Displays the physical parameters of the system, which could include properties like refractive index, density, or viscosity, providing a multifaceted view of the system's behavior.

Description of Curves:

- **Curve 1:** Starts at a high point, corresponding to a system dominated by copper(II) acetate. As triethanolamine is introduced, the curve shows a steady decrease, suggesting significant changes in the system's acidity or other chemical properties as the balance shifts.

- **Curve 2:** Initially rises gently, indicating an increase in a particular physical parameter as triethanolamine content grows. It then plateaus and slightly declines, but remains relatively stable across the central composition range, possibly reflecting a balance between the two components.
- **Curve 3:** Exhibits a prominent peak in the middle of the graph, corresponding to a specific molar ratio where the interaction between copper (II) acetate and triethanolamine reaches a critical point, likely forming a distinct chemical complex. After this peak, the curve declines, suggesting the dissolution or alteration of the complex as the ratio continues to change.
- **Curve 4:** Remains stable initially, then undergoes a sharp decline, followed by a resurgence toward the right-hand side of the graph, indicating a dynamic response of the system's physical parameters to the changing composition.

This graph provides a nuanced look at how the system's properties evolve as the ratio of copper (II) acetate to triethanolamine shifts. The inflection points and varying slopes of the curves hint at underlying molecular interactions, such as the formation and breakdown of complexes, changes in solvation dynamics, or shifts in the structural organization of the solution. Understanding these transitions is crucial for optimizing the system's application in industrial or agricultural contexts.

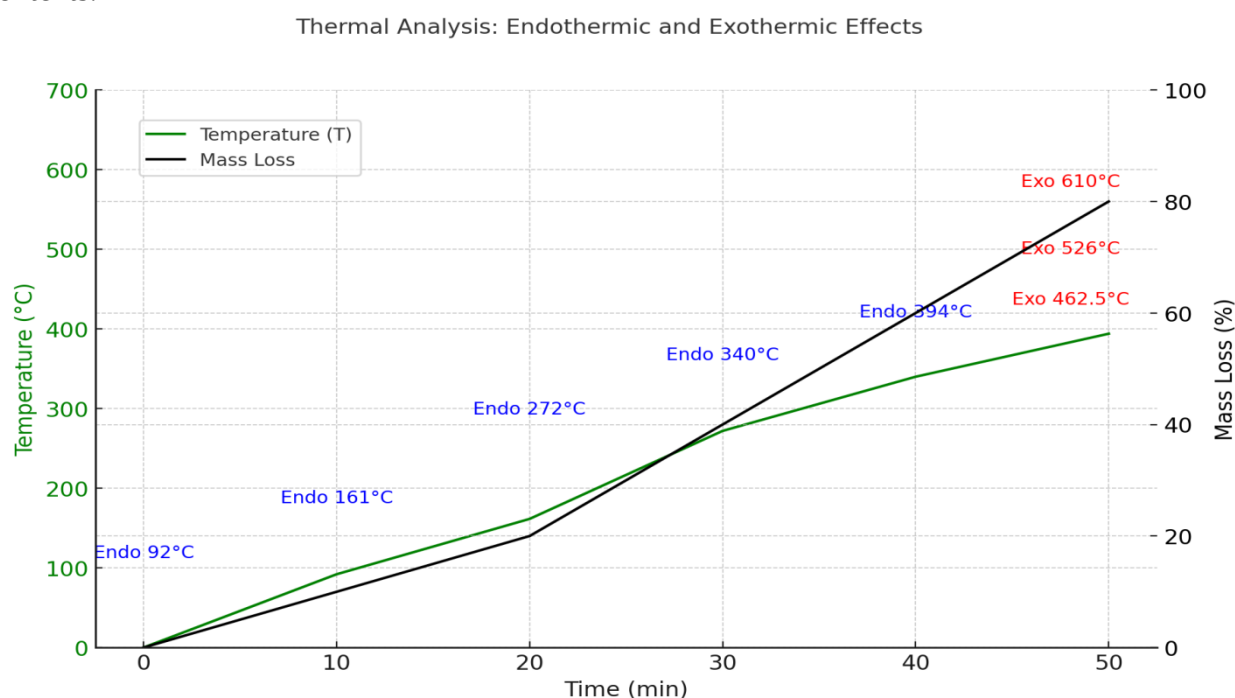


Figure 2. Thermal Analysis of the $N(C_2H_4OH)_3 \cdot (CH_3COO)_2Cu \cdot H_2O$ Sample

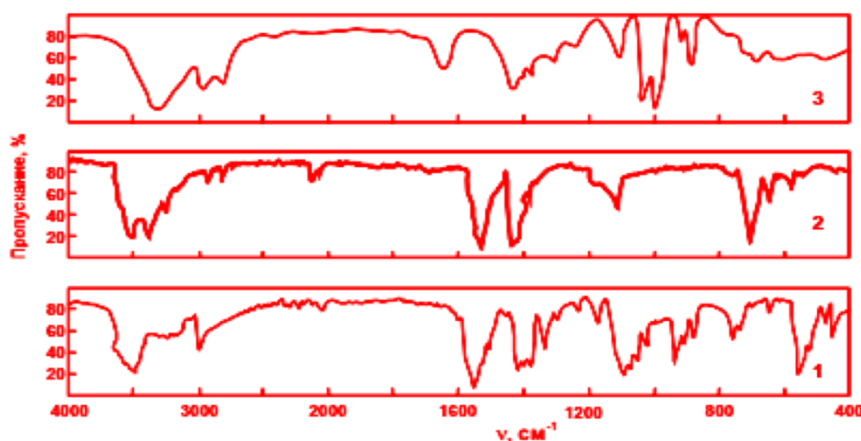
Figure 2 illustrates the thermal behavior of the compound $N(C_2H_4OH)_3 \cdot (CH_3COO)_2Cu \cdot H_2O$ during a heating process. The thermal analysis reveals five endothermic effects occurring at 92°C, 161°C, 272°C, 340°C, and 394°C, along with three exothermic effects at 462.5°C, 526°C, and 610°C.

The first endothermic effect, observed at 92°C, is accompanied by a mass loss of approximately 5.6%, which corresponds to the initial dehydration of the monohydrate salt of copper acetate and triethanolamine. This indicates the release of water molecules from the crystal structure. The second endothermic effect, occurring at 161.5°C, is associated with the melting of the substance, during which a further mass loss of 10.6% is recorded. This suggests the beginning of more significant decomposition processes.

The three exothermic effects observed at higher temperatures (462.5°C, 526°C, and 610°C) are indicative of the continued decomposition and combustion of the thermolysis products. These reactions likely involve the breakdown of the organic components and the oxidation of the remaining material.

By the time the temperature reaches 610°C, the mass of the sample has decreased to approximately 80% of its original mass. This is evidenced by the mass loss curve (black line), which approaches the 80% mark on the right-hand axis of the graph, corresponding to the percentage of mass loss. The gradual decline in mass at this stage reflects the culmination of decomposition and the stabilization of the residual material.

This detailed thermal analysis offers insight into the decomposition pathway of the $N(C_2H_4OH)_3 \cdot (CH_3COO)_2Cu \cdot H_2O$ compound, revealing critical temperature thresholds for dehydration, melting, and subsequent decomposition, all of which are vital for understanding the thermal stability and potential applications of this material.



Comparative Analysis of IR Spectra of the Complex and Initial Substances: A comparative analysis of the IR spectra of the complex and the starting materials—copper acetate monohydrate and triethanolamine—reveals significant changes in the IR spectra upon complex formation. Given the absence of an NH group in triethanolamine, the most notable change is observed in the region of stretching vibrations around 3600 cm^{-1} . In this region, a narrow, intense band appears at 3400 cm^{-1} , indicative of the formation of an intramolecular hydrogen bond involving the OH group of triethanolamine. This interaction is reflected in the shift of the C=O band to a lower frequency by 20 cm^{-1} , clearly observed at 1580 cm^{-1} .

Conclusion: To substantiate the synthesis of a plant growth stimulant with fungicidal properties, the conditions and mechanism of interaction between triethanolamine and copper acetate monohydrate were studied using the isomolar series method. The research identified the formation of a new compound, which was characterized through physicochemical analytical methods, including solubility studies in various solvents, thermal analysis, and IR spectroscopy. Based on the data obtained, it was concluded that ethanolamines interact with $(CH_3COO)_2Cu$ through the formation of intermolecular hydrogen bonds.

The synthesized copper complexes with triethanolamine, as demonstrated by the studies, show potential as fungicidal agents. Their efficacy is attributed to the ability of copper to inhibit the enzymatic systems of pathogenic microorganisms, while triethanolamine can stabilize the active substance, enhancing its effectiveness and duration of action. Encapsulation of these complexes in biopolymers such as chitosan or alginate can improve their stability and control the release of the active ingredient, which could be particularly beneficial for prolonged protection of seeds and seedlings. The application of these compounds as seed treatments can provide comprehensive plant protection, improve disease resistance, and promote more uniform and healthy growth. Further studies on the biological activity of these complexes, their effects on various crops, and their environmental safety will be important.

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Rezyume: Ushbu maqolada mis asetat monogidрати, trietanolamin va suv tizimidagi komponentlarning o‘zaro ta’siri izomolyar seriyalar usuli yordamida o‘rganildi. Trietanolamin miqdori o‘zgartirilgan holda muhitning sinish ko‘rsatkichi, zichlik, qovushqoqlik va pH qiymatlaridagi o‘zgarishlar tahlil qilindi. Natijalar 30% va 70% trietanolamin tarkibiga mos keluvchi ikki burilish nuqtasini aniqladi, bu tizimning komponentlari orasida murakkab o‘zaro ta’sirlar mavjudligini ko‘rsatadi. Ushbu topilmalar tizimning kimyoviy xatti-harakatini tushunishda muhim ahamiyatga ega bo‘lib, yangi materiallar ishlab chiqishda qo‘llanilishi mumkin.

Резюме: В данном статье изучено взаимное влияние компонентов в системе моногидрата ацетата меди, триэтаноламина и воды методом изомолярных серий. Проведен анализ изменений показателя преломления, плотности, вязкости и pH среды при варьировании содержания триэтаноламина. Результаты выявили две точки перегиба, соответствующие 30% и 70% содержанию триэтаноламина, что указывает на сложные взаимодействия между компонентами системы. Эти выводы важны для понимания химического поведения данной системы и могут найти применение в разработке новых материалов.

Kalit so‘zlar: Mis asetat monogidрати, Trietanolamin, Izomolyar seriyalar, komponentlarning o‘zaro ta’siri, sinish ko‘rsatkichi, zichlik, qovushqoqlik, pH

Ключевые слова: Моногидрат ацетата меди, Триэтаноламин, Изомолярные серии, взаимодействие компонентов, показатель преломления, плотность, вязкость, pH

**PHYSICAL AND MECHANICAL CHARACTERISTICS AND CHEMICAL
COMPOSITION OF AGRO-ORES OF KARAKALPAKSTAN**

Allaniyazov D.O¹, Orakbayev A.A².

¹*Karakalpak Research Institute of Natural Sciences of the Karakalpak Branch of the Academy of
Sciences of the Republic of Uzbekistan*

²*Institute of General and Inorganic Chemistry of the Academy of Sciences of the Republic of
Uzbekistan*

Summary: *In this research work, the chemical composition and physical-mechanical classification of some mineral raw materials identified in the territory of Karakalpakstan were studied. The reserve of Krantau glauconite deposit, which contains 37% glauconite, is 50 million tons. It covers an area of 4.5 km². Khodzhakol phosphorites, Beshtyube and Krantau bentonites, and vermiculite deposits containing an average of 19% P₂O₅ were proved to be suitable for industrial use in terms of raw material composition.*

Keywords: *Karakalpakstan, agro-ores, glauconite, phosphorite, bentonite, vermiculite, Khudzhakul, Krantau, Beshtyube.*

Introduction. As a socially-oriented market economy is established in the Republic of Uzbekistan, one of the decisive factors is the development of the chemical industry, in particular the production of mineral fertilizers.

At the present stage of large-scale reforms and democratic transformations, scientific research on the search for new fertilizers based on local raw materials and the large-scale application and effective use of new mineral fertilizers have been significantly expanded and deepened.

At present, the scientifically substantiated need of the republic's agriculture for fertilizers is expressed in 839.6 thousand tons of nitrogen, 518.3 thousand tons of phosphorus and 278.9 thousand tons of potash fertilizers based on 100% nutrients.

In the conditions of depletion of reserves of high-quality ores, in order to increase soil fertility and crop yields, it is very important to involve in processing on an ever-increasing scale new types of agronomic ores (glauconites, bentonites, phosphorites and vermiculites) containing a number of macro- and microelements.

For this purpose, it is necessary to create a mineral resource base and scientifically substantiated introduction into agricultural production of new non-traditional types of local mineral raw materials with complex action, since their preparation and introduction into agricultural production, in general, does not require significant capital expenditures.

Glauconite is a widespread mineral in nature, the total world resources of which are estimated at 35.7 billion tons [1].

Glauconite sands attract attention primarily due to the low cost of the product, high potassium content (up to 9%), the ability to release potassium in the form of easily digestible compounds over a long period of time, the ability to absorb nuclides, heavy metals and toxicants in the soil. Information about the presence of glauconite in the territory of Karakalpakstan is mentioned in the works of I.V. Mushketov, A.D. Arkhangelsky [2,3] and other researchers as accompanying minerals in the formation of phosphorites. The most promising deposit is Krantau, with a total area of 4.5 km², with an average thickness of 4.7 m, with an average glauconite content of 37%, and promising reserves of about 50 million tons [4]. It contains up to 4-5% potassium and about 15 microelements.

The use of these glauconite sands directly or after processing as microelement-containing fertilizers is of great economic and ecological importance for the regions of Karakalpakstan with their saline soil [5-9].

The content of glauconite in any rocks rarely exceeds 50%. Of practical interest are glauconite sands containing at least 40% glauconite [9].

Phosphorite is a sedimentary rock, an agronomic ore consisting mainly of phosphate minerals of the apatite group, which are in a crypto- or microcrystalline form. It has the formula $\text{Ca}_5(\text{PO}_4)_3(\text{F}, \text{Cl})$ with an admixture of CaCO_3 . Among the agronomic ores of Karakalpakstan, nodular phosphorites occupy a special place. The presence of phosphorite manifestations in Karakalpakstan is described in a number of works by A. Palybekov et al. [10]. The estimated reserves of phosphorite deposits and manifestations of Karakalpakstan amount to more than 70 million tons of ore [11].

Khudzhakul phosphorites. Situated in the northwest of Mount Karatau (Lake Khudzhakul). There are 3 phosphorite horizons here. The lower one is confined to the Upper Cretaceous, and the second and third to Paleogene deposits. The upper phosphorite horizon is 0.1-0.25 m, which contains P_2O_5 up to 11.61%. The phosphorite layer contains numerous fragments of macrofauna shells. The P_2O_5 content is on average 18%. Thickness is 0.20-0.25 m. In nodular phosphorite, the relative content of lemon-soluble P_2O_5 reaches up to 40%, much more than in the Karatau and Kyzylkum or, especially, apatite ores [12]. This predicts the prospects for its use as a mineral fertilizer in the form of phos flour or as part of standard mineral fertilizers [13].

Bentonites (from the name of the city of Fort Benton, Montana (USA), in the area where this clay was first discovered) consist mainly of minerals of the montmorillonite group and disperse in water to a colloidal state [14].

Bentonite clays are agro-ores containing various macro- and microelements [15]. In Karakalpakstan, the presence of bentonites is mentioned in the works of K.K.Kurbaniyazov, M.Z.Zakirov [16].

The Beshtyube deposit of bentonite clays is located on the right bank of the Amu Darya River (14-15 km southeast of Nukus), with a thickness of 0.5-50.5 m. The clay fraction content is 16.2%, silt 30%, and carbonates 3.2%. The mineralogical composition mainly includes quartz 35.0%, rock fragments 25.7%, potassium feldspars 13.0%, heavy fraction clay minerals consist of single grains of zircon, tourmaline, garnet, etc. The clays are greenish-gray.

The Krantau deposit of bentonite clays is located on the right bank of the Amu Darya River, near the village of Krantau in the Nukus region and is confined to sandy-clayey deposits of the Upper Cretaceous. Here, bentonite in terms of reserves is one of the largest located in the central regions of Karakalpakstan. The approved reserves of bentonite are 5 million tons. Bentonites of these deposits, due to insufficient study of their physical and chemical properties, have not yet found wide application in various fields [17].

Vermiculite is a natural mineral from the group of hydrated micas, which contain not only hygroscopic water, but also crystallization water, which is part of the crystal lattice of the mineral. The formula of vermiculite is: $\text{Mg Fe } 0.8 \text{ Al}_2\text{O}_3 \text{ } 0.4 \text{ SiO}_2 \cdot 10 \text{ H}_2\text{O} (\text{CaSiO}_3) \text{ } 0.9$. According to grain size, vermiculite is divided into three fractions: large - with grain sizes from 5 to 10 mm; medium - with grain sizes from 0.6 to 5 mm; small - with grain sizes up to 0.6 mm. Therefore, when heated, vermiculite swells due to the explosive release of water. In this case, it splits into separate mica plates, partially connected to each other. Swelling of vermiculite leads to an increase in its volume by 15 - 20 times [18-19]. The hardness of the mineral raw material is 1.0–1.5 on the Mohs scale.

The melting point of the studied samples is in the range of 1360 - 1385 °C. At a temperature of 1400 °C, a melt is formed, which solidifies in the form of matte black glass.

Vermiculite mined from the Tebinbulak deposit, located in the North-Western end of the Sultanuvays Mountains, 16 km from the village of Karatau and 8 km from the Karauzyak railway station in the Republic of Karakalpakstan, was selected for the study.

The results of chemical analysis of vermiculite showed that the samples under study differ in the content of basic oxides. At the same time, the high content of sodium oxide in the vermiculite sample indicates its high sorption activity. The studies showed that the vermiculite concentrate under study is characterized by the presence of significant amounts of weakly bound water, which determines the high ability of the raw material to expand.

The involvement of new agro-ore deposits is necessary to provide all regions and districts of Karakalpakstan with cheap local raw materials.

Table 1 shows the chemical compositions of the glauconite sands of Krantau, nodular phosphorites of Khudzhakul, bentonite clays of Krantau, Beshtyube and Vermiculites of the Tebinbulak deposit in Karakalpakstan.

Table 1.

Chemical composition of glauconites of Krantau deposits of Karakalpakstan																		
Samples of birthplace	Content of components, wt. %																	
	SiO ₂	Fe ₂ O ₃	FeO	TiO ₂	MnO	P ₂ O ₅	Al ₂ O ₃	CaO	MgO	Na ₂ O	K ₂ O	CO ₂	SO ₃	ZnO	VO	H ₂ O	lps	%
Krantau	68,91	5,59	1,15	0,44	0,04	0,15	8,95	1,15	1,25	1,71	2,89	0,41	0,24	0,011	0,024	2,29	4,31	99,51
Chemical composition of phosphorites of the Khudzhakul deposits of Karakalpakstan																		
Samples of birthplace	Content of components, wt. %																	
	P ₂ O ₅	CaO	SiO ₂	CO ₂	MgO	R ₂ O ₃	Fe ₂ O ₃	Al ₂ O ₃	SO ₃	TiO ₂	H ₂ O	Na ₂ O	K ₂ O	Org. mat.	lps	%		
Khudzhakul	19,3	33,50	26,45	3,45	0,30	5,96	3,25	2,71	1,38	0,23	0,42	0,98	0,54	0,12	1,26	99,87		
Chemical composition of bentonites of the Krantau and Beshtyubinsk deposits of Karakalpakstan																		
Samples of birthplace	Content of components, wt. %																	
	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	TiO ₂	MgO	MnO	Na ₂ O	K ₂ O	CaO	CO ₂	SO ₃	P ₂ O ₅	H ₂ O	lps	%			
Krantau	66,42	10,91	6,91	0,42	1,17	0,01	2,01	2,54	1,12	0,30	0,52	0,09	3,27	3,93	99,62			
Beshtyube	62,63	15,15	4,31	0,36	1,12	-	2,1	2,94	-	0,20	0,58	0,09	2,68	6,39	98,55			
Chemical composition of vermiculites from the Tebinbulak deposits of Karakalpakstan																		
Samples of birthplace	Content of components, wt. %																	
	SiO ₂	Al ₂ O ₃	MgO	K ₂ O	CaO	TiO ₂	V ₂ O ₅	Cr ₂ O ₃	MnO	Fe ₂ O ₃	NiO	ZnO	Rb ₂ O	SO ₃	SrO	lps	%	
Tebinbulak	44,3	18,9	11,2	8,04	1,12	2,11	0,16	0,02	0,09	13,2	0,03	0,01	0,02	0,16	0,01	0,42	99,79	

Conclusion. The physical and mechanical characteristics and chemical composition of the initial raw materials are given - glauconitic sand of Krantau, nodular phosphorites of Khudzhakul, bentonites of Beshtyube and vermiculites of Tebinbulak deposit.

The methods for determining the chemical composition and commercial quality, as well as conducting physical and chemical studies of the original raw materials - glauconite sand and nodular phosphorites, bentonite clays and vermiculites of Karakalpakstan are described.

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Rezyume: *Ushbu tadqiqot ishida Qoraqalpog'iston hududida aniqlangan ayrim mineral xom-ashyo manbalarini kimyoviy tarkiblari va ularning fizik-mexanik tasniflari o'rganilgan. Tarkibida 37% glaukonit tutgan Krantau glaukonit koni zaxirasi 50 mln.t. bo'lib u 4,5 km² maydonni tashkil etadi. O'rtacha 19% P₂O₅ tutgan Xo'djako'l fosforitlari, Beshtyube va Krantau bentonitlari hamda vermikulit konlari xom-ashyo tarkibi bo'yicha sanoat miqiyosida foydalanishga yaroqli ekanligi isbotlandi.*

Резюме: *В данной исследовательской работе изучен химический состав и физико-механическая характеристика некоторых видов минерального сырья, выявленного на территории Каракалпастана. Запасы глауконитового месторождения Крантау, содержащего 37% глауконита, составляют 50 млн тонн. Он занимает площадь 4,5 км². По составу сырья признаны пригодными для промышленного использования Худжакульские фосфориты, содержащие в среднем 19% Р₂О₅, Бештюбинские и Крантауские бентониты, а также вермикулитовые месторождения.*

Kalit so'zlar: *Qoraqalpog'iston, agrorudalar, glaukonit, fosforit, bentonit, vermikulit, Xudjakul, Krantau, Beshtyube.*

Ключевые слова: *Каракалпастан, агроруды, глауконит, фосфорит, бентонит, вермикулит, Худжакуль, Крантау, Бештюбе.*

UDK 665.7335

STUDY OF THE EFFECT OF ETHANOL ON THE DETONATION AND PHASE STABILITY OF DOMESTIC AUTOMOTIVE GASOLINE

Svaykosov S.O.

Karakalpak State University named after Berdakh

Summary: *Recently, the requirements for the operational and environmental characteristics of gasoline have been growing day by day. Given this, adding ethanol to gasoline to produce oxygenated gasoline with updated properties is currently of great importance.*

In the course of our research work, ethyl alcohol was exposed to increase the octane number of gasoline using a complex of classical and modern research methods, and the temperature of the opacity of the mixture was studied.

Key words: *gasoline, octane number, ethanol, fuel, additive.*

INTRODUCTION.

Modern, intensively developing techniques in the world make serious demands on the physicochemical, operational and environmental properties of petroleum products used in them, in particular automotive gasoline. Today, while the assortment of automotive gasoline, which meets modern environmental requirements, has expanded and their production capacity has increased, the demand for high-quality gasoline is increasing day by day. Of particular importance in the production of high-quality autobenzines is the scientific research on the development of removable landings based on oxygen compounds and their application to automotive gasoline.

In the world, scientific research work is being carried out at an accelerated pace on the development of landing gear that increases the detonation and phase stability of automotive gasoline, their inclusion in the technological systems of gasoline compounding and optimization of processes. In this regard, special attention is paid to the development of a package of landings of oxygen compounds, which ensures the operational, environmental and physicochemical stability of gasoline [1].

LITERATURE ANALYSIS.

The degree of improvement of the environmental and technical and economic indicators of automobile engines is directly related to the growth of operational and quality indicators of gasoline. To improve these indicators of automotive gasoline, the introduction of modern new processes that allow the production of gasoline target components in the industrial sector is carried out by introducing into them compounds that store oxygen (oxygenates), in particular renewable raw materials resources, as well as improved landings of various functional properties [2].

The brand is the main components of automotive gasoline, products of catalytic cracking, catalytic reforming, alkylation, isomerization and various hydro processing processes, and oxygen-stored additives.

The use of ethanol in the composition of automotive gasoline. Today, with the increase in ethanol production, the production volume of gasoline and ethanol blended auto fuels such as E-5, E-10, E-15, E-30, E-85 is increasing. As a result of the performance of this gasoline and ethanol blended fuel, the environmental impact is several times less negative than that of gasoline [3,4].

Ethanol has several advantages as a fuel, as well as disadvantages. Its main advantages are a low level of poison and the fact that the gases formed by its combustion practically do not contain CO gas, the presence of a bioparching property, and the main one is that they are obtained on the basis of renewable resources. Its disadvantages include the use and cost of ethanol consumed.

In the world, since 1980, various brands of automotive fuels have been produced in Brazil, the United States, Sweden, the Netherlands, France, Canada and Colombia, with the addition of 5% to 22% ethanol [5].

Car fuel injection stations of these states sell E5 (which contains 5% ethanol), E10 (which contains 10% ethanol), E22 (which contains 22% ethanol), E85 (which contains 85% ethanol), and E100 pure ethanol [6].

Studies of E85 brand motor fuel in Canada have shown that the application of this fuel reduces the emission of toxic gases leading to a thermal effect by 37-38 % (4-5% when applied to E10 fuel). The percentage of toxic waste is as follows: carbon monoxide is reduced by 25-40 %, nitrous oxide by 20-22 %, volatile organic compounds by 30-35 %, and carcinogenic aromatic compounds by 50-52 % [7].

In ethanol gasoline production, it is possible to increase the stability of the fuel being obtained mainly by using absolved ethanol, and a second problem with ethanol application is its absolution. There are different methods in this, and only in these methods, water purification causes an increase in the cost of bari-one ethanol.

The following methods of alcohol dehydration are relatively more commonly used in industry: dehydration using solid porous adsorbents, dehydration using moisture-absorbing liquid absorbers such as glycerin, saline rectification, and dehydration by azeotropic driving [8].

Relying on the results of the research analysis presented above and theoretical and practical information, it can be concluded that ethanol can be mixed with gasoline to improve its detonation stability and environmental properties.

METHODOLOGY.

Determination of the octane number of samples of goods and newly obtained gasoline using the Shatox SX-300 oil product quality determination device. *Device indicators and its use:* The Shatox SX-300 oil product quality detection device has the following specifications:

- * Determination of the octane number of automotive gasoline;
- * Determination of the number of tsetan diesel fuel;
- * Determination of diesel fuel solidification temperature;
- * Determination of the amount of metalloorganic antidetonative landings that increase the octane number of autobenzines;
- * Determination of the amount of motor oil in gasoline;
- • Determination of kerosene content in summer diesel fuel;
- * Determination of the amount of mechanical additives in oil;
- * Determination of the alkali number of Motor oils.

The Shatox SX-300 device looks compact (Figure 1), it is designed to determine the physicochemical properties of petroleum products in laboratory conditions. Working condition of this device: in the range from -10 to +45°C.

Using the device. The principle of operation of this device can be determined by determining the detonation stability of gasoline, studying the self-ignition of diesel fuels, and determining the properties of oils based on relative volumetric resistance and dielectric permeability.



Figure 1. Overview of the Shatox SX-300 oil product quality determination device

The sensor of this device consists of a glass with a capacity of 75 ml, which helps to determine the signal characteristic in the generator, while the generator glass is located at the bottom. At the same time, the sensor also has an element that measures the temperature of the fuel sample.

There is an imitator at the top of the sensor, which helps to start the sensor without being sampled in preparation for the experiment.

The electronic computing block of the Shatox SX-300 device processes the sensor signals and displays the results obtained, performing all the calculations. Another task of the electronic computing block is to constantly test all nodes of this device.

The technical characteristic of the Shatox SX-300 device is presented in table 2.1 [9].

Determination of the temperature of fading and hardening of petroleum products using the TPZ-LAB-12 device. The TPZ-LAB-12 analysis device is designed to determine the temperature of fading and hardening of petroleum products according to ASTM d6749, ASTM d7683, the accuracy of the results obtained using this device is fully consistent with ASTM D2500, ASTM D 97, GOST 20287, GOST 5066, EN 23015, ISO 3015, ISO 3016, IP 15.

The TPZ-LAB-12 analysis device belongs to the latest generation of modern laboratory equipment. One of the distinctive features of the TPZ-LAB-12 is that it is able to lower the test temperature to minus 85°C without the use of external cooling systems, and also comes with a cooling device. The device automatically sets the temperature of the cooling bath and is able to maintain that temperature. The device is designed to conduct tests to determine the temperature of fading and hardening of petroleum products. At the same time the device creates and stores data from tested products in memory.



Figure 2. Overview of the TPZ-LAB-12 device

The main advantages of this analysis device are the low application of the sample (around 4-5 ml) and, accordingly, the receipt of the desired results over a low period of time. An overview of the TPZ-LAB-12 device is shown in Figure 2.6.

To determine the dimming temperature of petroleum products, in particular gasoline, an optical light distribution system is used. Features of the TPZ-LAB-12 device include:

1. Conducting the test in full automatic control;
2. The presence of the possibility of cooling the sample through the cooling system in the device –up to 85oc temperature without external factors;
3. High precision Pt-100 temperature meter;
4. Touch control;
5. Cooling system speed control;
6. Detection range -85...+51oC;
7. The presence of an automatic overheating self-protection system;
8. Remote software update [10].

RESULTS.

Research on the effect of ethanol on the detonation stability of AI-80 and AI-92 automotive gasoline

99% ethyl alcohol was used in the study of alcohols, specifically the effects of ethanol, on the detonation stability of automotive gasoline. The effect of ethanol on the detonation stability of AI-80 gasoline was determined in concentrations of 1-10, and the results obtained are shown in Figure 3.

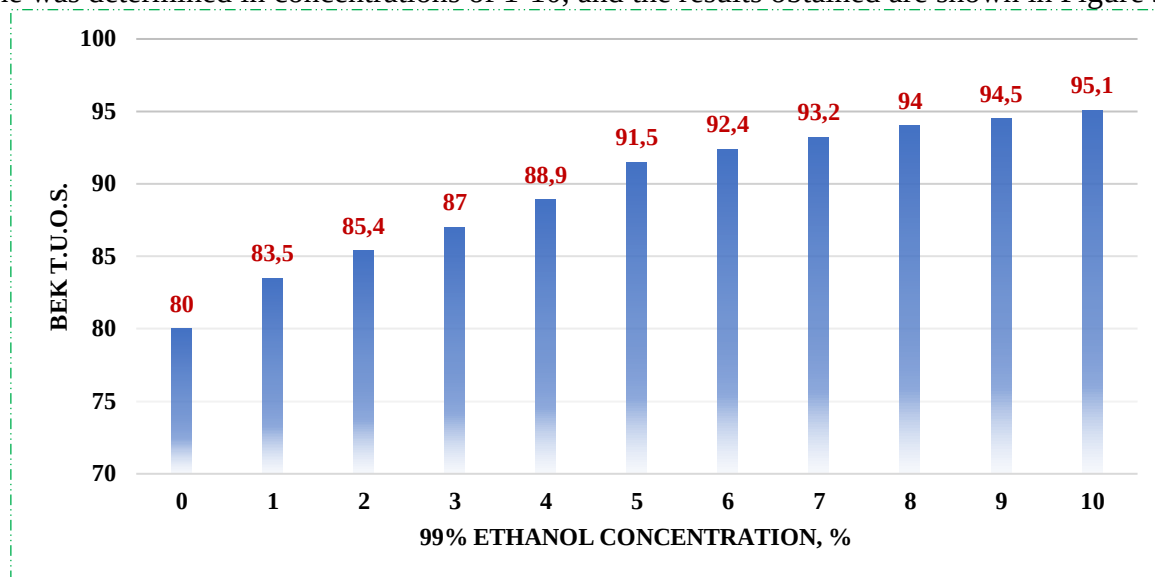


Figure 3. The effect of ethyl alcohol on the detonation stability of AI-80 automotive gasoline

And at the next stage of our study, the effect of ethanol on the octane number of the local autobenzine AI-92 was studied, and the results obtained are given in figure 4 [11].

While the detonation stability of ethanol and domestic automobile gasoline gaskets has increased significantly, considering that their phase stability changes their low-temperature properties with the addition of ethanol to gasoline, in the later stages of our research, the refractive temperature of the mixture of 99% ethanol to domestic AI-80 and AI-92 automotive gasoline at different concentrations has been researched [12].

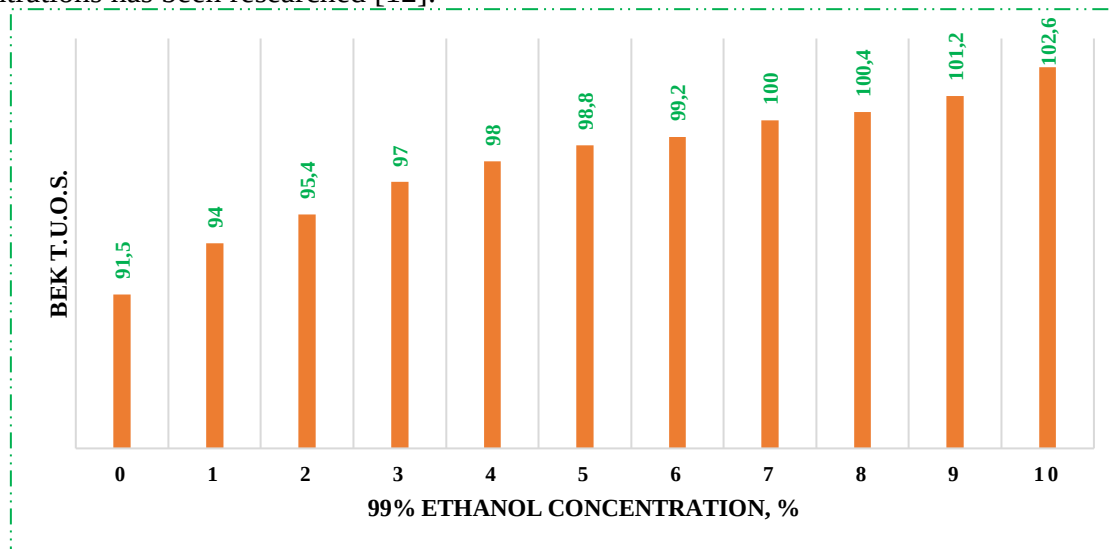


Figure 4. The effect of ethyl alcohol on the detonation stability of AI-92 automotive gasoline

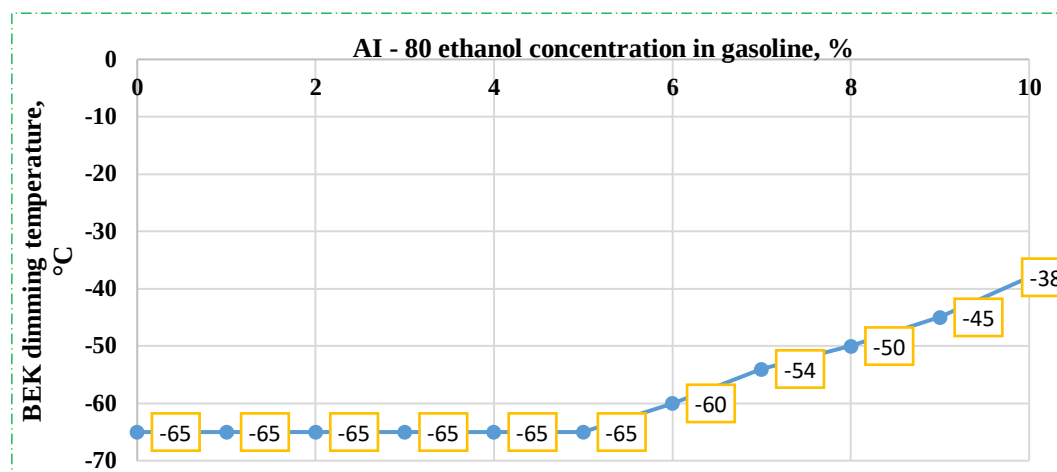


Figure 5. AI-80 with ethanol of 99% gasoline, the dimming temperatures of the obtained mistresses of different concentrations

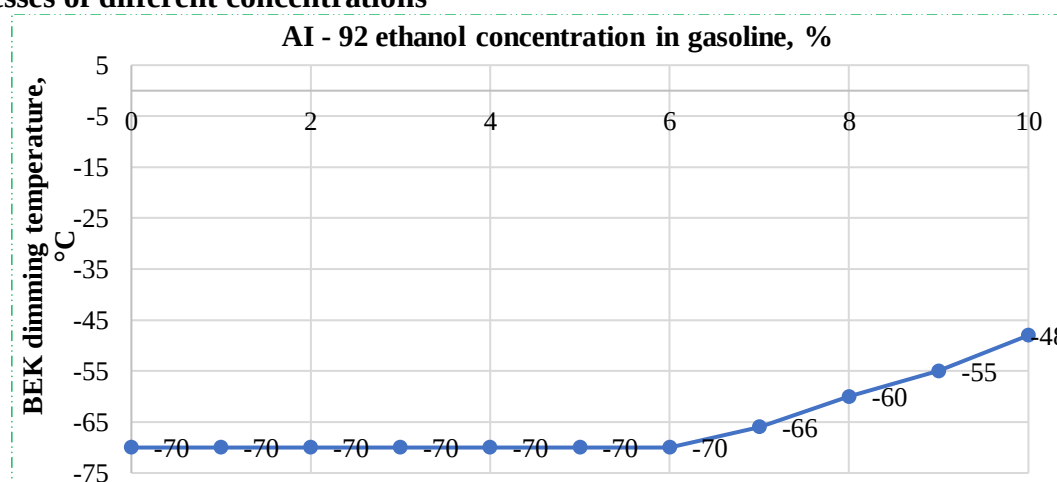


Figure 6. AI-92 with ethanol 99% of gasoline, the dimming temperatures of the obtained Beks of different concentrations

DISCUSSION.

As can be seen from the above research work, samples of gasoline ethanol compositions (BEK), originally supplemented with domestic AI-80 automotive gasoline and 99% ethanol, showed that the octane number of Beks increases to an average of 1.5-3 punkt at 1 to 10% ethanol content. To increase the octane number of this automotive gasoline of ethanol, that is, to produce the autobenz AI-95, it requires the addition of 10% ethanol in its composition.

The results of determining the effect of ethanol on the octane number of AI-92 automotive gasoline have shown that it is possible to obtain AI-95 gasoline with the addition of 2-3% ethanol.

The results of a study to find out the dimming temperatures of BEKs with AI-80 automotive gasoline and ethyl alcohol showed that 99% ethanol can be directly added to automotive gasoline by up to 5%.

Studies with AI-92 gasoline also confirmed the results of studies with AI-80 automotive gasoline.

CONCLUSION.

Currently, many countries have established the use of ethanol fuels, with the introduction of automobile engines adapted to ethanol fuels. The benefits of ethanol fuels are most likely the low environmental harm of avvalo. In our country, too, the transition to fuels that meet Euro standards is being carried out in stages. With this in mind, the possibilities of obtaining ethanol fuel based on domestic gasoline were studied.

During our research work, the concentration of ethanol with technical ethyl alcohol of 99% of domestic AI-80 and AI-92 automotive gasoline was obtained at intervals of 1-10%, and their dimming

temperatures were determined. The result proved that AI-80 gasoline could be added 5% directly, and AI-92 gasoline 6% directly. The effect of 99% ethanol on the detonation stability of domestic AI-80 and AI-92 automotive gasoline was also researched. With the introduction of up to 10% ethanol into AI-80 gasoline, its octane number was found to be 95.1 points, while the octane number with 2% ethanol added to AI-92 gasoline was found to increase to 95.4 points, and 10% added to 102.6 points.

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Rezyume: So'nggi paytlarda avtomobil benzinlarining ekspluatatsion va ekologik xususiyatlariga qo'yilayotgan talablar kundan – kunga ortib bormaqda. Shularni hisobga olgan holda etanolni benzin tarkibiga qo'shib, yangilangan xossaga ega oksigenatli benzin olish hozirgi kunda kata ahamiyatga ega.

Ilmiy tadqiqot ishimiz davomida klassik va zamonaviy tadqiqot usullari majmuasidan foydalanib benzinni oktan sonini ko'tarish uchun etil spirti ta'sir ettirilib ko'rildi va shu bilan birga aralashmaning xiralanish haraorati ham o'rganib ko'rildi.

Резюме: В последнее время требования к эксплуатационным и экологическим характеристикам автомобильных бензинов растут день ото дня. Учитывая это, добавление этанола в бензин для получения оксигенированного бензина с обновленными свойствами в настоящее время имеет большое значение.

В ходе нашей научно-исследовательской работы этиловый спирт подвергался воздействию для повышения октанового числа бензина с использованием комплекса классических и современных методов исследования, а также изучалась температура непрозрачности смеси.

Kalit so'zlar: benzin, oktan soni, etanol, yoqilg'i, qo'ndirma, qo'shimcha.

Ключевые слова: бензин, октановое число, этанол, топливо, присадка, добавка.

STUDYING DIAGRAMS OF ELECTROMAGNETIC CONVERTER OF DISTRIBUTED PARAMETERS

Abubakirov A., Begmuratova Sh.

Nukus Mining Institute at the Navoiy State Mining and Technology University, Uzbekistan, Nukus.

Summary: modeling of transforming circuits of sensors with distributed parameters gave possibility research input values as electrical current, voltage and ets. and output signals as electrical voltage of the basis of using sensitive elements. In article collect results modeling and research transforming circuit of primary sensors with distributed magnetic parameters.

Key words: sensor, circuit, distributed parameter, current, voltage, signal, sensitive element, modeling.

Introduction.

The primary electromagnet sensors with distributed parameters (magnetic core, air gaps, electrically conductive materials, dielectrics - as an insulating plate, etc.) of control systems have a very different geometrical configuration and structure. As well as distributed character (nonsymmetrical and nonlinear values) of transforming primary circuit to secondary voltage and three-dimensionality structure construction of sensor elements of on volume of signal from sensor and control systems (current and voltage) of electrical circuit, is clear that modeling and calculating them in full a difficult task. In this article carried out modeling and research of transformation circuit, splitting them into separate components and simple elementary parts based on replacing it with a three-dimensional electric circuit of substitution - a graph model of transforming circuits of primary sensors [1, 2].

Main part.

The research oriented on stage of analysis and modeling of elements' constructions on basis of graph model - representation of principles of transformation of distributed parameters of electrical physical value as primary sensors of control systems. The solution of problem of modeling principles of operation of sensors of current in graph models is reduced to the procedure for transforming the initial graph consisting node, value - incoming - primary current to -secondary voltage - the output electrical signal.

The graph model characterizes value of participates in the process of transformation of electromagnetic current and voltage sensors, and reflect the nature of the functional relationship between the values and parameters of the transformation circuit and elements. Design of the circuits for electromagnetic current and voltage sensors, the number of which continuously increases as new physic technical effects are used in them, raises the problem of their systematization and selection of optimal quantities and parameters of the transformation and circuit that meets the requirements of a modern control system [3, 4].

The methods for modeling and calculating of circuits of transformation sensors and measurement systems of current and voltages of labors sensors, are very approximate and do not always allow for the peculiarities of transforming of signal from sensors [4-7].

Based on the magnetic circuits of the transformation sensors and measurement systems of current and voltages with distributed parameters, the algorithm for constructing the model of transformation elements - the magnetic system or circuit - is explained, since the structure, shape and geometric dimensions, as well as magnetic materials of the magnetic circuit, reflect the essence of the magnetic circuits of the transformation electromagnetic current and voltage sensors.

On the basis of this research, the real physical transformation circuit of current and voltage sensors, is replaced by an equivalent model with longitudinally, transversely and vertically distributed parameters or a model, represented in three-dimensional coordinate system .

The parameters and values of model are determined on the basis of geometric dimensions and taking into account unit-specific distributed parameters of sensors.

Then resistances of elementary sections of equivalent model of transformation circuit are determined from equations [5-11]:

$$R_{\mu i, j, k} = R_{\mu i, j, k} \Delta X_i, \quad (1)$$

$$\Pi 0_{\mu i, j, k} = \Pi_{\mu i, j, k} \Delta X 0_j, \quad (2)$$

$$\Pi 1_{\mu i, j, k} = \Pi_{\mu i, j, k} \Delta X 1_k, \quad (3)$$

where: $\Delta X_i = X / N$, $\Delta X 0_j = X 0 / M$, $\Delta X 1_k = X 1 / K$ - elementary parts circuit; X , $X 0$, $X 1$ - length of transformation sites; X - longitudinal length of sections; $X 0$ - vertical length of sections; $X 1$ - transverse length; N , M , L – number of dividing sections.

The algorithm of modeling of circuit of primary electromagnet sensors of current is represented in following steps:

1. Complex circuit of the transformation of sensors will be divided to elementary parts (taking into account magnetic circuit, air gaps, additional cores, and scattering fluxes) according to principle of magnetic flux constant at each section of conversion chain.

2. The preliminary distribution of the magnet moving force (m.m.f.) and magnetic flux along sections of circuit defined.

A preliminary distribution of magnetic induction in sections i and j , where there is an air gap is defined as follows:

$$B_{i, j} = \frac{\Phi_{i, j} \Pi 0_{\mu i, j}}{\delta_{i, j}}, \quad (4)$$

where $\Phi_{i, j}$ - magnetic fluxes in sections of circuit; $\Pi_{\mu i, j}$ and $\Pi 0_{\mu i, j}$ are magnetic conductivities of i and j -th sections of circuit.

When primary current flow through current circuit - primary winding of electromagnetic sensor I_{BX} is set, then m.m.f. in magnetic circuit is defined as follows:

$$F_{i, j} = I_{\text{BX}} w_{\text{OB}}, \quad (5)$$

where: w_{OB} - number of turns of current conductor - field winding.

The magnetic flux is determined as follows:

$$\Phi_{i, j} = \Pi 0_{\mu i, j} (F_{i, j} - F_{i, j+1}). \quad (6)$$

3. The complex conductivity of each longitudinal i, j -th section will defined as:

$$\Pi 0_{\mu i, j} = Y_{\mu i, j} = Z_{\mu i, j}^{-1} = g_{\mu i, j} - j b_{\mu i, j}, \quad (7)$$

where $Z_{\mu i, j} = R_{\mu i, j} + j X_{\mu i, j}$ is complex magnetic resistance of i, j -th section.

4. For the considered magnetic section of transmission circuit: $R_{\mu i, j} = \rho l_{\mu i, j} / F_{i, j}$ - active magnetic resistance – parameter of i, j -th section, characterizing property of magnetization of magnetic material under influence of applied force; $X_{\mu i, j} = \rho l_{\mu i, j} / S_{i, j}$ - reactive magnetic resistance of i, j -th section, characterizing loss of magnetizing force on eddy currents and hysteresis; $\rho R_{\mu i, j}$ and $\rho X_{\mu i, j}$ respectively, specific reactive and reactive magnetic resistances of i, j -th section of magnetic circuit, determined depending on magnetic induction and magnetic characteristics; length of i, j -th section of magnetic circuit of transformation.

When i, j -th segment of circuit is an air gap, then its active magnetic conductivity determine as

$$\Pi O_{\mu i,j} = R_{\mu i,j}^{-1} = \sqrt{2}\mu_0 \frac{F_{i,j,k}}{\delta_{i,j}}, \quad (8)$$

where; i, j - parts of magnetic circuit; μ_0 is magnetic constant of air. If i, j -th segment is a scattering section, then determine magnetic conductivity:

$$\Pi O_{p i,j} = g_{\mu} l_{\mu p i,j}, \quad (9)$$

where specific magnetic conductivity of the scattering, obtained from structure and analytically from known relationships.

5. The field of graph model of designated nodal points will taking put into account their mutual arrangement.

6. Connection each pair of node points graph model constructions between each other by two oppositely directed arcs according to designated nodes of initial design of transformation circuits of electromagnetic current sensors.

7. For each arc of obtained nodal subgraphs, will assigned a complex transfer equal to ratio of complex conductivity of elementary region between nodes of initial system under consideration to complex conductivity of node to which arc of graph model is directed as:

$$T_{i,j,k} = \frac{\Pi O_{\Sigma i,j}}{\Pi_{\Sigma i,j} + \Pi O_{\Sigma i,j}}. \quad (10)$$

8. The field of graph model points corresponding to given quantities (primary electric current) and these points will be considered as nodes of graph model of transformation circuit sensors We put on.

9. Connection nodes $F_{i,j}$ with arcs corresponding to complex materials of nodes of section on which source will be located in form of model.

In case, when nodes of connecting influencing quantities - fluxes. through coefficients of relationships between values of electric and magnetic value, for this cases communication means as a parameter between magnetic flux and m.m.f. of circuit of sensors determined as follows:

- for model node $F_{\mu 11}$ is determined on basis of the interchain coupling coefficient between electric and magnetic circuits. The input value at point $F_{\mu 11}$ will determined from next equal:

The input value at the point $F_{\mu 11} = K_{IF} I_{\Sigma};$

$$\frac{F_{\mu 11} - F_{\mu 12}}{R_{\mu 11} + R_{l \mu 11}} = 0 \quad (11)$$

$$F_{\mu 11} = F_{\mu 12} \quad (12)$$

$$\frac{F_{\mu 11} - F_{\mu 12}}{R_{\mu 11}} - F_{\mu 12} \cdot G_1 = 0 \quad (13)$$

$$F_{\mu 11} - F_{\mu 12} - F_{\mu 12} \cdot G_1 \cdot R_{\mu 11} = 0 \quad (14)$$

$$F_{\mu 12} = \frac{F_{\mu 12}}{1 + G_1 \cdot R_{\mu 11}} \quad (15)$$

where $R_{\mu 11} = \frac{l}{\mu \cdot \mu_0 \cdot a \cdot b}$; $G_1 = \frac{\mu_0 \cdot a \cdot b}{l_{e.3}}$ are the resistance and conductivity of the sections of the transformation circuits.

In fig.1 given the graphs of change flux and m.m.f. on longitudinal sections of transformation signal of circuit of sensors.

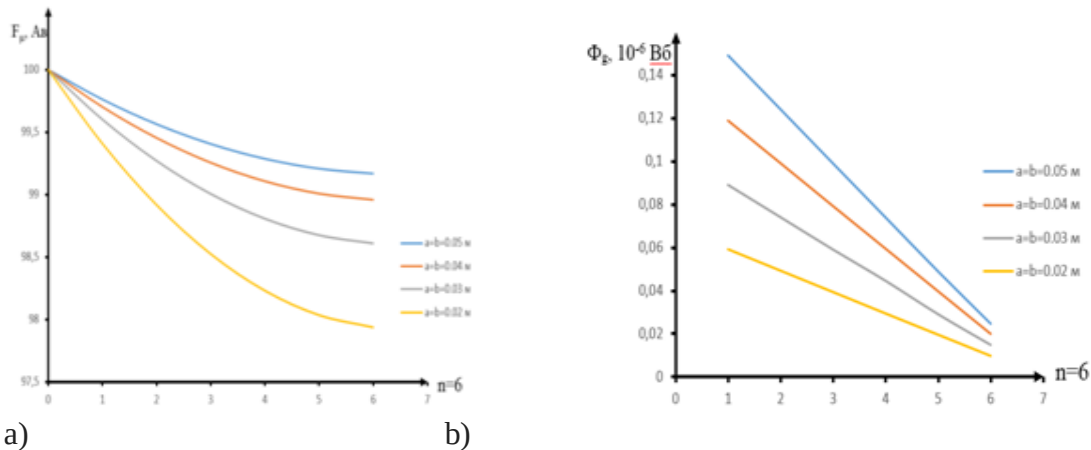


Fig.1 The graphs of change flux and m.m.f. on longitudinal sections of transformation signal of circuit of t sensors where: a – graph of changing of m.m.f.and b –graph of changing of flux

In fig. 2 and 3 presents the electromagnet sensors with distributed parameters, that transforming in real time of the values of the electrical network and the results of their practical researchs [10-12].

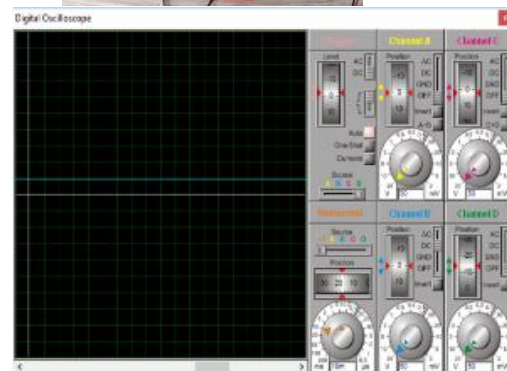
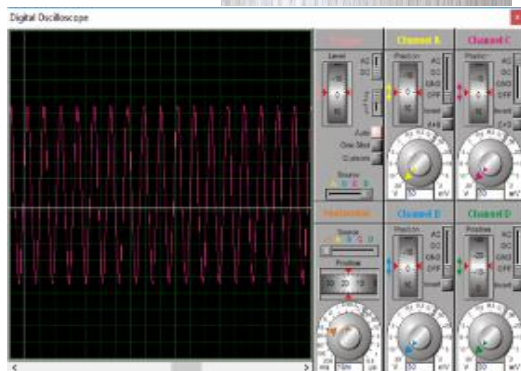
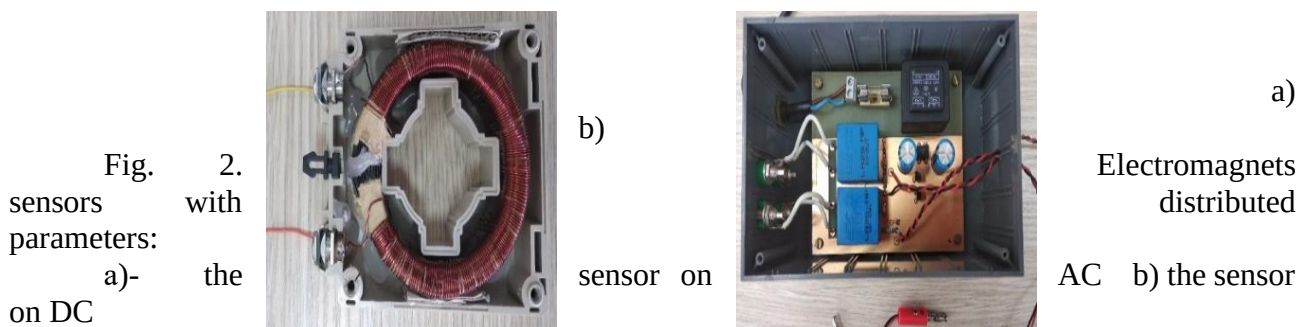


Fig.3 Results of research
a)- from sensor of AC

b) – from sensor of DC

Conclusion.

1. Motivated, that using flat measuring windings in sensors of primary current to secondary voltage as sensing element, provides unified out signal with parameters: voltage - 20 V, current - 100 mA.
2. Installed, that value out voltages U_{out} depends on degree of perpendicular and uniformities of crossing magnetic flow area flat measuring windings, optimal resistances and conductivities complex portioned area and structures of magnetic circuit of sensors.
3. The entropy inaccuracy of sensors of the primary current to secondary voltage does not exceed 0,2%%.
4. Practically on the basis of results of research determined, that total reliability combined control system source of electrical power of power systems on the base of intelligent sensors and measurement systems of current to voltage with flat measuring windings forms, best value equal to 0,96.

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Rezyume: taqsimlangan parametrlarga ega datchiklarning transformatsion sxemalarini modellashtirish elektr toki, kuchlanish va boshqalar kabi kirish qiymatlarini tadqiq qilish imkoniyatini berdi. va chiqish signallari sezgir elementlardan foydalanish asosining elektr kuchlanishi sifatida. Maqolada taqsimlangan magnit parametrlarga ega bo'lgan birlamchi sensorlarni o'zgartirish sxemasini modellashtirish va tadqiqot natijalarini to'plang.

Резюме: моделирование преобразовательных цепей датчиков с распределенными параметрами дало возможность исследования входных величин в виде электрического тока, напряжения и т.д. и выходных сигналов в виде электрического напряжения на основе использования чувствительных элементов. В статье собраны результаты моделирования и

исследования преобразовательных цепей первичных датчиков с распределенными магнитными параметрами.

Kalit so'zlar: *datchik, sxema, taqsimlangan parametr, oqim, kuchlanish, signal, sezgir element, modellashtirish.*

Ключевые слова: *датчик, цепь, распределенный параметр, ток, напряжение, сигнал, чувствительный элемент, моделирование.*

UDK: 1.138.2

SYNTHESIS OF TEITA-1 AND ITS APPLICATION AS A CARBON STEEL CORROSION INHIBITOR IN 0.5 M H₂SO₄ SOLUTION

Durdubaeva R.M¹., Beknazarov Kh.S²., Khozhametova B.K³.

¹Karakalpak State University named after Berdakh, assistant

²Angren University, head of the department of General Medicine, doctor of technical sciences, professor

³Karakalpak State University named after Berdakh, Associate professor of the department of Chemical technology, candidate of technical sciences

Summary: The TEITA-1 compounds were characterized using the IR spectrum. The inhibitory effect of 2,4,6-triethanolimine-1,3,5-triazine (TEITA-1) on the dissolution of carbon steel St20 in 0.5 M H₂SO₄ solution was shown using various methods. Corrosion parameters obtained from the methods used confirm that the inhibitory ability of the TEITA-1 compounds increased with increasing concentration of the TEITA-1 compounds, decreasing temperature and surface properties, eg surface tension, interfacial tension.

Keywords: 2,4,6-triethanolimine-1,3,5-triazine, IR spectrum, corrosion inhibitor, H₂SO₄.

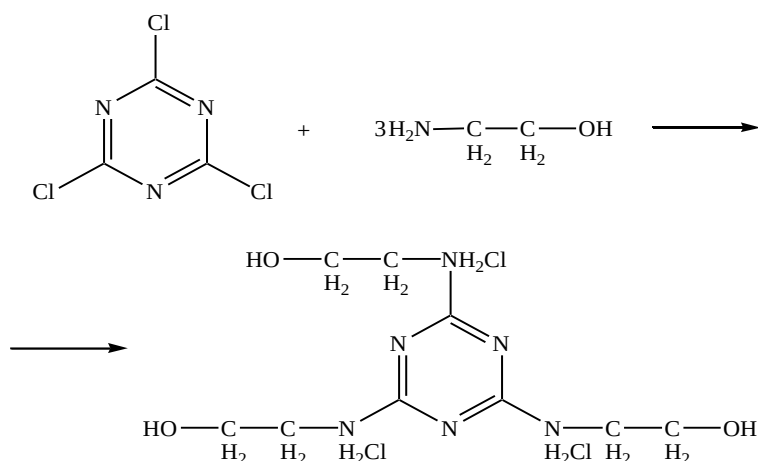
1. Introduction.

Corrosion of carbon steel (CS) in sulfuric acid and attempts to inhibit it are among the important topics pursued by many scientists as it has important economic significance and affects the national income of a country. Sulfuric acid is used in various industrial processes such as acid pickling, acid cleaning and acid descaling [1]. These processes corrode the AC, and so scientists use corrosion inhibitors to overcome many of the damage that results from AC corrosion and acid consumption. In most previous studies, organic compounds containing N, S, or O atoms were used as corrosion inhibitors for carbon steel. These compounds provide high inhibitory efficiency in reducing the corrosion rate due to their adsorption on the steel surface [2–4]. Unfortunately, most of these organic substances are imported from abroad. To solve these problems, available substances were used, which have many advantages, including ease of preparation, low cost and availability of substances, as well as local products manufactured by “Navoiyazot” JSC. There are many types of corrosion inhibitors that have been used as anticorrosion agents against US corrosion in acidic environments and give high inhibition efficiency due to the ease of adsorption on the steel surface, where there is more than one place, which facilitates the adsorption process [5–7].

The main goal of our research is to try to reduce the corrosion of 0.5 M DC.sulfuric acid using synthesized compounds based on cyanuric chloride and monoethanolamine containing nitrogenous compounds in the ring and in the form of imine groups, with the use of various methods to measure the effectiveness of inhibition and also study the effect of high temperatures and determine some thermodynamic parameters of the activation and adsorption process.

2. Experimental part.

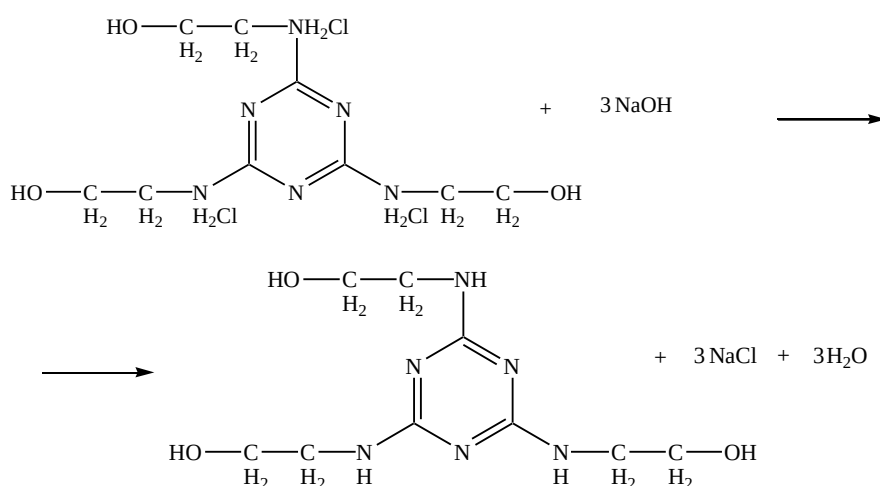
Synthesis of a corrosion inhibitor based on cyanuric chloride and monoethanolamine (TEITA-1). This process was carried out as follows: in the *first stage* synthesized secondary amine salts based on 2,4,6-trichloro-1,3,5-triazine with monoethanolamine in acetone. The reaction scheme can be represented as follows:



Scheme 1. Synthesis of secondary salt derivatives based on 2,4,6-trichloro-1,3,5-triazine with monoethanolamine.

Stage 2. Extraction of amine derivatives of cyanuric chloride.

At the second stage, 3 moles of sodium hydroxide solution were added per mole calculated salt. After treatment with caustic soda, the resulting substances were separated. The reaction scheme can be represented as follows:



Scheme 2. Reaction scheme for the preparation of 2,4,6-triethanolimine-1,3,5-triazine (TEITA-1).

3. Results and discussion.

3.1. The structure of the synthesized product was established according to IR data spectroscopy.

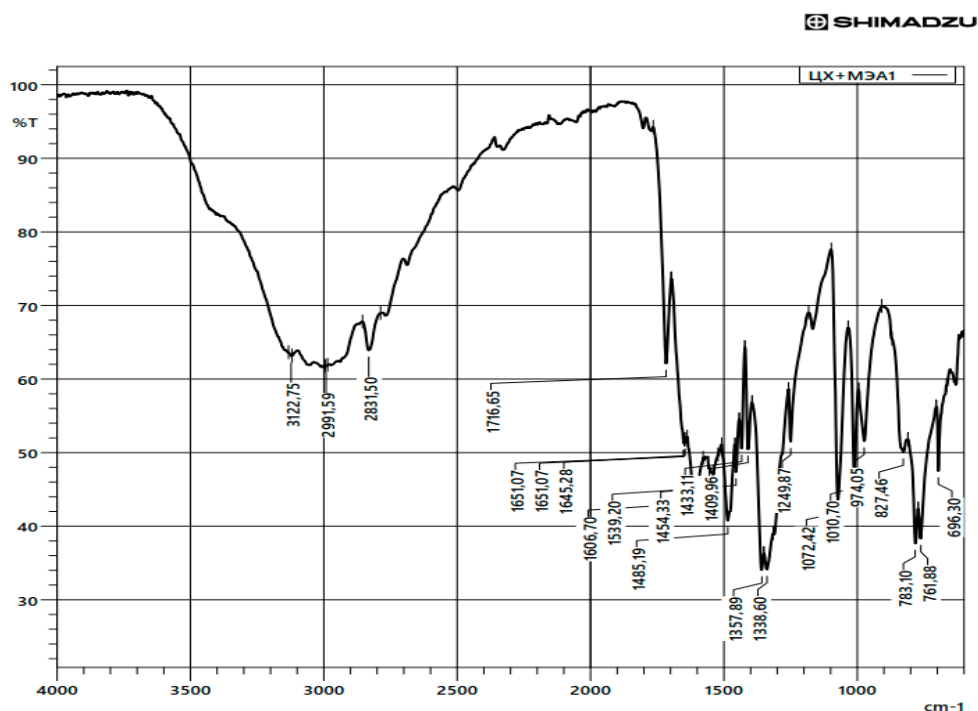


Figure 1: IR spectrum of 2,4,6-triethanolimine-1,3,5-triazine (TEITA-1).

In the IR spectrum of 2,4,6-triethanolimine-1,3,5-triazine hydroxyl groups –OH are absorbed in the region of 3122 cm⁻¹ in the form of a broad band, and bending vibrations imine groups –NH appear in the regions of 1651, 1606 and 1539 cm⁻¹. C-N bonds appear around 1010 and 1072 cm⁻¹.

3.2. Corrosion inhibition measurements by gravimetric method.

Corrosion inhibition of St20 carbon steel using gravimetric analysis. In Figure 2 shows the relationship between the mass loss curves and the immersion time of St20 samples in an uninhibited 0.5 M H₂SO₄ solution containing some concentrations of TEITA-1 at 25°C. With an increase in the concentration of TEITA-1 compounds, the weight loss of St20 carbon steel in an acidic solution decreases significantly. We can conclude that all three tested TEITA-1 compounds are good inhibitors of St20 acid corrosion. The ratio of straight lines in Fig. 1 indicates the absence of insoluble surface films during corrosion.

The corrosion rate R_{corr} (g cm⁻² min⁻¹), surface coverage (θ) and %IE were calculated using the following relationship [8-9]:

$$R_{corr} = \Delta W / At, \quad (3.1)$$

$$\theta = \left[1 - \frac{R_{add}}{R_{free}} \right], \quad (3.2)$$

$$\%IE = \left[1 - \frac{R_{add}}{R_{free}} \right] \times 100, \quad (3.3)$$

where ΔW is the mass loss, A is the surface area and t is time, R_{free} and R_{add} are the corrosion rate in the absence and presence of the corrosion inhibitor TEITA-1 after 10 hours, respectively.

The values of R_{corr} , IE % and θ are presented in table. 1. From this table it is clear that R_{corr} decreases and %IE values increase, which indicate the inhibitory ability of the tested TEITA-1 inhibitors.

Inhibitory efficacy increases with increasing concentration of TEITA-1. This result can be explained by the fact that the higher the concentration of TEITA-1, the greater the number of adsorbed molecules, which leads to the coverage of a larger area of St20 carbon steel. Thus, the corrosion rate is reduced and the inhibition efficiency is increased.

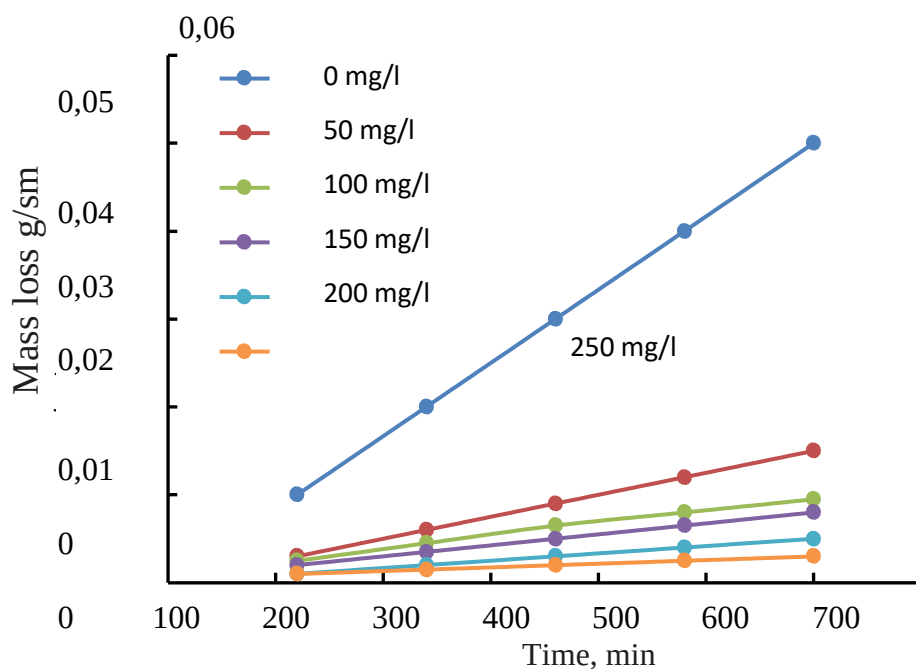


Figure 2: Dependence of mass loss on time for corrosion of St20 in a 0.5 M H₂SO₄ solution containing various concentrations of TEITA-1.

Table 1

Corrosion parameters obtained by the St20 gravimetric method in an uninhibited 0.5 M H₂SO₄ solution, and including some concentrations of TEITA-1

Inhibitors	Concentration, mg/l	$R_{\text{corr}} \times 10^{-7}, \text{mg} \cdot \text{sm}^{-2} \cdot \text{min}^{-1}$	θ	%IE
Without inhibitor	0	6,68	—	—
TEITA-1	50	1,89	0,839	83,91
	100	1,81	0,857	85,72
	150	1,69	0,889	88,94
	200	1,58	0,903	90,36
	250	1,41	0,919	91,94
	500	1,34	0,936	93,63
	1000	1,29	0,958	95,89

It is obvious that the same sequence obtained from the PDP and EIS measurements is fully consistent with the gravimetric results. This proves the sincerity of the results obtained.

Conclusions.

From the data obtained it is clear that TEITA-1 molecules act as a good corrosion inhibitor for St20 carbon steel in a 0.5 M H₂SO₄ solution. The high inhibitory efficiency of the TEITA-1 molecule is associated with an increase in their concentration and a decrease in temperature, surface and interfacial tension.

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Rezyume: TEITA-1 birikmalari IQ spektri yordamida tavsiflangan. Turli usullardan foydalangan holda, 2,4,6-trietanolimin-1,3,5-triazin (TEITA-1) ning St20 karbonli po'latning 0,5 M H₂SO₄ eritmasida erishiga ingibirlash ta'siri ko'rsatildi. Amaldagi usullar yordamida olingan korroziya parametrlari TEITA-1 birikmalarining ingibitorlik qobiliyati TEITA-1 birikmalarining kontsentratsiyasining ortishi, haroratning pasayishi va sirt xossalariining kamayishi, masalan, sirt tarangligi, oraliq taranglikni tasdiqlaydi.

Резюме: Соединения TEITA-1 охарактеризованы с использованием ИК-спектра. С помощью различных методов показано ингибирующее действие 2,4,6-триэтанолмин-1,3,5-триазина (ТЭИТА-1) на растворение углеродистой стали Ст20 в 0,5 М растворе H₂SO₄. Параметры коррозии, полученные с помощью использованных методов, подтверждают, что ингибирующая способность соединений TEITA-1 увеличивается с увеличением концентрации соединений TEITA-1, снижением температуры и поверхностных свойств, например, поверхностного натяжения, межфазного натяжения.

Kalit so'zlar: 2,4,6-trietanolimin-1,3,5-triazin, IQ spektri, korroziya inhibitori, H₂SO₄.

Ключевые слова: 2,4,6-триэтанолмин-1,3,5-триазин, ИК-спектр, ингибитор коррозии, H₂SO₄.

**EXTRACTION OF URANIUM FROM SECONDARY URANIUM-CONTAINING ORES
BY HEAP METHOD OF PHYSICAL-CHEMICAL GEOTECHNOLOGY**

Nazarov Zh.T¹., Allaberganova G.M¹., Muzafarov A.M¹., Kaipbergenov A.T².

¹Navoi State University of Mining and Technology, Uzbekistan, Navoi,

²Nukus Mining Institute at Navoi State University of Mining and Technology, Uzbekistan, Nukus,

Summary: This paper presents the results of a study on the extraction of uranium from uranium-containing secondary ores using a heap method of physical and chemical geotechnology. Methods for analytical determination of the concentration of the parent radionuclide - ^{238}U and each daughter radionuclide - ^{234}U , ^{230}Th , ^{226}Ra , ^{222}Rn , ^{218}Pa , ^{214}Pb and the parameters of the new technological flowsheet of the heap method of physical and chemical geotechnology were studied. The effective aspects of the heap method of physical and chemical geotechnology for extracting uranium from uranium-containing secondary ores are listed. The contribution of granulometric separation to the efficiency of the method of physical and chemical geotechnology for extracting uranium from secondary uranium-containing ores has been assessed. Based on the use of granulometric separation of secondary uranium-containing ores, in the process of uranium mining, a reduction in the presence of waste rock was achieved by 37% and due to this, ore productivity was increased by 1.5 times.

Key words: uranium extraction, uranium-containing secondary ore, heap method, physical and chemical geotechnology, analytical determinations, uranium concentration, radionuclide concentration, uranium decay chains, classifier, granulometric composition of ore.

Introduction. During the processing of uranium-containing ores, a certain amount of secondary waste is formed [1-4]. This waste is a poor technogenic uranium waste and contains small amounts of uranium in its composition [5-8].

The Republic of Uzbekistan is among the top ten countries in the world that are considered world leaders in uranium production. In its half-century history of uranium production, the Navoi Mining and Metallurgical Combine - NMMC (now the state-owned enterprise Navoiuran) has been and is engaged in uranium mining [9-12]. From the late 60s of the last century until the beginning of the 21st century, all uranium mined at NMMC was produced by underground mining. In these processes, many million tons of uranium-containing secondary technogenic waste was generated at the industrial sites of the NMMC. These technogenic wastes found in dumps, tailings dumps and temporary storage sites are promising secondary technogenic ores. These technogenic secondary uranium ores, formed in the processes of uranium extraction by geotechnological and mining methods, contained a small amount of uranium in their composition, up to 250 g/t, than in technological ores the uranium content should be at least 300 g/t [13-16].

Application of the classical method of uranium extraction technology from these technogenic secondary uranium ores are not effective. Since the classical method of uranium mining technology is multi-stage and very expensive. In addition, from the point of view of economic considerations, the classical method of uranium mining technology requires the processing of ore with a uranium content of at least 300 g/t.

As the regulations for the technology of uranium extraction from ore with a uranium content of at least 300 g/t have shown, it does not even cover the cost of the resulting finished product.

To develop an effective technological scheme for the extraction of uranium from technogenic uranium ores, it is necessary to analytically determine the concentration of the parent - ^{238}U and each daughter radionuclide - ^{234}U , ^{230}Th , ^{226}Ra , ^{222}Rn , ^{218}Pa , ^{214}Pb and conduct research to determine the parameters of this new technological scheme.

The novelty of this article is the conduct of a study to evaluate the efficiency parameters of the heap method of physical and chemical geotechnology for extracting uranium from uranium-containing secondary ores and the development of methods for analytical determination of the

concentration of parent - ^{238}U and daughter radionuclides - ^{234}U , ^{230}Th , ^{226}Ra , ^{222}Rn , ^{218}Pa , ^{214}Pb in them.

Experimental technique and methods. It is known that technogenic uranium ores are secondary deposits and radiation-hazardous objects. The composition of these technogenic uranium ores contains all the daughter radionuclides - ^{234}U , ^{230}Th , ^{226}Ra , ^{222}Rn , ^{218}Pa , ^{214}Pb , etc., formed from the parent - ^{238}U , in the process of radioactive decay.

The concentrations of these radionuclides were determined by the X-ray fluorescence method using X-ray spectrometers - type ARF-7 and EDX-7000, by the radiometric method using the Gamma-Progress device, and by the alpha spectrometric method using the CANBERRA device.

The presence of these radionuclides in technogenic uranium ores determines its degree of radioactive contamination. And the extraction of uranium from these ores provides the opportunity to obtain additional uranium with the purification of processed ores from radionuclides to the established standard in International and Republican regulatory documents. The basic technological diagram of the heap method of physical and chemical geotechnology for extracting uranium from uranium-containing secondary ores is shown in Fig. 1..

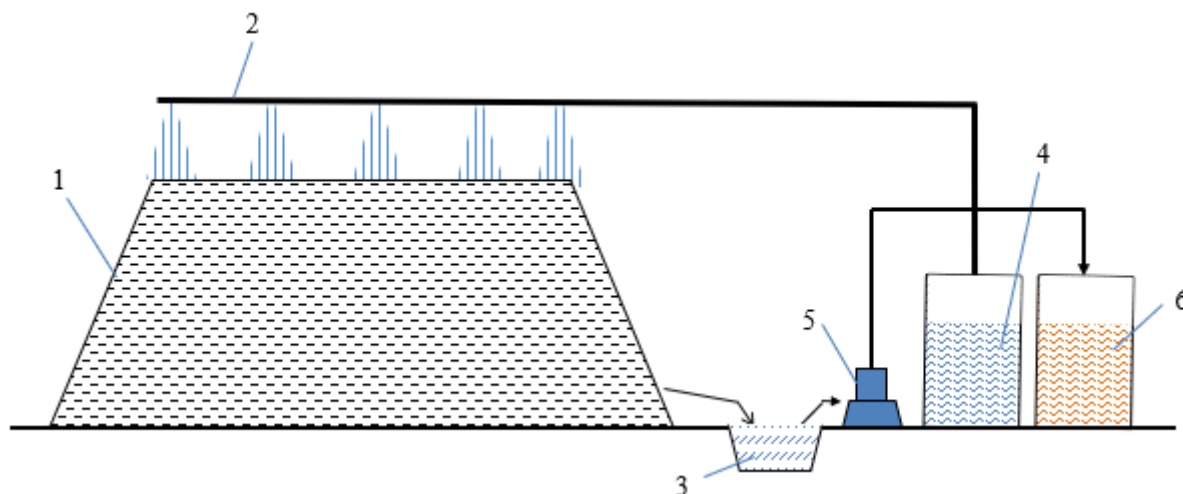


Fig.1. Schematic flow diagram of the heap method of physical and chemical geotechnology for the extraction of uranium from secondary uranium-containing ores

As can be seen from Fig. 1, the schematic diagram of the heap method of physical and chemical geotechnology for extracting uranium from uranium-containing secondary ores consists of the following working units and parts: 1-heap - uranium-containing secondary ores; 2 - irrigation system; 3 - tank for productive solution; 4 - tank for working solution; 5 - pump for pumping liquid working fluids; 6-tank for the productive solution.

The operating principle of this schematic diagram of the heap method of physical and chemical geotechnology for extracting uranium from uranium-containing secondary ores, shown in Fig. 1 occurs in the following sequence: 1-heap has a size of 20x25x2m of uranium-containing secondary ores in a stack and has a rock density of 2.7 m³/t, it contains about 2,400 tons of ore, 4-working solution is irrigated by a system with a spray parameter of 25-30 l/h*m² 2-working solution through the pump from the 4-tank in which it is stored, the solution formed in the process of selective dissolution of uranium is collected in the 3-tank and, using the 5-pump, is sent to the 6-tank in which the productive solution is stored.

Based on the above facts, within the framework of this study, maximum attention is focused on increasing the mass fractions of productive fine granulometric classes of ores involved in processing using the method of physical and chemical geotechnology.

To establish an increase in the proportions of productive fine granulometric classes of ores and their yield during sorting of secondary ores, studies were carried out to divide them into granulometric classes and determine the uranium concentration in them.

As a result of the study, it was established that the share of uranium is more than 82% in productive fine granulometric size classes in the range (-50+25 mm, -25+10 mm, -10+5 mm, -5+3 mm, -3+2 mm, -2+1 mm, -1+0 mm), and the mass fraction of these ores is 70%. That is, 30% of the ores contain only 18% of the total uranium. During the study, these ores were excluded from processing processes.

To study the suitability of this technological scheme for real samples, samples were taken from secondary technogenic uranium ores. Based on the above technological scheme, 24 samples of technogenic uranium ores were processed.

The results of the decrease in the initial concentration of uranium and their specific effective activity - A_{eff} in processed uranium-containing secondary ores after applying the proposed scheme of the heap method of physical and chemical geotechnology are given in table. 1.

Table 1

Results of a decrease in the initial concentration of uranium and their specific effective activity - A_{eff} in processed uranium-containing secondary ores

Sample no.	Uranium concentration in initial samples - g/t	Specific effective activity of initial samples - A_{eff} , kBq/kg	Uranium concentration in samples after processing - g/t	Specific effective activity - A_{eff} after processing, kBq/kg
1	310.3	60.1	76.8	19.2
2	297.7	58.8	73.5	18.8
3	293.2	56.4	72.4	17.4
4	281.6	52.5	69.8	16.6
5	271.3	50.6	63.7	15.3
6	263.5	48.8	60.4	14.7
7	243.5	56.2	72.4	18.7
8	234.2	54.4	69.2	18.5
9	209.3	54.2	64.6	18.1
10	205.1	51.1	59.7	17.5
11	198.6	50.2	62.4	16.9
12	193.4	49.5	61.1	16.9
13	189.8	49.2	57.5	16.4
14	189.3	48.3	58.3	16.4
15	188.6	47.7	57.9	16.2
16	176.5	47.3	53.8	15.2
17	175.6	46.2	52.7	15.3
18	171.2	44.9	54.1	14
19	159.7	44.1	47.3	13.4
20	147.1	43.3	46.7	13.4
21	143.4	42.6	42.3	14.1
22	142.2	41.3	44.4	13.3
23	137.7	39.4	43.7	13.3
24	134.2	37.9	41.6	13.1

As can be seen, from the results given in table. 1. concentration of uranium and specific effective activity - A_{eff} in 24 initial samples will change in the range - uranium concentration on average from 134.2 g/t to 310.3 g/t, and specific effective activity values - A_{eff} ranging from 37.9 kBq/kg up to 60.1 kBq/kg. The concentration of uranium in samples after processing of technogenic uranium ores will change on average from 41.6 g/t to 76.8 g/t, and the values of specific effective

activity - A_{eff} in them will change on average from 13.1 kBq/kg up to 19.2 kBq/kg. The background value of specific effective activity - A_{eff} for this region is 1.2 kBq/kg. The Clark content of uranium in soils is 80 g/t.

From the results obtained it is clear that in samples after processing of technogenic uranium ores the concentration of uranium from 41.6 g/t to 76.8 g/t is much less than the Clarke content. And the values of specific effective activity - A_{eff} in them are much higher from 13.1 kBq/kg to 19.2 kBq/kg than the background value.

As the results obtained in Table 1 show. 1., after processing technogenic uranium ores, the concentration of uranium in them decreases by an average of 75%, and the values of specific effective activity - A_{eff} decreases by an average of 70%.

Conclusion. based on the conducted study to determine the effectiveness of the heap method of physical and chemical geotechnology for extracting uranium from uranium-containing secondary ores has established that this scheme is suitable for processing secondary technogenic uranium ores. Based on the use of the heap method of physical and chemical geotechnology for extracting uranium from 24 initial samples of uranium-containing secondary ores, the concentration of uranium and specific effective activity - A_{eff} decreases. In various samples, the uranium concentration ranges from 134.2 g/t to 310.3 g/t. The specific effective activity values - A_{eff} of these samples range from 37.9 kBq/kg to 60.1 kBq/kg. After processing these samples, the initial concentration of uranium becomes in the range from 41.6 g/t to 76.8 g/t and the specific effective activity value - A_{eff} in them becomes in the range from 13.1 kBq/kg to 19.2 kBq/kg.

The heap method of physical and chemical geotechnology for extracting uranium from secondary technogenic uranium-containing ores is suitable for additional uranium extraction and is suitable for reclamation of secondary technogenic uranium-containing ores.

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Rezyume: Ushbu maqolada fizik-kimyoviy geotexnologiyaning uyum usuli yordamida uran o'z ichiga olgan ikkilamchi rudalardan uran olish bo'yicha tadqiqot natijalari keltirilgan. Asosiy radionuklid - ^{238}U va har bir qiz radionuklid - ^{234}U , ^{230}Th , ^{226}Ra , ^{222}Rn , ^{218}Pa , ^{214}Pb kontsentratsiyasini analitik aniqlash usullari va fizikaviy va geotexnologiyaning yig'ish usulining yangi texnologik sxemasining parametrlari. Uranni o'z ichiga olgan ikkilamchi rudalardan uran olishning fizik-kimyoviy geotexnologiyasining uyum usulining samarali tomonlari sanab o'tilgan. Ikkilamchi uranli rudalardan uran olishning fizik-kimyoviy geotexnologiyasi usulining samaradorligiga granulometrik ajratishning hissasi baholandi. Ikkilamchi uran saqlovchi rudalarni granulometrik ajratishdan foydalanish asosida uran qazib olish jarayonida chiqindi jinslar mavjudligini 37 foizga kamaytirishga erishildi va buning natijasida ruda unumdorligi 1,5 barobar oshdi.

Резюме: В данной работе представлены результаты исследования по извлечению урана из урансодержащих вторичных руд с использованием кучного метода физико-химической геотехнологии. Изучены методы аналитического определения концентрации материнского радионуклида - ^{238}U и каждого дочернего радионуклида - ^{234}U , ^{230}Th , ^{226}Ra , ^{222}Rn , ^{218}Pa , ^{214}Pb и параметры новой технологической схемы кучного метода физико-химической геотехнологии. Перечислены эффективные аспекты кучного метода физико-химической геотехнологии для извлечения урана из урансодержащих вторичных руд. Оценен вклад гранулометрического разделения в эффективность метода физико-химической геотехнологии для извлечения урана из вторичных урансодержащих руд. На основе использования гранулометрического разделения вторичных урансодержащих руд в процессе добычи урана достигнуто снижение наличия пустой породы на 37% и за счет этого увеличена производительность по руде в 1,5 раза.

Kalit so'zlar: uran qazib olish, tarkibida uran bo'lgan ikkilamchi ruda, uyum usuli, fizik-kimyoviy geotexnologiya, analitik aniqlashlar, uran kontsentratsiyasi, radionuklid kontsentratsiyasi, uranning parchalanish zanjirlari, tasniflagich, rudaning granulometrik tarkibi.

Ключевые слова: извлечение урана, вторичные урансодержащие руды, кучный способ, физико-химическая геотехнология, аналитические определения, концентрирование урана, концентрирование радионуклидов, цепочки распада урана, классификатор, гранулометрический состав руды.

**MATHEMATICAL FOUNDATIONS AND PRACTICAL APPLICATIONS OF
DECISION TREE ALGORITHMS**

Tursinbayev N.Sh., Jalgasbaeva Q.X.

*Nukus branch of Tashkent University of Information Technologies named after
Muhammad al-Khwarizmi*

Summary: This paper explores the decision tree algorithm, a supervised learning technique widely used for both classification and regression tasks. It provides an in-depth analysis of its mathematical foundation, covering entropy, information gain, and the Gini index. We present how the decision tree builds a model, discuss common challenges like overfitting, and review various pruning techniques.

Keywords: decision tree algorithm, entropy, information gain, overfitting, pruning techniques, ensemble methods.

1. INTRODUCTION

Decision trees are fundamental algorithms in machine learning, known for their interpretability and ease of use. They form the backbone of decision-making processes in various domains, from medical diagnosis to financial forecasting. Unlike many machine learning models that operate as black boxes, decision trees offer a clear, visual representation of decision rules, making them particularly attractive for applications where understanding the reasoning behind a prediction is crucial. The algorithm splits the dataset based on feature values into branches, with each split aimed at creating subsets that are as homogenous as possible.

The decision tree algorithm is widely adopted due to its ability to handle both classification and regression tasks. Its appeal lies in its simplicity; however, beneath this lies a solid mathematical foundation involving entropy, information gain, and the Gini index—key metrics that drive the tree's ability to identify the most relevant features for splitting data. These mathematical principles enable the decision tree to recursively partition the dataset into increasingly pure subsets, ultimately leading to effective decision-making.

Despite its strengths, decision trees face challenges such as overfitting, especially when they grow too deep. To address these issues, techniques like pruning and ensemble methods have been developed. In this paper, we provide an in-depth analysis of the decision tree algorithm, with a particular focus on its mathematical foundations, challenges, and potential solutions, highlighting its role in modern machine learning.

2.1. Decision tree construction

A decision tree constructs by recursively partitioning the dataset. At each node, the algorithm chooses the best split by considering every possible feature and threshold. The best split is one that maximizes a specific evaluation criterion, such as information gain or the Gini index.

2.2. Mathematical background

Entropy. Measures the impurity or uncertainty in a dataset. For a binary classification problem, the entropy of a node is calculated as.

$$H(S) = -p_1 \log_2(p_1) - p_2 \log_2(p_2)$$

where p_1 and p_2 are the proportions of classes 1 and 2, respectively. Lower entropy means better classification at that node.

Information Gain. This is the reduction in entropy before and after a split and helps in selecting the best feature for splitting.

$$IG(S, A) = H(S) - \sum_{v \in \text{Values}(A)} \frac{|S_v|}{|S|} H(S_v)$$

where A is the feature being split, S_v is the subset for a particular value v of feature A , and $H(S_v)$ is the entropy of that subset.

Gini Index. An alternative to entropy, Gini measures impurity and is defined as following:

$$G(S) = 1 \sum_{i=1}^c p_i^2$$

where p_i is the proportion of instances belonging to class i , and c is the number of classes.

3. RESULTS

3.1. Algorithm Performance

The decision tree algorithm has been evaluated across a range of datasets, showcasing its notable strengths in interpretability and computational efficiency. Its clear, graphical representation of decision rules provides an intuitive understanding of the model's behavior, which is advantageous for practical applications where transparency is key.

Interpretability. The decision tree's ability to illustrate decision-making processes through simple, hierarchical structures remains a significant advantage. This clarity allows users to easily understand and trust the model's predictions.

Computation Time. The algorithm is efficient in terms of training and prediction times, particularly for smaller datasets. It constructs the tree by evaluating splits based on metrics such as information gain or Gini index, which are computationally manageable.

Smaller Datasets. The algorithm tends to overfit when trained on smaller datasets, as the tree can grow excessively complex and capture noise rather than the underlying data patterns.

Pruning Impact. When appropriately pruned, the decision tree demonstrates improved generalization, performing well on validation and test datasets. Pruning techniques—both pre-pruning and post-pruning—help in reducing the tree's complexity and mitigating the risk of overfitting.

While decision trees are effective and efficient, their performance can be significantly enhanced through pruning methods, which are crucial for managing overfitting and ensuring robust model performance across varying dataset sizes.

3.2. Overfitting and Pruning

Decision trees are prone to overfitting, a phenomenon where the model becomes too complex and starts capturing noise rather than the underlying pattern in the training data. This occurs when the tree grows too deep, making it highly sensitive to fluctuations in the training dataset. As a result, the model performs well on training data but poorly on unseen data, leading to poor generalization.

Overfitting can be mitigated through various pruning techniques:

Pre-pruning. This involves stopping the growth of the tree early, before it becomes overly complex. Criteria for pre-pruning can include setting a maximum depth for the tree, requiring a minimum number of samples at a node before it can be split, or halting the process if further splits do not improve performance significantly. By applying these constraints, pre-pruning helps prevent the tree from growing beyond a level where it starts to overfit.

Post-pruning. Also known as cost complexity pruning, this technique involves growing the full tree and then removing branches that have little importance. Post-pruning evaluates the performance of the tree on a validation set and trims branches that do not contribute significantly to the predictive power. The process typically involves calculating a cost-complexity measure that balances tree accuracy and complexity. The most common approach is to use methods like Reduced Error Pruning (REP) or Minimum Description Length (MDL).

Ensemble Methods. To further address overfitting, ensemble methods such as Random Forests and Gradient Boosted Trees are employed. These methods combine multiple decision trees to create a more robust model. For instance, Random Forests build multiple trees on various subsets of the data and average their predictions, reducing variance and improving generalization. Similarly, Gradient Boosted Trees build trees sequentially, with each tree correcting the errors of its predecessor, thereby enhancing performance.

These pruning and ensemble techniques play a critical role in optimizing the decision tree's performance, ensuring it remains a powerful tool for both classification and regression tasks while avoiding the pitfalls of overfitting.

4. CONCLUSION

The decision tree algorithm stands out for its simplicity and interpretability, making it a popular choice in machine learning for both classification and regression tasks. Its ability to represent complex decision-making processes through clear, visual structures is a significant advantage, particularly in domains where understanding the reasoning behind predictions is crucial.

Mathematically, decision trees leverage concepts such as entropy, information gain, and the Gini index to determine the best splits in the data, ensuring that each branch of the tree contributes to a more accurate and effective model. However, the algorithm is not without its challenges, most notably its tendency to overfit the training data, leading to poor generalization on unseen datasets.

To combat overfitting, various pruning techniques—both pre-pruning and post-pruning—can be applied to simplify the tree and improve its generalization ability. Additionally, ensemble methods like Random Forests and Gradient Boosted Trees offer robust solutions by combining multiple decision trees to enhance predictive performance and stability.

In summary, while decision trees are a powerful and intuitive machine learning tool, careful consideration of their limitations and the application of appropriate techniques to address overfitting are essential for achieving optimal results. The ongoing development and refinement of these methods continue to solidify the decision tree's role in practical machine learning applications.

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Rezyume: *Ushbu maqolada tasniflash va regressiya muammolari uchun keng qo'llaniladigan nazorat ostida o'rganish usuli bo'lgan qarorlar daraxti algoritmi muhokama qilinadi. U entropiya, ma'lumot olish va Jini indeksini o'z ichiga olgan matematik asoslarini chuqur tahlil qiladi. Biz qaror daraxti modelni qanday qurishini taqdim etamiz, ortiqcha moslama kabi umumiy muammolarni muhokama qilamiz va turli kesish usullarini ko'rib chiqamiz.*

Резюме: *В этой статье рассматривается алгоритм дерева решений, метод контролируемого обучения, широко используемый как для задач классификации, так и для задач регрессии. В ней дается углубленный анализ его математической основы, охватывающий энтропию, прирост информации и индекс Джини. Мы представляем, как дерево решений строит модель, обсуждаем распространенные проблемы, такие как переобучение, и рассматриваем различные методы обрезки.*

Kalit so'zlar: *qarorlar daraxti algoritmi, entropiya, overfitting, kesish usullari, ansambl usullari.*

Ключевые слова: *алгоритм дерева решений, энтропия, прирост информации, переобучение, методы обрезки, ансамблевые методы.*

EXPERIENCE IN THE USE OF INVERTED ROCK CRUSHING SANDS AS AGGREGATE IN CONCRETE (REVIEW PART)

Ilyasov A¹., Nazibekov A²., Abdreimov R¹.

¹*Karakalpak State University named after Berdakh,*

²*Tashkent State Transport University*

Summary: *The article presents the application of industrial crushing sands with a higher content of dust-like particles than according to the standards. In order to reduce the negative impact of the grain composition of crushing screenings, it is recommended to use chemical additives. It is noted that the use of crushed screenings as part of concrete aggregate is always beneficial in regions of Karakalpakstan that are remote from natural sand mining sites.*

Key words: *screenings, crusher, filler, chemical additives, sand.*

The construction industry in Uzbekistan has been developing at high speed over the past decades, which ultimately creates a great need for raw materials. At the moment, this issue is being addressed using classic materials such as natural sand, but high demand and growing environmental pressures create a need for a quality alternative to this material. In terms of all characteristics and unit cost, screening from rocks can compete with sand as a fine aggregate for concrete [1].

Rock screening is an inorganic bulk material obtained in the process of processing dense rocks into crushed stone, with a minimum grain size of 5 mm. The percentage of screenings yield in the production of crushed stone is very high, at the moment it is about 20-30 % by mass [2-4]. The use of innovative crushing technologies with the use of new developments in the field of crushers allows to reduce this percentage, but, nevertheless, the problem remains relevant.

Screening from rocks is comparable to the original rock in terms of strength, in addition, it has a more developed microrelief and isometric shape of the surface compared to natural sand. The natural disadvantage of the sift is the high content of finely dispersed component and periodic inclusions of weaker minerals, such as mica, feldspar and hornblende [5-9].

Studies on the use of crushing sands as fine aggregate of concrete, which were conducted at different times by I.N.Akhverdov, I.M.Grushko, S.S.Gordon, E.I.Levina, L.P.Legkaya, S.A.Myshkovskaya, M.L.Nisnevich, A.I.Polyakova, A.N.Rvachev, A.M.Sheinin, R.Blanks, G.Kennedy, K.Takemura, G.R.Fernandez and others [10,11] showed the possibility of significant expansion of the raw material base of fine aggregate through the use of crushing sands.

The peculiarity of crushing sands is the angular shape of grains and chirpy surface of grains. The grain composition of crushing sands is dominated by fractions of 2.5-1.25 mm and grains less than 0.16 mm. As a rule, crushing sands contain an increased (up to 10% and more) amount of dust-like particles (less than 0.05 mm), determined by scouring according to GOST 8735-88.

According to the results of research of various crushed stone plants of CIS countries [12, 13], on average, crushing sands have the following particle size distribution (Table 1).

Table 1

Grain composition of crushing sands

Fraction, mm	Fractional content,%		
	Limits of change	on average	GOST 26633-91 (GOST 10268-80*, GOST 8736-85, for sand from crushing screenings)
3,0-5,0	10-54	15	0-20
1,2-3,0	12-26	22	5-25

0,6-1,2	10-42	26	15-25
0,15-0,6	13-49	27	30-70
0-0,15	4-17	11	. 0-10

Analysis of the grain composition of crushing sands shows that industrial crushing sands without additional enrichment, as a rule, did not meet the technical requirements of GOST 10268-80* and other domestic normative and technical documents regulating their use in concrete and therefore their use as concrete aggregate was limited.

Consideration of the requirements for crushed sand (sand from crushing sands) in different countries shows that the position of a number of foreign standards differ from the requirements of domestic normative and technical documents.

UK standard BS 882 allows particles $<150\text{ }\mu\text{m}$ (0.15 mm) up to 20%; At the same time, the requirements for the number of elutriated particles are differentiated: in crushed sand from gravel - no more than 3%, in crushed sand from rock - no more than 15%. This separation is probably due to the difference in the products formed when crushing gravel and rock. In Japan, according to the JTSA 50040-80 standard, it is allowed to use a material with a grain composition with a passage through a 0.15 mm sieve - 15%, while the permissible fluctuations in the particle size modulus are normalized to ± 0.15 ; the content of tormented particles is up to 7.0%. According to the Polish standard PN-B-06712-79, the presence of particles less than 0.125 mm in size - up to 16% - is allowed in a mixture of crushed sands of fraction 0-2. Australian standard A77 limits the content of dust particles (fraction less than $0.75\text{ }\mu\text{m}$) in crushed sand to 4-10%, the Israeli ISI standard limits the content of dust particles to 10%, the content of fractions less than 0.15 mm - 25%. The standards of the USA (ASTM-C33-80) and France (NPF 18-301-60) determine the content of elutriable particles - no more than 3-5%.

The specific surface area of crushing sands is greater than the specific surface area of natural sands of the same grain composition, and their hollowness is higher. Therefore, the use of crushing sands in concrete mixtures requires an increase in water content, which can lead to higher cement consumption in equal- strength concrete and deterioration of a number of construction and technical properties: reduced durability, increased shrinkage, etc.

Current regulatory documents governing the quality of non-metallic building materials do not directly determine the possibility of using crushing sands (sands from crushing sands of class 1 or 2 according to GOST 8736-93) as aggregate for concrete. These requirements can be formulated only on the basis of analyzing the requirements for concrete of various types and previously existing standards. Specific choice of grain composition of sand within the requirements of GOST 26633-91 is determined by the consumer depending on the requirements for the resulting concrete. In particular, for road concrete can be used crushing sands in the form of sands from the sands of class 1 and class 2 with the content of dusty and clay particles up to 5%.

In some cases in practice it may be expedient to enrich the crushed material [14] in order to extract crushed stone of 5-10 mm particle size from the sands and reduce the content of particles $<0.15\text{ mm}$ to the requirements of GOSTs. Energy consumption for beneficiation of crushing sands is 0.8-1.2 kWh/m³. However, the dry classification of siftings on conventional screens has low productivity, due to the sticking of sieve cells. Hydraulic classification is effective, but more difficult to implement, and in quarries where there is no industrial water supply, is not possible at all. Dry pneumatic separation with an aerospouting layer has low productivity and high energy intensity, and requires additional equipment for cleaning the air from dust. There are data [15] on enriching a part of the material and then mixing it with the unenriched one. Such technology requires special mixing equipment. Thus, the existing enrichment schemes are not yet conducive to wide implementation of enrichment in practice.

Nevertheless, the widespread use of crushing sands (the output of crushing sands amounted to more than 60-90 million m³ /year) determined a significant amount of work on the application of this material in concrete.

One of the promising directions for the use of crushing sands is their introduction into the composition of substandard sands, as well as an enlarging additive to fine and very fine sands and the expansion of the raw material base of aggregates for concrete [16,17].

Currently, the prospects for the use of crushing screenings (sands from crushing screenings) are associated with their use together with plasticizing additives or with natural sand. It should be noted that GOST 10268-80* allowed the use of crushed sand from screenings only if the specified workability was ensured without excess consumption of cement.

N.A. Erokhina and N.N. Tsibenko presented the results of studies on the use of diorite crushing sands as fine aggregate in concrete [18]. The positive influence of plasticizing additives based on lignosulfonates on the increase of frost resistance and water resistance of concrete with fine aggregate made of crushing sands and natural quartz sand is shown. These studies are confirmed by the works of G.S.Zolnikova, who established the possibility of increasing the water resistance of pipe concrete with fine aggregate made of crushing sands and quartz sand in the ratio of 1:1 [19].

The main conclusion in [19] was the proof of the possibility of using crushing sands as an enlarging additive to fine and very fine natural sands, which allows to produce concrete grades up to 700 without overconsumption of cement. The amount of crushing sands in the composition of M300 concrete mixed with natural sand (FM=1,16 (Fineness Modulus)) amounted to 70%. The amount of plasticizing additive C- 3 was 0.5%.

When crushing screenings are used in a mixture with natural sand, the strength of medium grade concrete (up to 10%) and high grade concrete (up to 20%) increases compared to mixtures made with natural sand [20]. It is noted that the use of screenings, even with some excess consumption of cement, is beneficial in the case of compensation for excess consumption of cement by increasing the strength of concrete. Using screenings and plasticizers, high-grade concretes (M500-600) were obtained with cement consumption 5-10% lower than with natural sands [17].

Thus, the saving of stone materials - sand and crushed stone, is very important, but not the only direction of application of crushing sands (crushed sands from screening). Another actual direction of the use of crushed sands is the creation of high-strength concrete by modernizing the structure or, respectively, a possible reduction in cement consumption while maintaining the basic construction and technical properties of concrete.

Crushing sands can be used in road construction, one of the most material- intensive areas of the economy.

Promising and real areas of application of crushing screenings are the production of asphalt and cement concrete and the construction of road pavement bases using organic and inorganic binders [21]. The use of crushed screenings in the construction of road pavements reduces the shortage of road building materials, especially during the construction of rural and on-farm roads. When constructing layers of road pavement reinforced with binders, it is allowed to use screenings from crushing rocks of varying degrees of enrichment.

Previously, according to GOST 26193-84, the use of crushing sands in concrete (including concrete for coatings) was allowed only when they were enriched and brought to the quality requirements of GOST 26633-91 or in accordance with GOST 8736-85 to the requirements for sands from crushing sands.

As noted by O.T.Batrakov and others [22], the introduction of crushing screenings of strong rocks significantly changes the structure of concrete on fine sands. This makes it possible to reduce cement consumption compared to concrete on fine sands without crushing screenings, and to increase the roughness and coefficient of adhesion of the wheel to the coating. The low cost of concrete using mixed sands from crushed screenings and local sands, the structure of which is modified with chemical additives, allows them to be used effectively in road construction

It should be noted that modern methods for monitoring the frost resistance of concrete (GOST 10060.0-95, GOST 10060.2-95) impose new, more stringent requirements for the test method, in particular, saturation of the sample when thawing in a 5% sodium chloride solution. This simulates the performance of concrete when exposed to deicing agents and creates more stringent test

conditions. Therefore, the issue of ensuring frost resistance of concrete depending on the content of dust particles in fine aggregate requires further consideration.

The widespread introduction of fine-grained concrete with crushing screenings is restrained by the framework of modern high-speed construction technology, characterized by the fact that the preparation of concrete mixtures is carried out in high-performance mixers with free mixing of the mixture, and the mixture is laid into the coating using a concrete paver with sliding forms using the method of deep vibroforming.

Crushing screenings are widely used as fine aggregate for concrete abroad. The product range of foreign crushing and screening plants provides for the production of enriched and unenriched sands from screenings. In the USA, crushed screenings are widely used in low-cost road concrete, called "econcrete". In this case, the content of fine particles in crushing screenings can be 15%. Economical concrete for the construction of road pavements using the rolling method using local materials, including crushing screenings are used in France ("Sandrosim", "Betopact"). An increased content of fine particles in crushing screenings helps to increase the workability, workability and uniformity of such mixtures [23].

In France, about 20% of the crushed sands produced are used in road construction. In German Democratic Republic, 42.7% of all crushed sands were used in road construction, including road concrete [24]. Sand with smaller grain content of less than 0.25 mm is used for concrete preparation, and especially limit the content of fraction less than 0.063 mm. It is noted that as a result of the large specific surface, small particles of crushed sand increase the water demand of the concrete mixture, which causes an increase in cement consumption and, as a consequence, an increase in capillary porosity. At the same time, the frost and salt resistance of concrete decreases. However, the same work indicates the possibility of using crushing screenings without enrichment.

The volume of use of crushed sand from screenings in the USA is constantly increasing [15]. Articles by A. Goldbach (National Concrete Scientific Association) in the 1930s and 40s pointed out many advantages and some disadvantages of crushed sand when used in concrete. The main obstacle to its widespread use was that the crushing screenings contain more fine fractions passing through the 100 (0.143 mm) and 200 (0.074 mm) sieve than is usually allowed by the technical requirements for natural sands.

The articles show the use of industrial crushing screenings with a higher content of dust particles than according to the standards. In order to reduce the negative impact of the grain composition of crushing screenings, it is recommended to use chemical additives. It is noted that the use of crushed screenings as part of concrete aggregate is always beneficial in regions of Karakalpakstan that are remote from natural sand mining sites.

The issue of developing compositions and technology for road concrete using crushed screenings continues to remain relevant.

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Rezyume: *Maqolada standartlarga mos changga o'xshash zarrachalar miqdori yuqori bo'lgan sanoat maydalagich qumlarini qo'llash ko'rsatilgan. Maydalanuvchi qumlarning donadorlik tarkibining salbiy ta'sirini kamaytirish uchun kimyoviy qo'shimchalardan foydalanish tavsiya etiladi. Qayd etilishicha, beton agregatning bir qismi sifatida maydalangan qumlardan foydalanish tabiiy qum qazib olinadigan joylardan olisda joylashgan Qoraqalpog'iston hududlarida hamisha foydalidir.*

Резюме: *В статьях приведена применять отсеки дробления промышленного выпуска с более высоким содержанием пылевидных частиц, чем по нормам стандартов. С целью снижения отрицательного влияния зернового состава отсеков дробления рекомендуется использовать химические добавки. Отмечается, что применение отсеков дробления в составе заполнителя бетона всегда выгодно в регионах Каракалпакстана, удаленных от мест добычи природного песка.*

Kalit so'zlar: *elak, maydalagich, to'ldiruvchi, kimyoviy qo'shimchalar, qum.*

Ключевые слово: *отсев, дробилка, заполнитель, химические добавки, песок.*

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GRAPHOSTATIC AND IR-SPECTROSCOPIC STUDIES OF THE INITIAL AND PRODUCTS OF OXIDATION OF LICORICE MEAL WITH AN AQUEOUS SOLUTION OF HYDROGEN PEROXIDE

**Usanbayev N.Kh¹., Namazov Sh.S¹., Atayev Kh²., Dzhumaeva O²., Alimov U.K¹.,
Orakbayev A.A¹., Kurbaniyazov R.K³., Badalova O.A¹., Saydullayev A.A¹.**

¹*Institute of General and Inorganic Chemistry of the Academy of
Sciences of the Republic of Uzbekistan,*

²*Institute of Chemistry of the Academy of Sciences of Turkmenistan,*

³*Karakalpak State University named after Berdakh*

Rezyume: *The work presents the elemental composition of the original and oxidized licorice meal, their extractives and residual meal after extraction of the extractives, as well as the content of functional groups in them. Results of graphostatic analysis of the oxidation process of licorice meal with a solution of hydrogen peroxide and IR spectroscopic studies of the original licorice meal of oxidation products, humic acids and organic fertilizer. It has been shown that as a result of the oxidation of the meal, the content of oxygen and active functional groups in the latter increases, both in the meal itself and in its extractive substances, including humic acids.*

Key words: *licorice meal, hydrogen peroxide, carbon, oxygen, hydrogen, nitrogen, oxidation, reduction, hydration, carboxylation.*

In previous works, in order to develop an environmentally friendly technology for processing licorice waste and to obtain environmentally friendly products – humus fertilizers that increase soil fertility [1-4], we determined the optimal conditions for increasing the yield of extractive substances from licorice meal by oxidation with nitric acid and hydrogen peroxide depending on the concentration of oxidizers, temperature, duration and weight ratio of meal : oxidizer. It has been shown that it is possible to increase the content of extractives extracted with a 1% solution of sodium hydroxide in meal from 5.87% to 49.68% if the oxidation of 20% HNO₃ is carried out at 40°C for one hour at a weight ratio of the organic part of the meal to nitric acid monohydrate equal to 1: 1.6. The oxidation process with hydrogen peroxide was carried out at a concentration of 10 to 30% and a weight ratio of licorice meal : H₂O₂ from 1: 0.1 to 1: 1. The experiments were carried out in a glass cylindrical reactor equipped with a thermostatic jacket and a stirrer under certain conditions. The largest amount of extractives in a 1% sodium hydroxide solution of 37.17% is formed in the oxidized meal obtained using 10% hydrogen peroxide and the weight ratio of the meal: H₂O₂ = 1: 0.1 [1-2].

The process of obtaining granular organic fertilizer from again oxidized meal with hydrogen peroxide using a 5% bentonite suspension to improve the commercial and agrochemical properties of the resulting fertilizer has also been studied. It has been established that the addition of a bentonite suspension during granulation of oxidized meal leads to an improvement in the physical and agrochemical characteristics of organic fertilizer [3].

The process of obtaining humic simple superphosphate by decomposition of phosphorites of Karakalpakstan: Khujakul, Porlytau and Nazarkhan has been studied sulfuric acid and the addition of oxidized licorice meal with hydrogen peroxide. It has been established that the addition of oxidized meal to the acidic superphosphate mass before ammoniation and drying does not lead to a decrease, as usually occurs when obtaining simple superphosphate by decomposition of phosphorites with sulfuric acid, followed by ammoniation and drying, but to a significant increase in the relative content of digestible forms of P₂O₅ [4].

In this work, we first determined the elemental composition of the original and oxidized licorice meal, humic acids isolated from them and residual meal, as well as the content of functional groups in these products. The amount of carbon and hydrogen was found using the classical method

according to Pregli [5]. Nitrogen was determined using the Dumas method [6]. The sum of oxygen + sulfur was found from the difference $[100 - \sum (C + H + N)]$. Functional groups were identified by the sorption method, based on the ability of active acidic groups contained in organic matter to react with caustic barite and calcium acetate in an aqueous medium [7]. The results are shown in table.1.

As can be seen from this table, as a result of the oxidation of licorice meal with a solution of hydrogen peroxide, the content of nitrogen, oxygen and active functional groups in the latter increases, both in the meal itself and in its humic acids. If in the original meal the content of the carboxyl group was 2.56 mg-eq/g, and the phenolic hydroxyl was 1.638 mg-eq/g, then in the oxidized meal these figures increased to 4.44 mg-eq/g and 6.01 mg-eq/g, respectively, and in humic acids of oxidized meal up to 3.29 mg-eq/g and 6.30 mg-eq/g.

Table 1.

Characteristics of the original licorice meal and the products of its oxidation with hydrogen peroxide

Substance	Moisture, %	Ash, %	Elemental composition, % organic matter				Functional groups		
			C	N	O+ S	N	COOH + + OH, mg- eq /g	COO H mg- eq/g	OH mg- eq /g
Initial meal	4.21	4.66	58.75	8.79	23.11	9.35	5.75	2.56	1.638
Oxidized meal	3.60	7.81	56.28	7.73	25.58	10.41	10.41	4.44	6.01
HA of initial meal	1.02	5.69	55.15	8.05	27.10	9.70	7.86	4.22	3.64
HA of oxidized meal	2.73	8.40	48.85	7.35	34.11	9.69	9.59	6.30	3.29
Residual meal of the original meal	4.24	6.36	57.77	7.95	25.03	9.25	6.34	2.81	3.53
Residual meal of oxidized meal	4.01	9.67	50.03	7.51	33.13	9.33	4.21	1.73	2.48

The next stage of research was to determine the direction of the licorice meal oxidation process using a diagram by D.Wang Krevelen [8]. To do this, using the method described in [8], we recalculated the weight percentages of the components into atomic percentages, found the atomic ratios and superimposed them on the D. Wang diagram Krevelena. The results are shown in table.2 and in Fig.1.

Table 2.

Characteristics of the original licorice meal and its oxidation products.

Substance	Atomic percentages				Atomic relations		
	C	H	O	N	N/S	O/C	C/N
1	2	3	4	5	6	7	8
Initial meal	31.01	55.63	9.11	4.24	1.79	0.29	7.31
Oxidized H ₂ O ₂ meal	31.78	52.37	10.84	5.01	1.65	0.34	6.34
HA of initial meal	30.61	53.56	11.24	4.59	1.75	0.37	6.67
HA of oxidized meal	28.58	51.62	14.96	4.85	1.81	0.52	5.89
Residual meal of the original meal	32.11	53.07	10.41	4.41	1.65	0.32	7.28
Residual meal of oxidized meal	28.92	52.08	14.36	4.65	1.80	0.50	6.22

As can be seen from the data presented, during the oxidation of licorice meal, a decrease in carbon content is observed. In this case, the O : C ratio increases from 0.29 to 0.52. Oxidative

destruction of the licorice meal molecule leads to the formation of active functional groups at the site of broken bonds, which is confirmed by a change in the atomic ratio H : C from 1.65 to 1.81 and an increase in the content of carboxyl and phenolic hydroxyl groups. Based on the data obtained, a diagram was prepared in O/C - H/C coordinates, since it can represent all the main reactions, such as oxidation - reduction, hydrogenation - dehydrogenation, hydration - dehydration, carboxylation - decarboxylation in the form of straight lines. Looking at the composition points of our products on the diagram, we can say with confidence that when licorice meal is processed with hydrogen peroxide, the processes of oxidation, dehydrogenation and carboxylation occur.

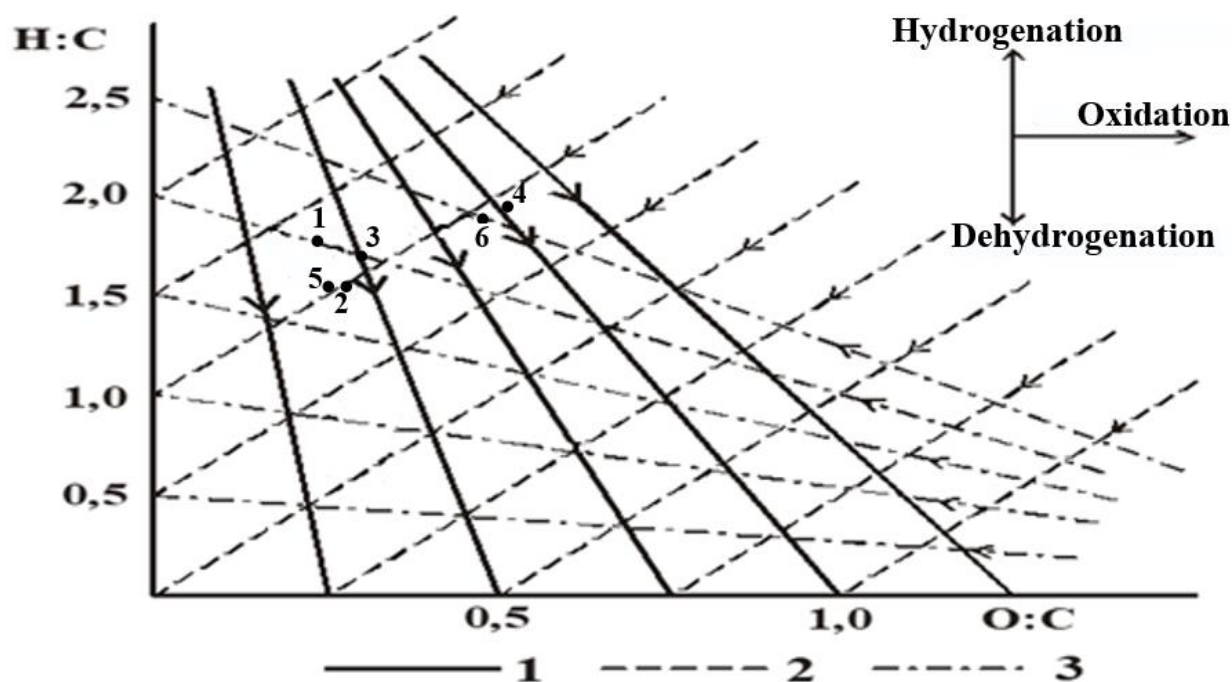


Fig. 1. Diagram of atomic relationships H: C-O: C:

1- initial meal; 2 - oxidized H_2O_2 meal; 3 – HA of the initial meal; 4- HA of oxidized meal; 5 – residual meal of the original meal; 6 – residual meal of oxidized meal. (– 1 loss of CH_3 ; --2 dehydration; - · - 3 decarboxylation).

In the next stage of the work, IR spectroscopic studies of the original meal and its oxidation products were carried out.

It is known that IR analysis is mainly used to determine the presence of various functional groups and properties of organic substances [9-11]. Therefore, in the next stage of the study Using IR spectroscopy, an additional search was carried out for the distinctive characteristics of the functional groups of the original meal, oxidized meal, humic acids isolated from the oxidized meal and organic fertilizer obtained from licorice meal oxidized with hydrogen peroxide and the addition of bentonite. IR spectra of the studied compounds in tablets with KBr were recorded (region 4000–400 cm^{-1}) on a System 2000 Fourier IR spectrometer from Perkin - Elmer. The results obtained are shown in Figures 2-5.

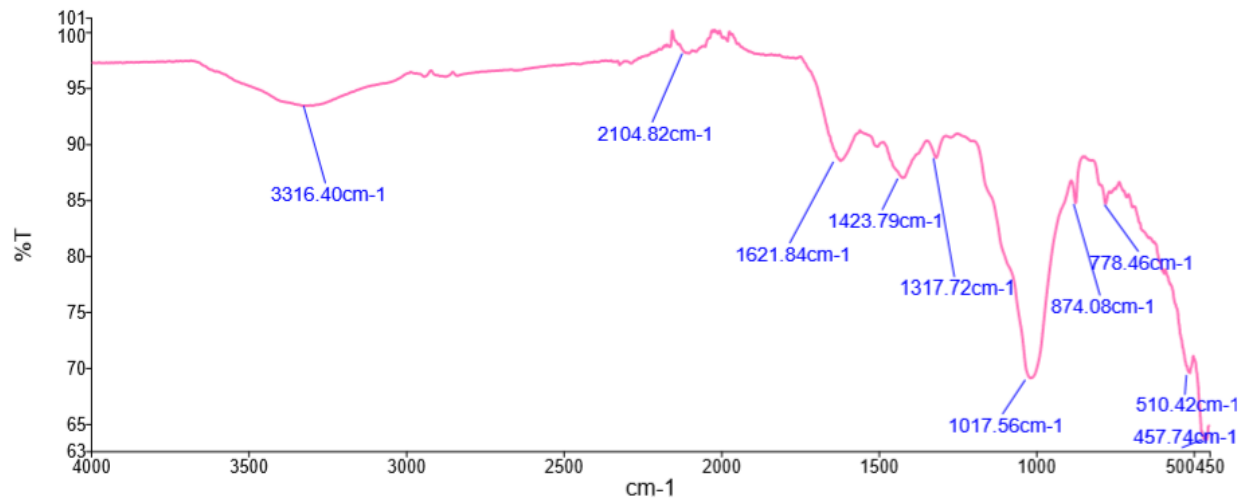


Fig. 2. IR spectrum of the original licorice meal

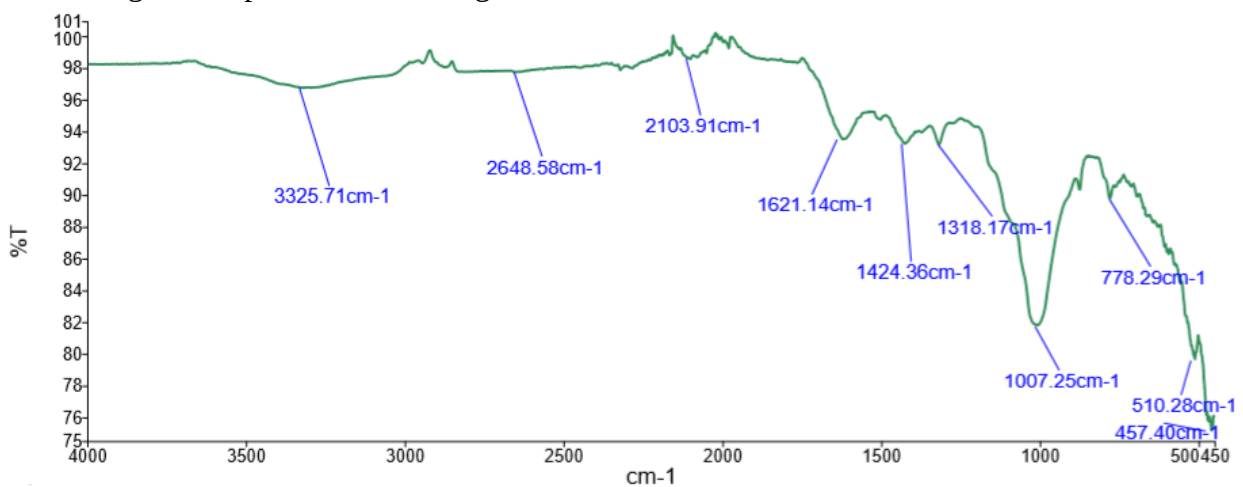


Fig. 3. IR spectrum of oxidized licorice meal with hydrogen peroxide

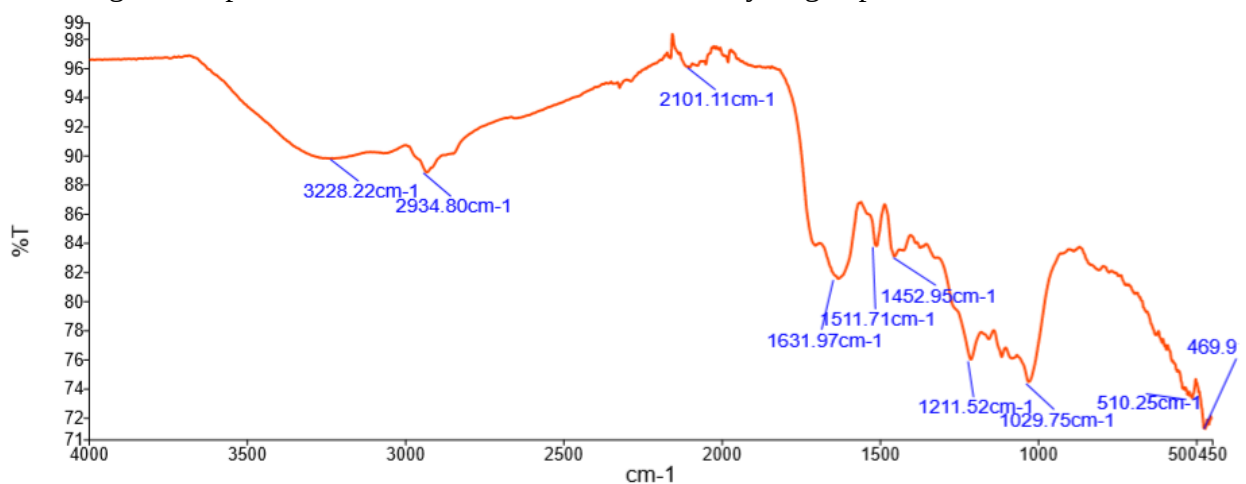


Fig. 4. IR spectrum of humic acid isolated from oxidized meal with hydrogen peroxide

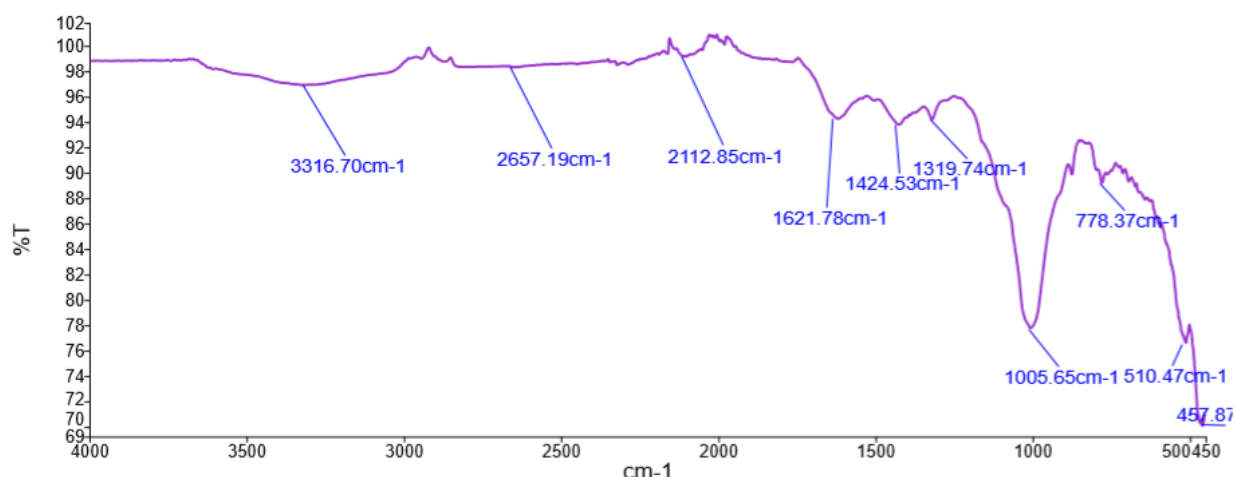


Fig. 5. IR spectrum of organic fertilizer obtained from oxidized licorice meal with hydrogen peroxide and the addition of bentonite

Analysis of the spectra of the original, oxidized and extractive substances isolated from oxidized meal with hydrogen peroxide showed that all samples contain absorption bands characterizing the presence of hydroxyl groups OH^- (3325 cm^{-1}), primary and secondary amines, as well there are absorption bands associated with stretching vibrations of aliphatic hydrocarbon compounds CH , CH_2 , CH_3 , they appear in the region of 2934 cm^{-1} and $2657\text{--}2648\text{ cm}^{-1}$. In addition, bands of stretching vibrations of the CH_3 group in the side chains are detected at $1005\text{--}1029\text{ cm}^{-1}$. Various types of deformation vibrations associated with the presence of methylene and methyl groups appear with approximately the same intensity in all studied samples. They can be observed in IR spectra at frequencies of $1319\text{--}1211\text{ cm}^{-1}$, $874\text{--}778\text{ cm}^{-1}$ ($\text{CH}- + \text{-OH def.}$), 805 cm^{-1} is more clearly expressed in HA preparations from oxidized meal. Stretching vibrations $\text{C}=\text{C}$ (1511 cm^{-1}) and $\text{C}=\text{C}$, characteristic of aromatic structures (stretching 1505 cm^{-1} , bending 805 cm^{-1}) also appear in all spectra, but they are more intense in the original meal. HA is characterized by the appearance in the IR spectra of a band of stretching vibrations of carbonyl groups in the $\text{C}=\text{O}-\text{OH}$ group at $1631\text{--}1621\text{ cm}^{-1}$. This band is most intense in humic acids from oxidized meal. There are also other types of $\text{C}=\text{O}$ stretching vibrations ($1452\text{--}1423\text{ cm}^{-1}$) in HA and oxidized meal. It is necessary to pay attention to the absorption band of the $-\text{C}-\text{O}-\text{C}-$ group forming cross-links. This band appears at $\approx 1211\text{ cm}^{-1}$; it is present only in the original meal. Of the remaining absorption bands observed in the studied samples, noteworthy is the $\text{C}-\text{O}$ (stretching) band at $1005\text{--}1029\text{ cm}^{-1}$, the bands of deformation vibrations of $\text{C}-\text{C}$, $\text{C}-\text{OH}$ and CH in the region $778\text{--}457\text{ cm}^{-1}$ with low intensity.

Thus, based on the studies carried out, it is possible to draw certain conclusions about the processes occurring during the oxidation of licorice meal with hydrogen peroxide; a significant amount of carboxyl COOH groups is formed, as evidenced by the appearance of fairly intense absorption bands of carboxyl and carbonyl in HA from the oxidized meal. This conclusion is confirmed by chemical analysis data indicating a noticeable increase in the content of functional groups, showing a sharp increase in the amount of $\text{COOH} + \text{OH}$ in HA from oxidized meal. During oxidation with hydrogen peroxide, the $\text{C}-\text{O}-\text{C}$ bonds between condensed aromatic structures are broken. Thus, the study showed that the oxidation of licorice meal significantly increases the content of HA and active functional groups in it compared to the original licorice meal.

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Rezyume: *Ishda asl va oksidlangan qizilmiya shrotining elementar tarkibi, ularning ekstraktiv moddalari va ekstraktiv moddalarni ajratib olishdan keyin qolgan qoldiq, shuningdek, ulardagi funktsional guruhlarning tarkibi ko'rsatilgan. Qizilmiya ovqatining vodorod peroksid eritmasi bilan oksidlanish jarayonini grafostatik tahlil qilish natijalari va oksidlanish mahsulotlari, gumin kislotalari va organik o'g'itlarning asl qizilmiya yormasi IR spektroskopik tadqiqotlari. Ovqatning oksidlanishi natijasida kislorod va faol funktsional guruhlarning tarkibi ovqatning o'zida ham, undagi ekstraktiv moddalarda, shu jumladan humik kislotalarda ham ko'payishi ko'rsatilgan.*

Резюме: *В работе представлен элементный состав исходного и окисленного шрота солодки, их экстрактивных веществ и остаточного шрота после извлечения экстрактивных веществ, а также содержание в них функциональных групп. Результаты графостатического анализа процесса окисления шрота солодки раствором перекиси водорода и ИК-спектроскопических исследований исходного шрота солодки продуктов окисления, гуминовых кислот и органического удобрения. Показано, что в результате окисления шрота в последнем увеличивается содержание кислорода и активных функциональных групп, как в самом шроте, так и в его экстрактивных веществах, в том числе гуминовых кислотах.*

Kalit so'zlar: *qizilmiya yormasi, vodorod peroksid, uglerod, kislorod, vodorod, azot, oksidlanish, qaytarilish, gidratlanish, karboksillanish.*

Ключевые слова: *шрот солодки, перекись водорода, углерод, кислород, водород, азот, окисление, восстановление, гидратация, карбоксилирование.*

ISOTHERM OF AMMONIA ADSORPTION IN ZEOLITE CaA (M-34)

Reymov A¹., Raxmatkarieva F²., Koxxarov M³., Bakhronov Kh⁴.

¹Karakalpak State University named after Berdakh,

²Scientific Research Institute of General and Inorganic Chemistry of the Academy of Sciences of the Republic of Uzbekistan,

³Namangan institute of engineering and technology,

⁴Tashkent University of Information Technologies named after Muhammad al-Khwarizmi

Summary: This paper presents the values of ammonia adsorption isotherms on synthetic zeolite CaA (M-34), obtained experimentally at a temperature of 303 K. The adsorption isotherm was measured with high accuracy and stability using a system consisting of a differential automatic microcalorimeter of the Tian-Calve DAK-1-1A type, connected to a universal high-vacuum installation. Differential values of free energy, that is Gibbs energy, were calculated from the equilibrium values of pressure. Based on the general equation of the volume theory of micropores (VMOT), the coefficients of the mathematical apparatus of the isotherm were determined from the values of the Gibbs energy. On zeolite CaA (M-34), a regular relationship was established between the adsorption value and the energy properties of the sorption of ammonia molecules, the sorption mechanisms and the regularity of filling the zeolite volume with ammonia molecules. Under the experimental conditions (523 torr), the adsorption capacity of this zeolite with respect to NH₃ was expressed as 7.22 mmol/g per 1 g of zeolite. It was found that 49 % of the total adsorption was sorbed at an equilibrium pressure of 1 torr, 69 % at a pressure of 10 torr, 86 % at a pressure of 100 torr, and 100 % (7.22 mmol/g) at a pressure of 524 torr. It was proven that NH₃ molecules form tetrameric 4NH₃:Na with sodium cations and dimeric 2NH₃:Ca²⁺ with calcium cations ion-molecular complexes in the first coordination sphere in positions S_{II} and S_{III} of the zeolite.

Key words: adsorption, adsorbent, pressure, isotherm, free energy, microcalorimeter, ammonia.

Introduction. The key role of zeolite catalysts in the processes of oil refining industry, gas and petrochemistry, as well as organic synthesis has significantly stimulated the creation of new highly effective catalytic systems based on them. However, further progress in this area is significantly hampered by the lack of detailed information on the mechanism of synthesis of these materials, and on the influence of the mechanism of zeolite synthesis on their physicochemical, catalytic and adsorption properties, as well as due to the lack of methods for targeted regulation of these properties during synthesis. All this fully determines the relevance of this work, aimed at studying the mechanism of synthesis of zeolite of the LTA structural type and searching for ways of targeted regulation of its physicochemical and catalytic properties.

In the production of high-octane gasoline and its components from petroleum and non-petroleum raw materials, such as methanol, in the purification and processing of petroleum and petroleum products, in order to obtain environmentally friendly gas from natural gases, their removal from various unnecessary chemical compounds, including degassing and dewatering, is currently used all over the world. The year by year increase in requirements to prevent the release of greenhouse gases into the atmosphere, which has become a major environmental problem, attracts the large-scale use and expansion of production of adsorbents. In order to avoid the problems mentioned above, synthetically produced zeolites are required to expand in size.

It is important to achieve scientific and practical innovations on the basis of the results of scientific and scientific-practical research conducted on the synthesis of high catalysis and sorption and special zeolites, increasing the level of their selectivity.

Today, for catalysis and sorption processes, synthesis of zeolites with selective absorption properties in accordance with the kinetic sizes of adsorbate molecules in zeolites with nanoporous molecular structures such as LTA, MOR, MFI, FAU [1], as well as to determine the main thermodynamic

properties of adsorption of adsorbates of different physicochemical nature in these zeolites, the formation of ion-molecular complexes in the zeolite matrix, determination of the localization and stereochemistry of molecules, the thermokinetics of adsorption in the micropores of zeolite, the implementation of cation exchange in order to increase the sorption and catalysis properties, it is necessary to study the laws of migration of cations, and to determine the molecular mechanisms of sorption in zeolite.

In addition to the fact that instead of aluminum and silicon in aluminosilicate zeolites, they can be replaced by germanium, gallium, phosphorus elements that are close to them in nature, they can change their sorption and catalytic properties [2], they are due to the presence of water molecules in the internal structure of the crystal, when heated at a temperature of 450⁰ C, water molecules change the structure of the crystal lattice. It is the possibility of ion exchange due to the mobility of alkaline, alkaline earth cations and water molecules in the zeolite [3-5].

The adsorption of molecules of different physical and chemical nature in the forms of alkaline earth and alkaline earth metal cation LTA zeolites CaA(M-22), CaA(M-34), CaA(MISS-624) and CaA(Horst 50/50) was studied, their adsorption differential heat as a result of the stoichiometric effect was determined by the authors [6-8].

The adsorption and catalytic properties of hydrocarbons depend not only on the shape and size of the zeolite pores, but also on the SiO₂/Al₂O₃ ratio, as well as on the ratio and types of cations. There is a large amount of data on the adsorption of gases and vapors in LTA-type zeolites, which were obtained by various physicochemical methods of study. However, there is little data obtained by the adsorption-calorimetric method, which puts on the agenda the task of further detailed study of the adsorption properties of LTA-type zeolites in relation to gas and vapor molecules, as well as polar and non-polar molecules, and obtaining the main thermodynamic characteristics of these systems.

Analysis of the literature showed that the main thermodynamic properties and adsorption mechanisms of polar, nonpolar and quadrupole molecules in LTA zeolite CaA(M-34) have not been thoroughly studied. The study of zeolites of the LTA type will help in the targeted synthesis of zeolites and their use as adsorbents of various technological processes. This article presents the results of adsorption differential heat and entropy change, as well as the mechanism of adsorption, obtained by the method of adsorption-calorimetric experiment on synthetic zeolite of ammonia CaA (M-34).

Research methods. For measurements of isotherms and differential adsorption heats a system consisting of a universal high-vacuum adsorption unit and a Tian-Calvet-type, DAK-1-1A thermally conductive differential microcalorimeter connected to it was used, which has high accuracy and stability. The instrument's calorimeter sensitivity is extremely high and its reliability is high (it can measure about 0.2 μW thermal power). It can be used with confidence to measure the heat of processes of almost unlimited duration. The calorimeter makes it possible to obtain the thermokinetics of the process of adsorption systems under study, which is very important for elucidating the mechanism of adsorption.

Despite its outer insulating shells, it is not adiabatic, as the heat released in it is introduced from the calorimeter chamber as it is released and dissipated into the large metal block. Although the temperature of the calorimeter chamber changes only slightly, the instrument cannot be called strictly isothermal; it detects small temperature changes, which are unavoidable and form the basis of measurements.

Most of the heat (about 99%) released into the calorimeter chamber is dissipated into the calorimeter block immediately after release. Only about 1% of the heat released remains in the calorimeter chamber, raising its temperature very slightly. The measurement is mainly concerned with the heat flux that passes through the surface of the calorimeter chamber and the calorimeter block.

The adsorption-calorimetric method used in this work provides highly accurate molar thermodynamic characteristics and reveals detailed mechanisms of adsorption processes occurring on adsorbents and catalysts. Adsorption measurements and adsorbate dosing were carried out using a universal high-vacuum adsorption unit. The unit allows adsorbate dosing by both gas-volume and

volume-liquid methods. We used a BARATRON B 627 membrane pressure gauge to measure the equilibrium pressures [9-15].

Results and discussion. In this adsorption-microcalorimetric study, the adsorption isotherm of ammonia in CaA (M-34) zeolite at the temperature of 303 K was studied, the regular change of the adsorption amount to the equilibrium pressure and the adsorption mechanism were analyzed. The unit cell composition of this zeolite is represented by $\text{Ca}_9\text{Na}_3(\text{SiO}_2)_{12}(\text{AlO}_2)_{12} \cdot 27\text{H}_2\text{O}$. Based on its chemical composition, the amount of Ca^{2+} cations in 1 g of zeolite is 1.91 mmol/g and the amount of Na^+ cations is 0.96 mmol/g.

The adsorption isotherm of ammonia at a temperature of 303 K in CaA (M-34) zeolite was determined experimentally from the region of small saturations to the device range (~600 torr), the main thermodynamic characteristics from the initial region to the saturation pressure and the regular relationship between the amount of adsorption and the mechanism of the sorption process were determined. During the adsorption process, it was shown that ammonia molecules form ion-molecular complexes of different proportions with Na^+ and Ca^{2+} cations in S_{II} and S_{III} positions of zeolite.

The logarithmic isotherm of the adsorption isotherm of ammonia in CaA (M-34) zeolite at 303 K is presented in Fig.1. At small saturations of the adsorption volume, the logarithmic value of the equilibrium relative pressure at the adsorption amount of 0.05 mmol/g is equal to $\text{Ln}(P/P_s) = -13.3$ ($P/P_s = 1.73 \cdot 10^{-6}$, $P = 0.0326$ torr). Due to the high saturation pressure of ammonia ($P = 8750$ torr), the experiment was conducted up to $\text{Ln}(P/P_s) = -3$ ($P/P_s = 0.06$ or $P = 524$ torr). The amount of complete adsorption was equal to 7.22 mmol/g at this value of pressure.

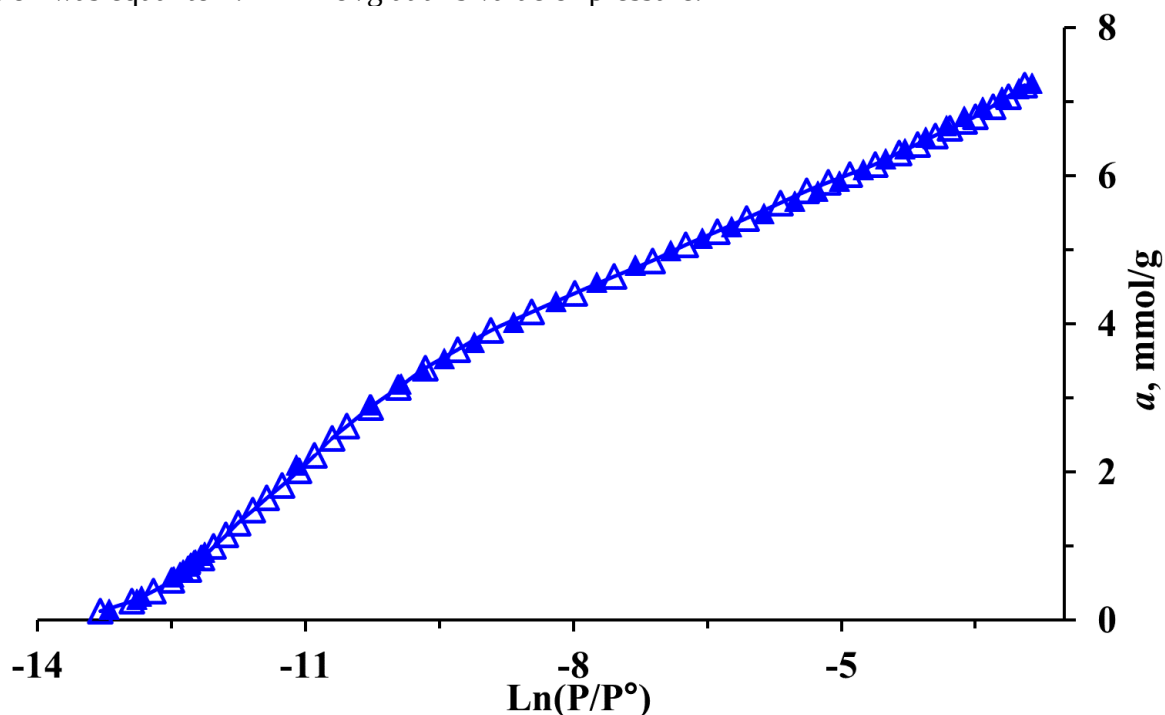


Figure 1. Isotherm in logarithmic coordinates of ammonia adsorption on CaA (M-34) zeolite at 303 K temperature. $\triangle$ -experimentally obtained isotherm values, $\blacktriangle$ -values calculated in the VMOT equation

The adsorption isotherm shows that ammonia molecules are strongly bound in CaA (M-34) zeolite in the initial region. In general, the isotherm has a convex appearance, which is due to the presence of strongly interacting adsorption centers in this adsorbent.

The isotherm is initially $\text{Ln}(P/P_s) = -12.16$ ($P/P_s = 4.88 \cdot 10^{-6}$, $P = 0.0435$ torr pressure) and a partial tilt towards the abscissa axis up to the adsorption amount of 0.84 mmol/g. As the sorption volume becomes saturated with ammonia molecules, at 2.87 mmol/g adsorption, the equilibrium relative pressure logarithm $\text{Ln}(P/P_s) = -10.27$ ($P/P_s = 0.000042$, $P \approx 0.37$ torr) of the isotherm is 45° degrees relative to the ordinate and abscissa axes. changes linearly under the angle. The partial tilt at

the initial region of 0.84 mmol/g and the linear change to the adsorption amount of 2.87 mmol/g are multiples of the amount of sodium cations in the zeolite (0.96 mmol/g). So, the initial ammonia molecules are adsorbed on the sodium cations contained in the CaA (M-34) zeolite, that is, NH_3 molecules at a small amount of adsorption form adsorbate/adsorbent monomer $1\text{NH}_3:\text{Na}^+$, trimer $3\text{NH}_3:\text{Na}^+$ ion-molecular complexes with Na^+ cations at an adsorption amount of 2.87 mmol/g does. The tetramer $4\text{NH}_3:\text{Na}^+$ forms an ion-molecular complex at the logarithmic value of adsorption of 3.91 mmol/g and relative pressure $\ln(P/P_s)=-8.9$ ($P/P_s=0.00014$, $P=1.17$ torr) with the isotherm bending towards the abscissa axis. But the change of the isotherm in the subsequent adsorption of ammonia molecules does not depend on the adsorption of 0.96 mmol/g. This is due to the completion of the sorption process of ammonia molecules in the first coordination sphere with sodium cations in the zeolite.

After the tetrameric complex, the line of the isotherm changes towards the abscissa axis, which means that ammonia molecules are adsorbed on the second active center of the zeolite. The change of the isotherm depends on the amount of adsorption of 1.9 mmol/g. Therefore, subsequent ammonia molecules are adsorbed on calcium molecules in the zeolite. Ammonia molecules form dimer $2\text{NH}_3:\text{Ca}^{2+}$ ion-molecular mechanism with calcium cations. In general, ammonia forms an ion-molecular mechanism with metal cations in zeolite adsorbate/adsorbent in the ratio $6\text{NH}_3:\text{Me}$.

Figure 1 shows the isotherm of ammonia molecules adsorption on SaA (M-34) zeolite obtained experimentally and calculated based on the general equation of the volume saturation theory of micropores (VMOT). It can be seen from Figure 1 that the isotherm values calculated based on VMOT agree with the experimental values.

Figure 2 shows the values of the relative pressure dependence isotherm of molecular ammonia adsorption on CaA (M-34) zeolite obtained in the experiment in the P/P_s coordinate. The isotherm corresponds to the Brunauer type 1 classification, that is, ammonia molecules are adsorbed in the micropores of the zeolite.

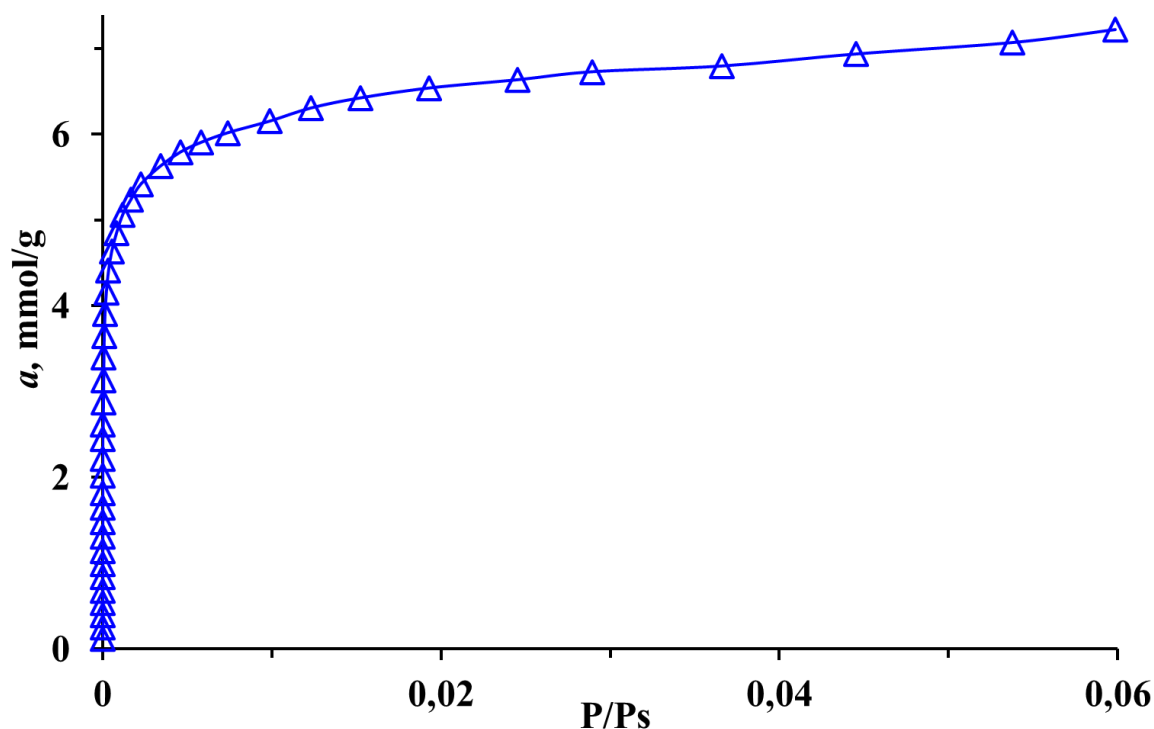


Figure 2. Isotherm of adsorption of ammonia molecules on CaA (M-34) zeolite at 303 K in P/P_s coordinate.

The isotherm in the P/P_s coordinate confirms the sorption mechanism based on the isotherm in the logarithmic coordinates (Fig. 2). The isotherm was brought to the value of relative pressure $P/P_s=0.06$ ($P=524$ torr) and the amount of adsorption to 7.22 mmol/g. In the initial region, the value

of equilibrium relative pressure $P/P_s=0.0001143$ ($P=1$ torr) and the amount of adsorption increases relatively slowly to 3.85 mmol/g. This is also due to the fact that the adsorbate-adsorbent interaction is strong. On the other hand, the amount of adsorption of 3.85 mmol/g is 4 times greater than the amount of sodium cations in zeolite (0.96 mmol/g). As explained by the graph of the isotherm in logarithmic coordinates, ammonia molecules form a tetramer $4\text{NH}_3:\text{Na}^+$ ion-molecular complex with sodium cations contained in zeolite.

Next, ammonia molecules are adsorbed on calcium cations. When forming the ammonia/ Ca^{2+} monomer $1\text{NH}_3:\text{Ca}^{2+}$ ion-molecular mechanism, the equilibrium relative pressure begins to increase relatively significantly. In the complete formation of the monomer $1\text{NH}_3:\text{Ca}^{2+}$ mechanism, the relative pressure at 5.85 mmol/g adsorption increases significantly up to $P/P_s=0.0046$ ($P=40$ torr).

In the formation of the dimer $2\text{NH}_3:\text{Ca}^{2+}$ complex, the relative pressure increases sharply up to the experimental range of the device ($P/P_s=0.06$ or $P=526$ torr) and, in general, the formation of the $6\text{NH}_3:\text{Me}$ ion-molecular mechanism with the metal cations in the zeolite ammonia adsorption on CaA (M-34) zeolite ends with

Conclusion. The adsorption isotherm of ammonia molecules on CaA (M-34) nanostructured zeolite was studied and the coefficients in the equation of the mathematical apparatus of the isotherm were calculated using the general formula of the volume saturation theory of micropores (VMOT). It was found that the adsorption isotherm varies regularly with the amount of Na^+ and Ca^{2+} cations in the zeolite. It was found that tetramer $4\text{NH}_3:\text{Na}^+$ in the first coordination sphere with Na^+ cations in S_{II} and S_{III} positions of zeolite, dimer $2\text{NH}_3:\text{Ca}^{2+}$ in the first coordination sphere with Ca^{2+} cations form ion-molecular complexes. In general, it was proved that ammonia molecules form $6\text{NH}_3:\text{Me}$ ion-molecular mechanism with cations contained in CaA (M-34) zeolite. The results of the adsorption-calorimetric research obtained on the basis of the experiment make it possible to obtain the main thermodynamic functions of the studied systems, which are necessary for the development of theoretical concepts of chemical and physical adsorption in synthetic zeolites of the LTA type, including CaA (M-34), as well as in the calculation of sorption technology processes and devices in practice.

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Rezyume: Ushbu maqolada CaA (M-34) sintetik seolitida ammiak adsorbsiyasining 303 K haroratdagi tajribada olingan izoterma qiymatlari keltirilgan. Adsorbsiya izotermasi universal yuqori vakuumli qurilmaga ulangan Tiana-Kalve tipidagi DAK-1-1A differensial avtomatlashtirilgan mikrokalorimetrdan tashkil topgan sistema yordamida yuqori aniqlik va barqarorlikka ega bo'lgan holda o'lgandi. Bosimning muvozanat kattaliklaridan erkin energiyaning differensial qiymatlari, ya'ni Gibss energiyasi hisoblandi. Gibss energiyasi qiymatlaridan mikrog'ovaklarning hajmiy nazariyasining umumiy tenglamasi asosida (VMOT) izotermaning matematik apparati koeffitsiyentlari aniqlandi. CaA (M-34) seolitida NH_3 molekularining adsorbsiyasi miqdori va energetik xususiyatlari o'rtasidagi qonuniyatli bog'lanish, sorbsion mexanizm va NH_3 molekularining seolit hajmini to'ldirish qonuniyati aniqlandi. Tajriba sharoiti (523 torr) da bu seolitning NH_3 ga nisbatan adsorbsion qobiliyati 1 g seolitda 7,22 mmol/g ga teng ekanligi ifodalandi. To'la adsorbsiyaning 49 % qismi 1 torr muvozanat bosimigacha, 69 % qismi 10 torr bosimigacha, 86 % qismi 100 torr bosimigacha, 100 % qismi (7,22 mmol/g) 524 torr ustuni bosimigacha sorbsiyalanishi aniqlandi. NH_3 molekulari seolitning S_{II} va S_{III} pozitsiyadagi Na^+ kationlari bilan birinchi koordinatsion sferada tetra $4\text{NH}_3:\text{Na}^+$ va Ca^{2+} kationlari bilan birinchi koordinatsion sferada dimer $2\text{NH}_3:\text{Ca}^{2+}$ ion-molekular kompleks hosil qilishi isbotlandi.

Резюме: В данной работе представлены значения изотерм адсорбции аммиака на синтетическом цеолите CaA (M-34), полученные экспериментально при температуре 303 K. Изотерму адсорбции измеряли с высокой точностью и стабильностью с помощью системы, состоящей из дифференциального автоматического микрокалориметра типа Тиана-Кальве ДАК-1-1А, соединенного с универсальной высоковакуумной установкой. Дифференциальные значения свободной энергии, т.е. энергии Гиббса, рассчитывались из равновесных значений давления. На основе общего уравнения теории объемного заполнения микропор (ТОЗМ) определены коэффициенты математического аппарата изотермы по значениям энергии Гиббса. На цеолите CaA (M-34) установлена закономерная связь между величиной адсорбции и энергетическими свойствами сорбции молекул аммиака, механизмами сорбции и закономерностью заполнения молекулами аммиака объема цеолита. В условиях эксперимента (523 мм.рт.ст.) адсорбционная емкость этого цеолита по отношению к NH_3 выражалась как 7,22 ммоль/г в 1 г цеолита. Установлено, что 49 % от полной адсорбции сорбируется при равновесного давления 1 мм.рт.ст., 69 % - при давления 10 мм.рт.ст., 86 % - при давления 100 мм.рт.ст., 100 % (7,22 ммоль/г) - при давления 524 мм.рт.ст. Доказано, что молекулы NH_3 образуют тетрамерный $4\text{NH}_3:\text{Na}$ с катионами натрия и димерный $2\text{NH}_3:\text{Ca}^{2+}$ с катионами кальция ионно-молекулярные комплексы в первой координационной сфере в положениях S_{II} и S_{III} цеолита.

Kalit so'zlar: adsorbsiya, adsorbent, bosim, izoterma, erkin energiya, mikrokalorimetr, ammiak.

Ключевые слова: адсорбция, адсорбент, давление, изотерма, свободная энергия, микрокалориметр, аммиак.

CONSTRUCTION OF WEAR LAYERS USING THE METHOD OF SURFACE TREATMENT OF BITUMEN EMULSIONS

Abdikadirov P.U., Adilbaev I.B., Bekbauliev R.I.

Karakalpak State University named after Berdakh

Summary: *The article presents. Device for treating road surfaces, using thin-layer coatings, preparing stable bitumen emulsions. Based on the results of the analysis, the effects of lime-containing mineral powders in bitumen emulsions for road surfaces were studied.*

Key words: *protective road coverings, bitumen emulsions containing CaO in mineral lime powder.*

Introduction: The functionality of highways largely depends on the quality of their maintenance. During the operation of highways, first of all, the top layer of the road surface wears out and collapses with the formation of cracks and potholes, making it difficult for the traffic flow to move at the designed speed and causing an emergency situation. When repairing the top layer of the road surface and carrying out patching repairs, problems arise in ensuring the integrity and solidity of road pavements while maintaining their basic performance indicators. The top asphalt concrete layer is subject to the greatest loads in road pavement. We are talking not only about the pressure from moving vehicles, but also about climatic factors. Exposure to water and ice, temperature changes, solar radiation - all these are natural “enemies” of road surfaces.

Repair of automobile pavement can be done by strengthening the pavement structure by gradually increasing layers of asphalt concrete, by installing a top base layer and covering the surface of the existing road, or by installing a surface layer. The most common repair method is surface treatment of road surfaces.

Which does not require large expenses and a huge amount of road inert materials. Bitumen in an emulsified state has found widespread use for repairing the top layers of road surfaces. Application of bitumen emulsions for surface treatment. This radically changes construction work.

- Fine distribution of bitumen for the top layer of the road surface.
- Good rollability of bitumen with mineral material.
- Simplicity of technology for using the material in a cold state.
- Saving binder material.
- Savings in transportation.

Surface finishing is a method of creating a rough pavement surface and installing wear layers and protective layers by pouring a thin layer of organic binder onto the substrate, spreading high-grade crushed stone and compacting it. The main work includes the spilling of bitumen, distribution and compaction of crushed stone. The process of final formation of surface treatment continues for about 10 days.

Main part:

An important task is the development of resource-saving, environmentally friendly technologies for the operation and maintenance of highways, ensuring stable roughness and a protective layer of coatings. Bitumen emulsions are liquid bitumen dispersed (crushed) in water with the addition of an emulsifier in the form of surfactants. The main parameters are the work ability of substances. The main parameters of the work-ability of wear layers are the stability of the structure, due to the adhesion of bitumen to the mineral filler, bending strength, resistance of the structure to changes in moisture and temperature (periodic freezing and thawing) conditions, fatigue failure, and others. It is known that the destruction of road pavements when water penetrates into the structure of the material occurs due to a change in the pore space, that is, its increase, resulting in a breakdown of the bonds between binders (bitumen) and mineral materials due to the stresses that arise when water penetrates the pores. Water under the influence of pore pressure has an explosive effect on the pores,

destroying the material. The use of bitumen emulsion wearing layers should reduce the penetration of moisture into pavements.

The solution to the issue of regulating the structural and mechanical properties of bitumen emulsions depends on the bitumen and mineral material. An important role in the processes of structure formation of bitumen emulsions belongs to the mineral powder included in the composition of the composite [4,21,37,38] Page. 16 11.2GL.

Combining with “bitumen, mineral powder” it is noted [36-37,57-58] that at a certain ratio of bitumen-mineral powder, the highest strength of the structured disperse system is achieved, forming with these materials. As a result, the resistance of bitumen to impact loads increases, the density of the resulting mass increases, and the strength under shear and compression stresses increases, and fragility decreases. Mineral powders make it possible to regulate deformation and reduce subsidence of road surfaces. When filling bitumen with mineral powder, the viscosity of the mixture increases and heat resistance increases. A traditional powder with a large number of positive adsorption centers and high structuring ability is limestone mineral powder [4]. Research work has found that the best are mineral powders obtained by fine grinding of limestone and dolomite. Almost everyone comes to this conclusion. Researchers working in this area [17,49-50,68]. To find the possibility of using such bitumen powders-mineral mixtures without deteriorating their properties, it is necessary to understand the mechanism of interaction between the mineral powder and the organic binder (bitumen).

An analysis of literary sources on the use of lime in heavy construction for the preparation of bitumen emulsions made it possible to establish that lime (fluff, boiling powder) and cement are considered effective and affordable mineral powders [30,85]. According to data [4,30], when the fluff lime activator is introduced into bitumen, not only better wetting and adhesion of the bitumen is achieved, but also its faster mixing with wet mineral material.

In the process of research, the authors of [142] proved that by adding slaked lime to bitumen, the adhesion of the mineral powder to the binder can be improved. Also, the addition of a water molecule to lime molecules can form a crystallization structure. Based on this, it can be assumed that when asphalt concrete pavements containing lime in the composition of mineral powder are saturated with water, physical and chemical processes will occur in the body of the composite.

Associated with the hydration of lime, leading to the formation of a stable structure. And further, it will entail an improvement in the quality, durability and performance properties of asphalt concrete in road pavement. These assumptions were the scientific hypothesis of the study.

Results and discussions:

The formation of the structure of a bitumen emulsion occurs through the adhesion of fine and coarse mineral powder to bitumen. With good adhesion, there is no possibility of tearing the bitumen from the mineral powder using mechanical force. Separation will be observed in the bitumen layer since the adhesion in bitumen is not strong enough compared to the strength of contact with the mineral. To improve the adhesion of bitumen, it is necessary to minimize the amount of free binder located in the emulsion through the use of mineral material together with bitumen.

The difference in the properties of mineral powders definitely affects the structure of the adhesion processes that act on each other with bitumen. Choosing a mineral powder with good adhesive properties is the best option for creating bitumen emulsions of good quality. As expected, the indicators of separation (desorption) of the binder remaining on the surface of the mineral powder can decrease with an increase in the amount of calcium oxide in it.

For the study, bitumen BND 60/90 and mineral powders with different compositions of calcium oxide CaO (10% 20% 30%) and another common limestone material were taken. The experiment made it possible to observe changes in the adhesion (adsorption) properties of the studied mineral powders with different calcium oxide contents and to assess the influence of the amount of lime in the composition of mineral powders on the activity of their interaction with the bitumen emulsion. According to the literature studied, limestone mineral powder has a high adhesion (adsorption) ability to bitumen. Determination of the adhesion of emulsions to the surface of crushed

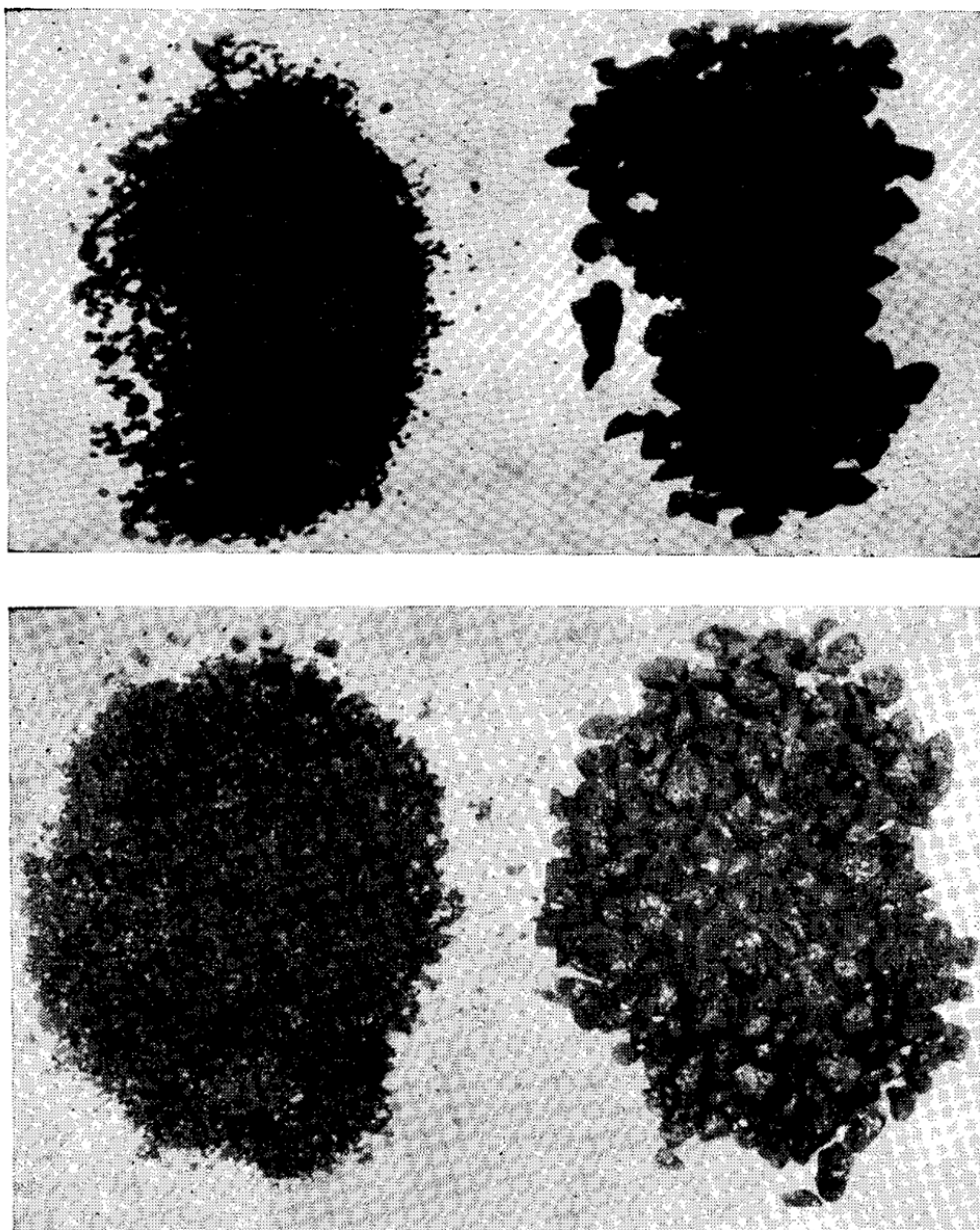
stone was studied in laboratory conditions in accordance with GOST 52128-2003 “Bitumen emulsions”.

The essence of the method is to assess the degree of preservation of the bitumen emulsion film on crushed stone grains after boiling in distilled water. For the research and preparation of mineral powders, finely ground calcium building lime without additives was used. It is a product of firing marble. It should be noted that for the research, 2nd grade lime was used with an average slaking time of 20 minutes.

The nature of the interaction (adhesion) of the studied mineral materials with the bitumen emulsion, according to GOST, is assessed visually by the degree of preservation of the bitumen emulsion film on the crushed stone grains after boiling it in distilled water. For comparison, a control limestone mineral powder and lime CaO were used in percentages of 0% 10% 20% 30%.

We immerse preheated crushed stone in a bitumen emulsion with different amounts of 0% 10% 20% 30% lime containing samples. We immerse different samples of crushed stone, treated with the bitumen emulsion under study, into boiling water for 30 minutes.

The remaining bitumen films on the crushed stone surface are taken as the test results.



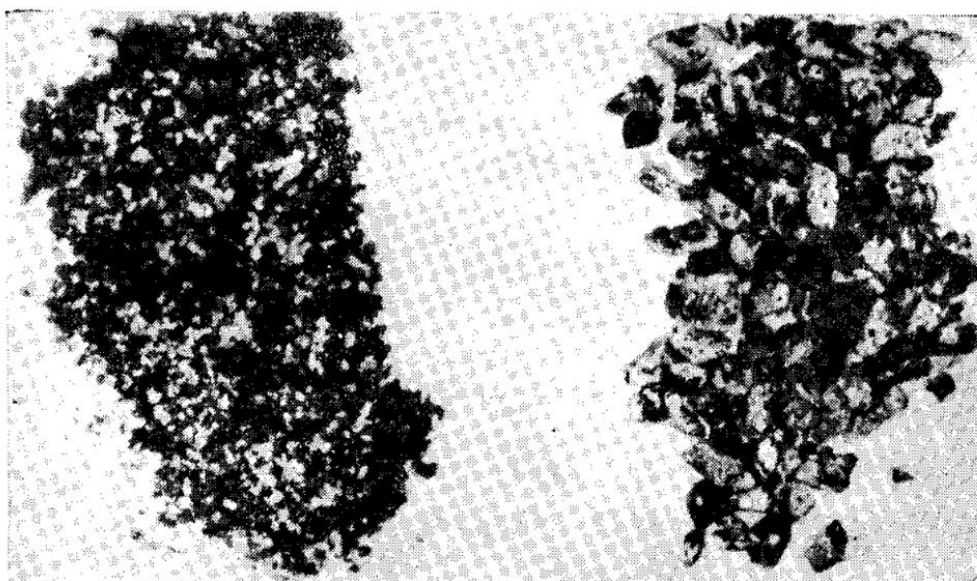


Table.

Characteristics of binder film	CaO content in bitumen emulsion	Points
The binder film is completely preserved on the surface of the grains.	30%	5
The binder film has partially separated from the sharp corners and edges of the grains	20%	4
A binder film of more than 50% is retained on the surface of the grains.	10%	3
A binder film of less than 50% is retained on the surface of the grains.	0%	2

However, the results obtained indicate that the content of calcium oxide in mineral powder significantly improves their adsorption capacity. This indicates that during the interaction of CaO bitumen emulsion, chemical processes occur, as a result of which strong water-insoluble bonds are formed between the “bitumen and mineral powder”, preventing the separation of the emulsion from the surface of the mineral powder. This proves that when calcium oxide (CaO) interacts with the components of the binder, chemical adsorption processes occur, and in the end, strong water-impenetrable layers are formed in the layers of bitumen emulsion, preventing the separation of bitumen from the surface of the mineral powder.

Conclusion:

Analyzing the data obtained, we can conclude that mineral powders for bitumen emulsions containing CaO have high energy potential, which, due to external influences (water, heat), is capable of changing the characteristics and qualitative state of the binder in a given direction. Unlike traditional limestone powders, lime containing powders have chemical and hydraulic activity, depending on the CaO content in their composition, capable of active interaction with both bitumen and water. Based on this, the formation of the structure of bitumen emulsions on lime-containing powders will differ from traditional mineral powders.

Analysis of the data obtained allows us to conclude that a feature of mineral powders containing lime, in contrast to conventional fillers from carbonate rocks, is the formation of the structure of bitumen emulsions over time when interacting with water. As a result of such contact, the lime contained in the powder becomes tarred, which leads to the appearance of new formations in the composer's body. In addition, the formation of chemisorption bonds is possible, presumably

due to the adsorption on the surface of the powders and other organic compounds of bitumen on the surface.

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Rezyume: *Ushbu maqolada yo'l sirtini qayta ishlash, yupqa qatlamli qoplamalardan foydalanish va barqaror bitum emulsiyalarini tayyorlash uchun qurilma taqdim etilgan.*

Резюме: *В статье представлены устройство для обработки поверхности дороги, применение тонкослойных покрытий, приготовление стабильных битумных эмульсий.*

Kalit so'zlar: *himoya yo'l qoplamalari, mineral ohak kukunida CaO ichiga olgan bitum emulsiyalari.*

Ключевые слова: *защитные дорожные покрытия, битумные эмульсий содержащие в минеральном порошке извести Ca O.*

UDK 656.057

ASSESSMENT OF NUKUS CITY TRANSPORTATION SYSTEM PERFORMANCE

Jumabaev D., Tolegenov B., Abdreymov R., Abdreymova A.
Karakalpak State University named after Berdakh

Summary: This article analyzes the structure and intensity of traffic at intersections, passenger and cargo turnover of the transport system of the city of Nukus.

Key words: Vehicles, passenger transportation, passenger turnover, cargo transportation, cargo turnover, indicators of road transport intersection, traffic flow, observation, point analysis, traffic composition.

Introduction. In large cities of the Republic of Uzbekistan, the transport infrastructure is being improved, in particular, the development of urban passenger transport, as well as freight transport. 36-the goal of the development strategy for 2022-2026. The New Uzbekistan is aimed at "Developing a unified transport system in conjunction with all modes of transport, creating conditions for the possibility of daily trips on scheduled transport routes between major cities [1], in particular:

- improvement of the public transport system and development of its infrastructure in the city of Tashkent and the regions;
- increasing the attractiveness of intercity and suburban railway routes;
- development of the market of transport and logistics services and infrastructure, bringing the level of electrification of railway infrastructure to 60 percent and accelerated development of the highway network;
- expansion of "green corridors" and transit opportunities in the transport system for foreign trade, as well as an increase in the volume of transit cargo turnover to 15 million tons.

The main part. The main indicators of motor transport in the Republic of Karakalpakstan are given in Table No. 1. Figures 1-4 provide information on transported cargo, cargo turnover and passenger transport in the Republic of Karakalpakstan.



Fig. 1. Transported goods.

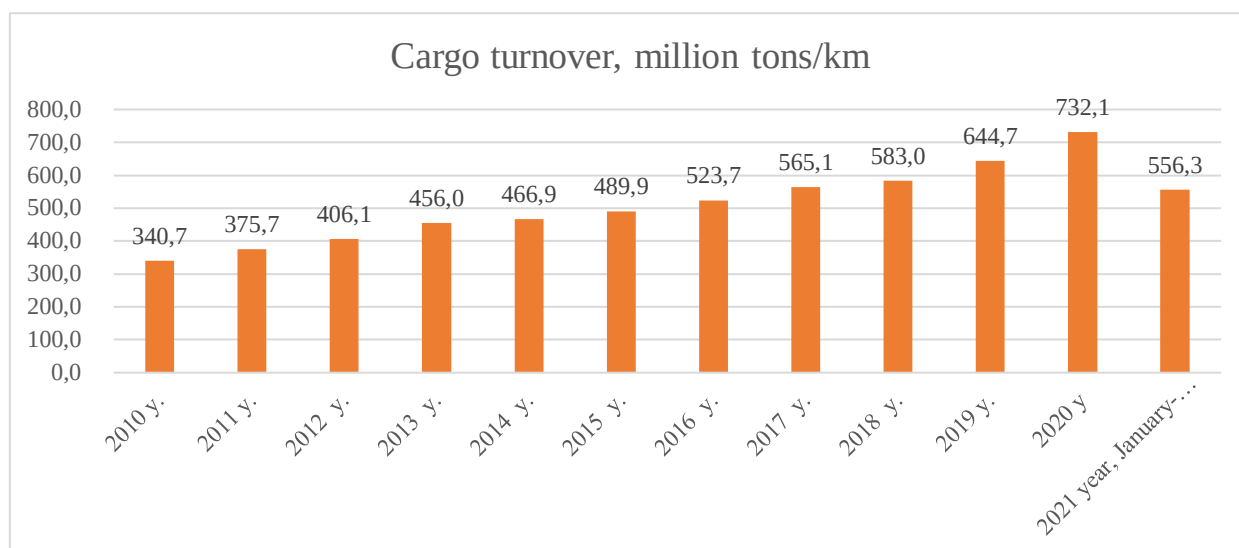


Fig 2. Cargo turnover.

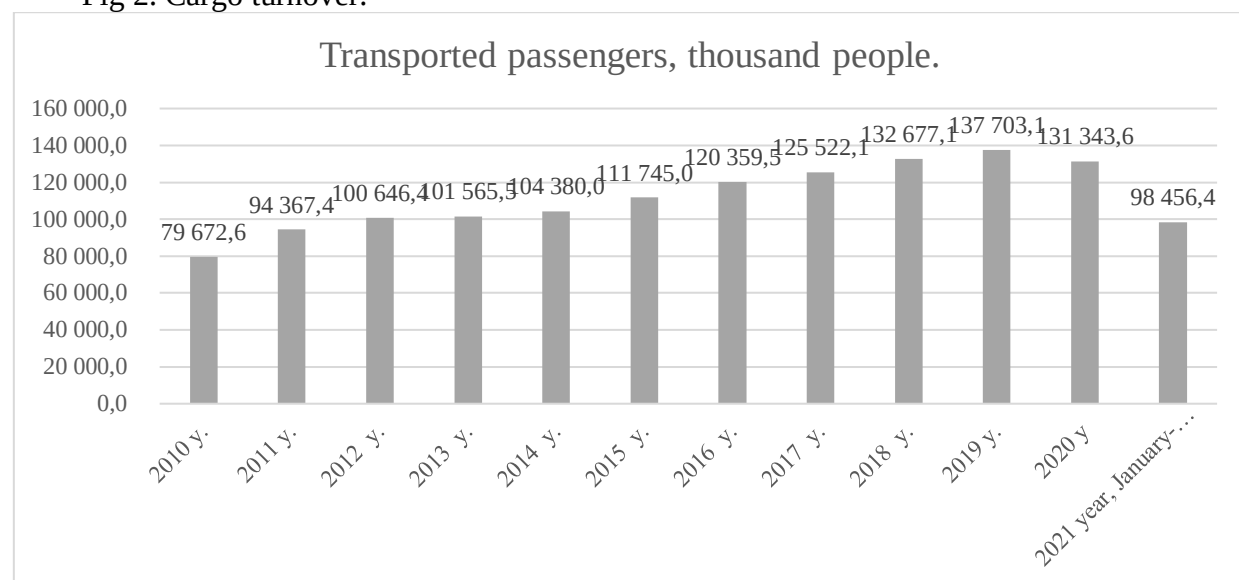


Figure 3. Transported passengers.



Figure 4. Passenger turnover.

Table No. 1 provides information on the number of cars issued by the corresponding license cards of the enterprise that provide services for the transportation of passengers and cargo to districts and cities in the Republic of Karakalpakstan on January 1, 2023 [5].

Table – 1

The number of cars issued the corresponding license cards of the company that provide services for the transportation of passengers and cargo to districts and cities in the Republic of Karakalpakstan

Number of cars, total	Of these: Buses	Minibuses	Passenger cars	Of these, the brand "Damas"
2313	40	144	2129	1486

On the territory of the city of Nukus, there are currently almost all types of modern transport: air, rail, road. Water transport, due to the low water content of the Amu Darya River, practically does not work.

Materials and methods used. The change in intensity at a busy time of day is taken into account when analyzing the level of service of traffic flow at a regulated intersection. However, the most commonly used procedures for assessing the level of transport services are based on 15-minute peak intervals [5]. As a result, traffic intensity exceeding the total bandwidth at a busy time of the day leads to oversaturation over the next hour.

Although a 15-minute interval is usually chosen as the study period, intervals of a different duration can be used. The intensity of the arrival of vehicles at the intersection can be obtained for a longer period, while using a special correction factor, which is called the "peak factor" [5].

Method "a": the duration of the study period is 15 minutes, that is, the duration of this T-period is 0.25 hours. In this case, you can use the following formula to get the hourly peak intensity obtained at 15-minute intervals, or a reduced peak intensity. [3]:

$$v_p = \frac{V}{PHF}$$

where v_p - is the highest intensity of arrival of vehicles on the approach (lane) to the regulated intersection, measured with an interval of 15 minutes.unit/hour;

V is the peak traffic intensity measured during peak hours.unit/hour;

PHF is the peak factor (in the absence of data, it is assumed to be equal to PHF = 0.92).

The main disadvantage of this method is that only one 15-minute interval is considered, although the queue at the considered element of the regulated intersection may remain after this interval, since the traffic intensity exceeds the capacity [3].

Method "C": the study proceeds during the entire period T (for an hour), but is divided into 15-minute time intervals. In this case, it becomes possible to take into account the residual queue, which is transferred from one to the next 15-minute interval of the study. As a result, if the intensity of the arrival exceeds its capacity, a more accurate measurement of the delay value at the element of the controlled intersection in question can be achieved.

Hourly traffic intensity leads to a maximum peak intensity, which can only be achieved within a 15-minute period. As a result, the final intensity value used in the calculations will be overestimated, which will lead to some increase in estimates of transport delays. When designing, this allows us to take into account the maximum intensity jump during the rush hour [3].

Results.Consequently, the intensity and composition of the traffic flow were studied at the next intersection:

The composition of the traffic flow at the intersection of Karakalpakstan-Guzar street of Uzbekistan, the schedule for changing the time zone of the traffic flow at the intersection and the schedule for changing the time zone according to the composition of the traffic flow are shown in Figures 5-6-7.

According to the results, at the intersection of Karakalpakstan-Uzbek Guzar Street, passenger cars make up 66%, trucks-3%, and buses and minibuses-31%.

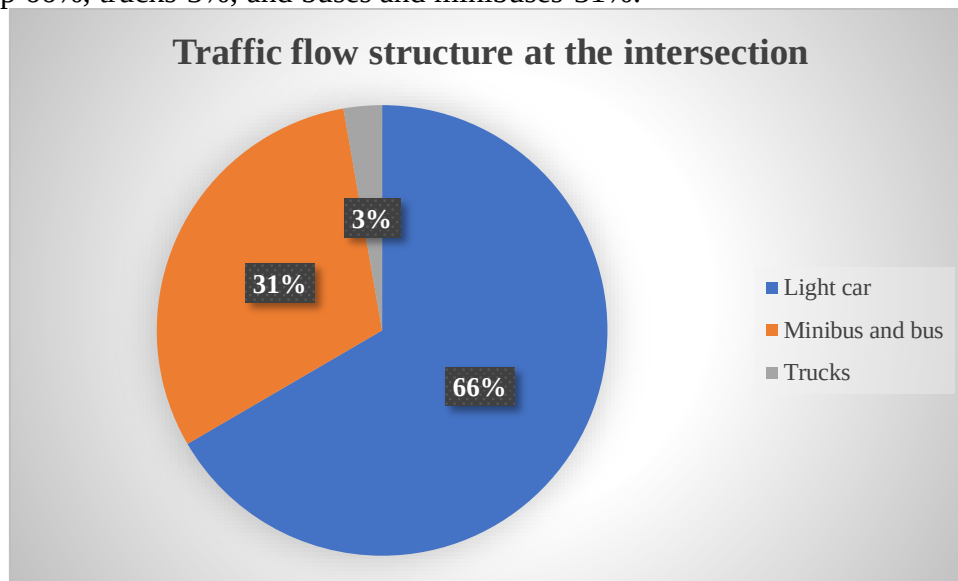


Figure 5 The structure of traffic flow at the intersection of Karakalpakstan-Uzbek Guzar street.

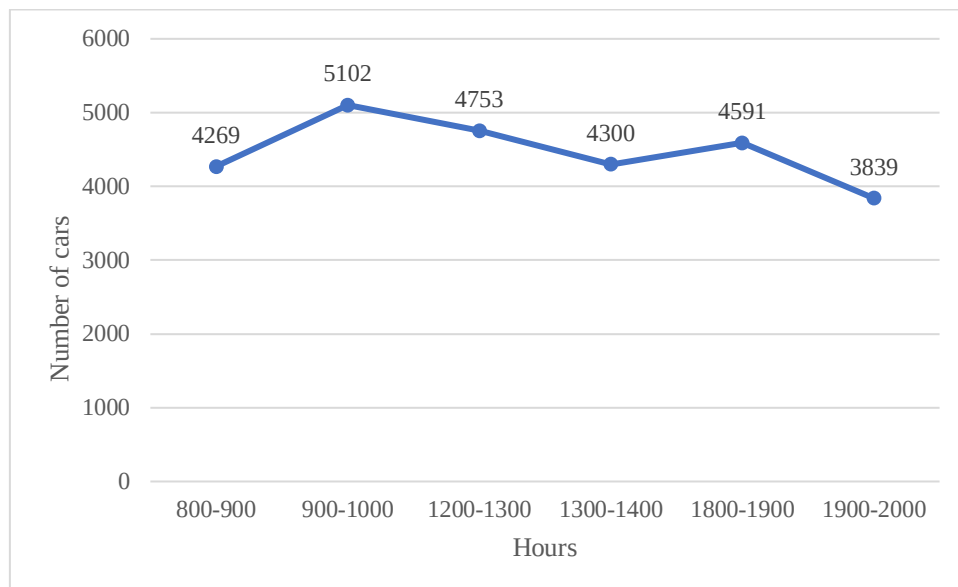


Figure 6. Graph of changes in the hourly segment of traffic flow at the intersection of Karakalpakstan-Guzar street of Uzbekistan

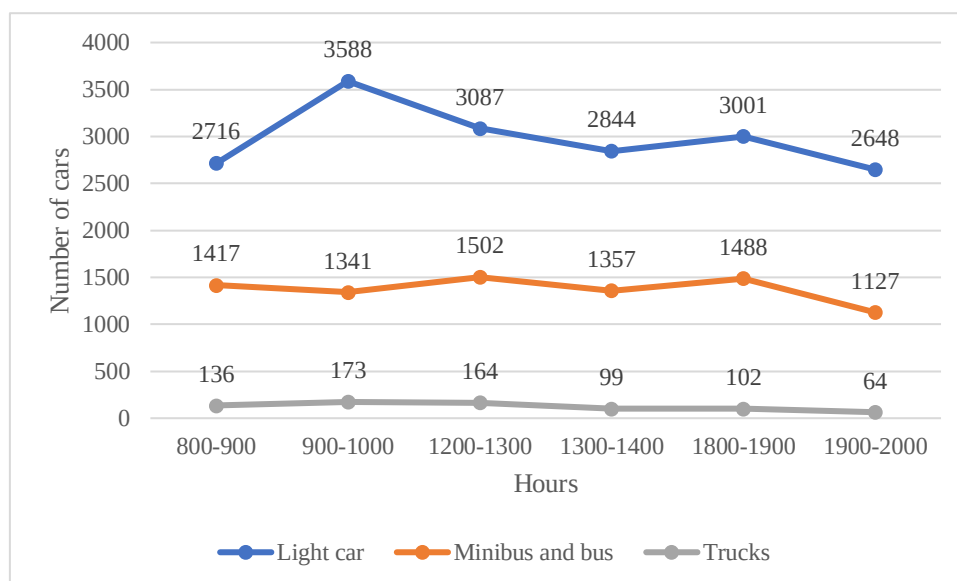


Figure 7. Hourly traffic flow schedule at the intersection of Karakalpakstan Street and Uzbekistan road.

Recommendations. The study of the world experience in solving the above problems, familiarity with comprehensive measures aimed at solving the problems of transport infrastructure of various megacities of the world are important for the development of the industry;

Republican roads passing through the territory of the city of Nukus should be transformed into main streets and in the future, according to the norms and recommendations of the building codes and regulations, use roads of this level in cities, provided that residential buildings should not be closer than 50 m to them;

Further development of the suburban highway network with the reconstruction of their dimensions and carriageway in accordance with the prospective traffic intensity and required technical indicators;

Further increase of transport mobility of rural and urban population in external directions;

The number of passengers transported in suburban and local traffic during the billing period, as well as technical and operational indicators of the suburban area of the city of Nukus with the adjustment of the population of the city and district in accordance with the draft layout;

Development of scientifically based schemes for long-term planning of the street and road network of the city of Nukus, according to which optimal planning of urban passenger transportation, organization of transport hubs based on best practices in improving the city's links with external transit roads, etc.

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Rezyume: Ushbu maqolada chorrahalarida transportning tuzilishi va intensivligi, Nukus shahri transport tizimining yo'lovchi aylanmasi va yuk aylanmasi tahlil qilinadi.

Резюме: В данной статье проанализированы структура и интенсивность движения на перекрестках, пассажирооборота и грузооборот транспортной системы города Нукус.

Kalit soʻzlar: transport vositalari, yoʻlovchi tashish, yoʻlovchi aylanmasi, yuk tashish, yuk aylanmasi, avtomobil transporti koʻrsatkichlari chorrahalar, transport oqimi, kuzatuv, nuqtalarni tahlil qilish, transport tarkibi.

Ключевые слова: Транспортные средства, пассажирских перевозок, пассажирооборота, грузо перевозка, грузооборота, показатели автомобильного транспорта перекресток, поток движения, наблюдение, анализ точек, состав движения.

ANALYSIS OF THE OPTIMAL VALUE OF THE FACTORS AFFECTING GAS ABSORPTION

Boyturayev S.A., Oxundadayev A.K.

Namangan Institute of Engineering - Technological

Summary: *This article employs computational fluid dynamics (CFD) modeling to investigate the behavior of oily smoke gases within air cleaning systems. It integrates detailed simulations of absorption, adsorption, and filtration processes to evaluate the influence of airflow patterns, residence time, and absorbent characteristics on cleaning efficiency. Field evaluations of industrial air cleaning systems provide empirical data on their performance in removing oily smoke gases, highlighting the effectiveness of various technologies. Laboratory experiments assess different absorbent materials, elucidating their efficacy in real-world conditions. The study emphasizes optimizing design parameters and operational strategies for enhanced industrial air pollution control.*

Key words: *Computational Fluid Dynamics (CFD) modeling, air cleaning systems, oily smoke gases, absorption efficiency, adsorption processes, filtration technology, industrial air pollution control, absorbent materials, temperature sensitivity, gas velocity effects.*

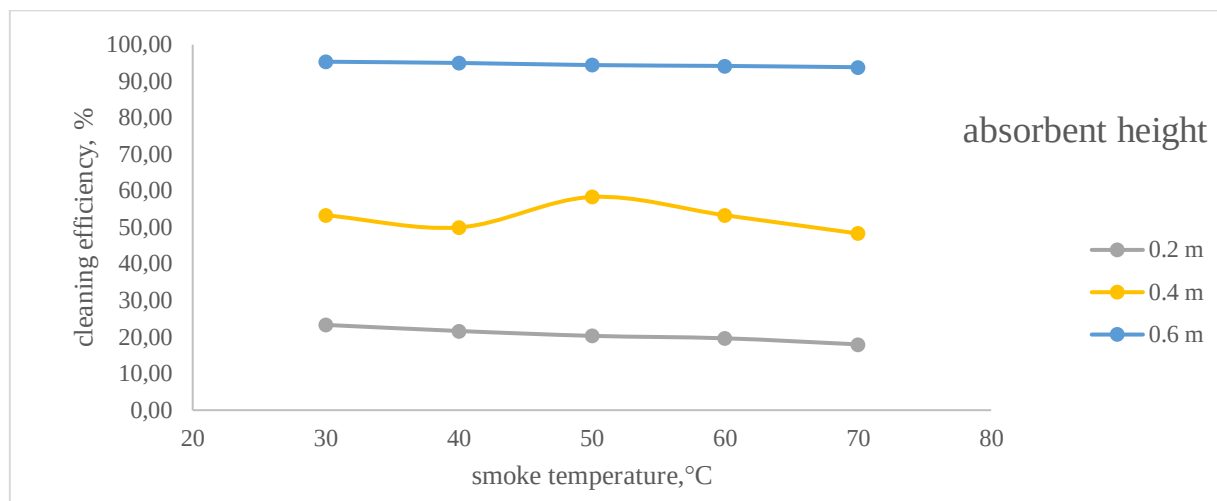
Introduction. This research utilized computational fluid dynamics (CFD) modeling to simulate the behavior of oily smoke gases within air cleaning systems. By incorporating detailed models of gas absorption, adsorption, and filtration processes, the study quantified the impact of various regime-constructive indicators such as airflow patterns, residence time, and absorbent characteristics on cleaning efficiency. Findings offer valuable insights for optimizing the design and operation of air purification systems.[1]. This study conducted field evaluations of air cleaning systems deployed in industrial settings to assess their performance in removing oily smoke gases. Monitoring of air quality parameters before and after the implementation of cleaning regimes provided empirical data on the effectiveness of different technologies. Results contribute to the understanding of real-world challenges and opportunities in air pollution control.[2].

Materials. In a study by Kim, S., Park, D., and Chang, M., various absorbents were tested under laboratory conditions for the effectiveness of absorption cleaning methods to reduce oily vapors from industrial processes and their oily particles and gas capture efficiency were evaluated. The obtained results showed significant changes in absorbance indicators between different absorbent materials. In addition, Computational Modeling has been used to predict the behavior of air cleaning systems and to use mathematical simulations to optimize their design parameters [3,6]. In a study by Smith, J., Johnson, A., and Lee, C., laboratory experiments were conducted to evaluate the effectiveness of absorption techniques in cleaning air contaminated with oily smoke gases. It tested various absorbent materials and evaluated their performance under controlled conditions, providing insight into the mechanisms governing air cleaning performance [4]. Wang, Q., Chen, L., and Liu, H. conducted research in different environmental areas, involving experiments or observations in real environments such as industrial facilities or commercial kitchens to evaluate the performance of air purification systems. [5] This study used computational modeling techniques to simulate the performance of absorption treatment systems for oily flue gases. By analyzing factors such as flow dynamics, mass transfer rates, and absorption properties, the study optimized system design and operating parameters to maximize air cleaning efficiency.

Laboratory Experiments. I-20 oil was used to determine the absorption efficiency. This process was carried out at different temperatures and liquid heights of 0.2 m, 0.4 m, 0.6 m. The effect of the absorption process on efficiency was considered in the given standard parameters. The obtained results are shown in Figure 1.

The absorber oil test was performed at different heights of the liquid level in the absorber. The absorbent test was conducted at a liquid level of 0.2 m. In this case, the absorption process was carried

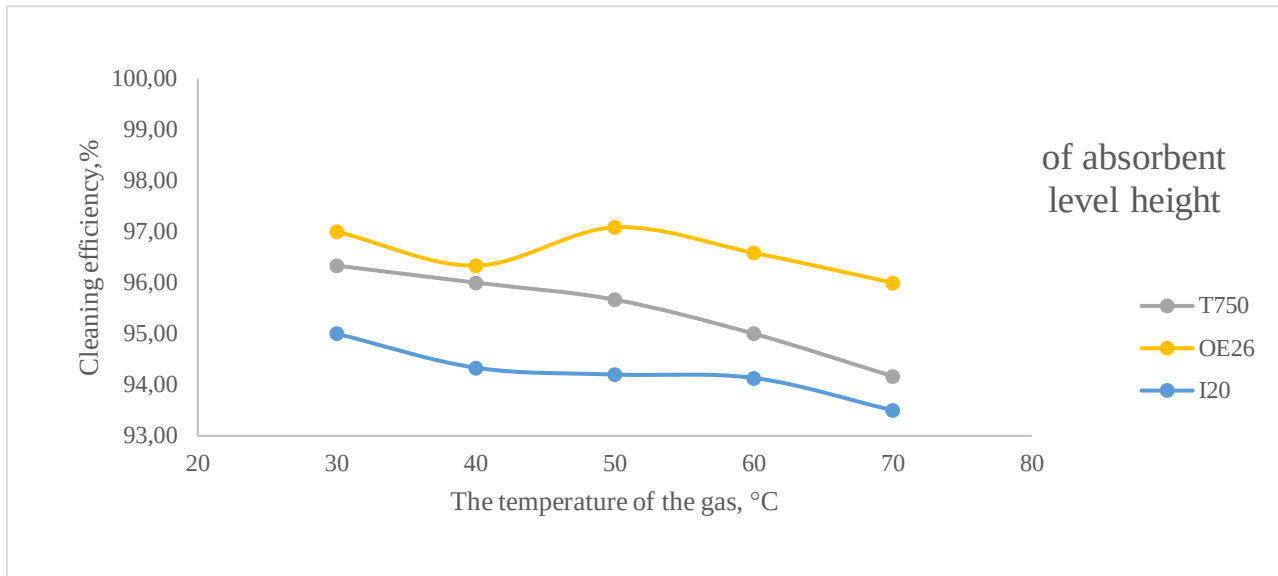
out when the temperature was from 30 °C to 70 °C. At a temperature of 30 °C, the cleaning efficiency was 25.00%. When the temperature is increased to 40 °C, 50 °C, 60 °C, 70 °C, the cleaning efficiency of the absorber decreases by 19.00%, 15.47%, 12.63%, 10.11%, 9.85%, respectively. When the absorber level is 0.4 m, it was found that the cleaning efficiency is somewhat higher. The absorber test was carried out at temperatures of 30÷70 °C. The cleaning efficiency was found to be 47.33 ÷ 45.50%, respectively. It was determined that the highest value of the absorption process corresponds to the liquid level of 0.6 m. In this case, the efficiency of the absorbent will be high. When the height of the absorber was 0.6 m, the temperature was changed to 30 ÷ 70 °C. It was determined that the efficiency is equal to 96.00÷95.83%.



1 - figure. Effect of flue gas temperature change on cleaning efficiency at different values of absorbent height

From the experiments, it can be seen that when the liquid height increases to 0.6 m, the cleaning efficiency for I-20 oil decreases from 96 to 95.83% depending on the temperature change. From Figure 1, it can be seen that the cleaning efficiency decreases with the change in temperature. It was found that the cleaning efficiency is higher at 0.6 m when calculated for 50 °C. It was determined that the cleaning efficiency at the absorbent height of 0.6 m is 34.75% higher than that of 0.4 m, and 73% higher than that of 0.2 m.[9]

The nature of the absorbents used in the cleaning of oily fumes and the effect of temperature changes on the cleaning efficiency were studied. An absorber equipped with a conical nozzle was used for the study. T-750, OE-26 and I-20 oils were used as adsorbents for the experiment. The cleaning efficiency of each oil was determined at a temperature of 30÷70 °C. The obtained results are shown in Figure 2. It can be seen from the picture that the cleaning efficiency decreases with increasing temperature. The analysis obtained for each oil shows that the cleaning efficiency was found to be higher in OE-26 oil for the conical nozzle. We reached the maximum value of this indicator at 50 °C. The cleaning efficiency of OE-26 oil was found to be 97.08% at 50 °C.



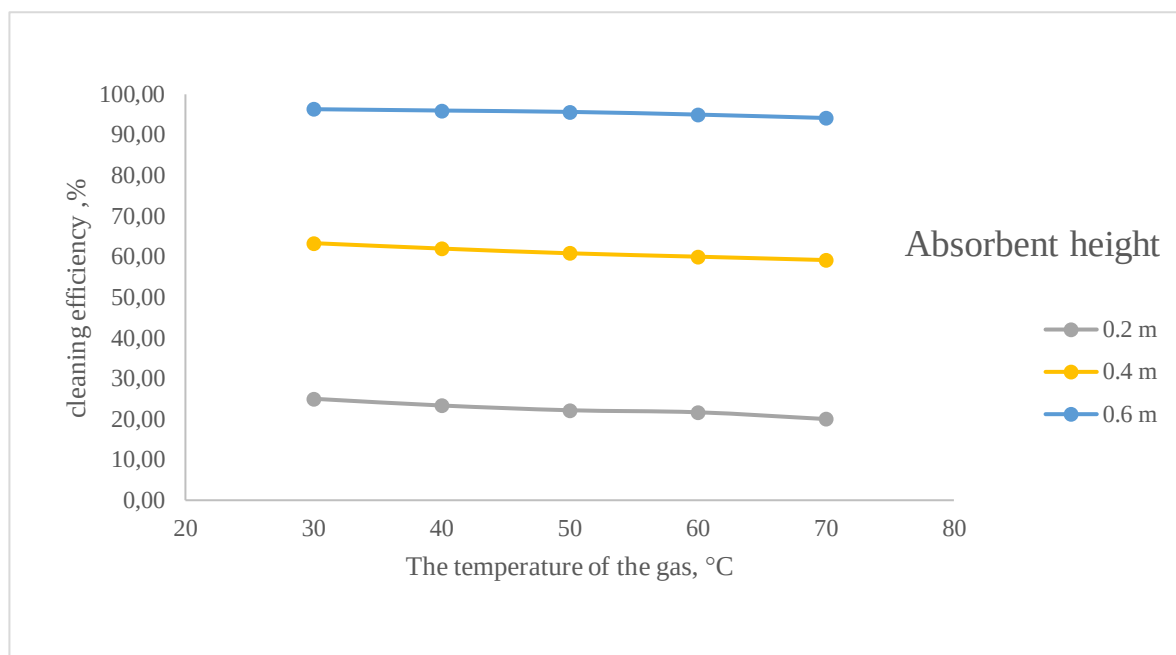
2 - figure. A graphical representation of the efficiency of a conical nozzle

The main reason for this is a change in the mode of movement of gas in the oil. At the raised temperature, the surface of the absorbed gas increases due to the change of the movement mode to the turbulent mode. In T-750 and I-20 oils, the mode of action is equal to the laminar mode. Therefore, it can be seen in the graph that the cleaning efficiency changes periodically with increasing temperature. It has been found that cleaning efficiency increases.[7]

Effect of absorbent level on air cleaning efficiency. The effect of flue gas temperature change on the cleaning efficiency at different values of absorbent level height was studied. T-750 absorbent and a conical nozzle were used. The obtained results are depicted in

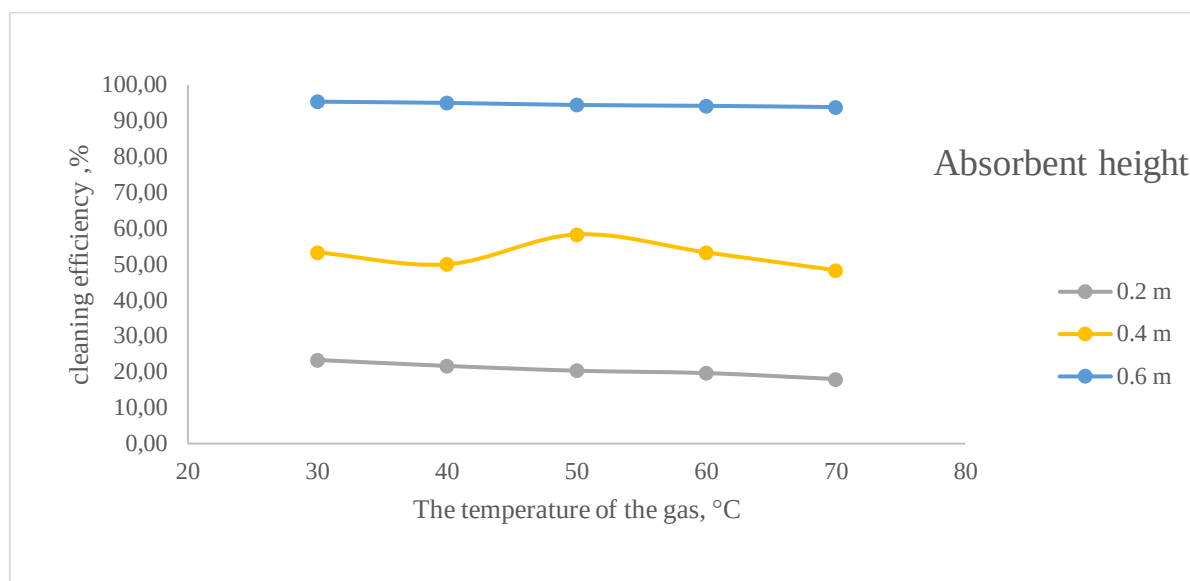
Figure 2.

At different values of the height of the absorbent layer



3 – figure. Change of gas cleaning efficiency depending on smoke temperature (absorbent type T-750, nozzle type - conical).

Figure 3 shows that the cleaning efficiency decreases with increasing temperature. Experimental tests were carried out using T-750 absorbent and pall ring nozzle, and a graph was formed based on the obtained results.

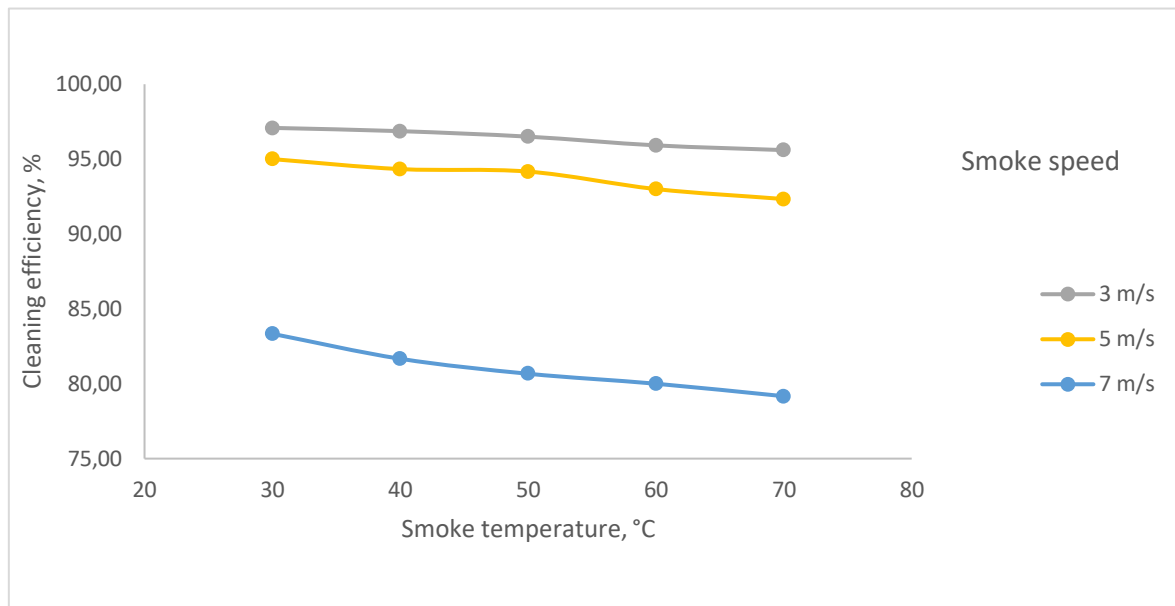


4 - figure. Variation of gas cleaning efficiency depending on smoke temperature at different values of absorbent level height
(absorbent type - T-750, nozzle type - Pall ring)

Research on the effect of T-750, OE-26 and I-20 absorbents on the efficiency of oil smoke gas cleaning

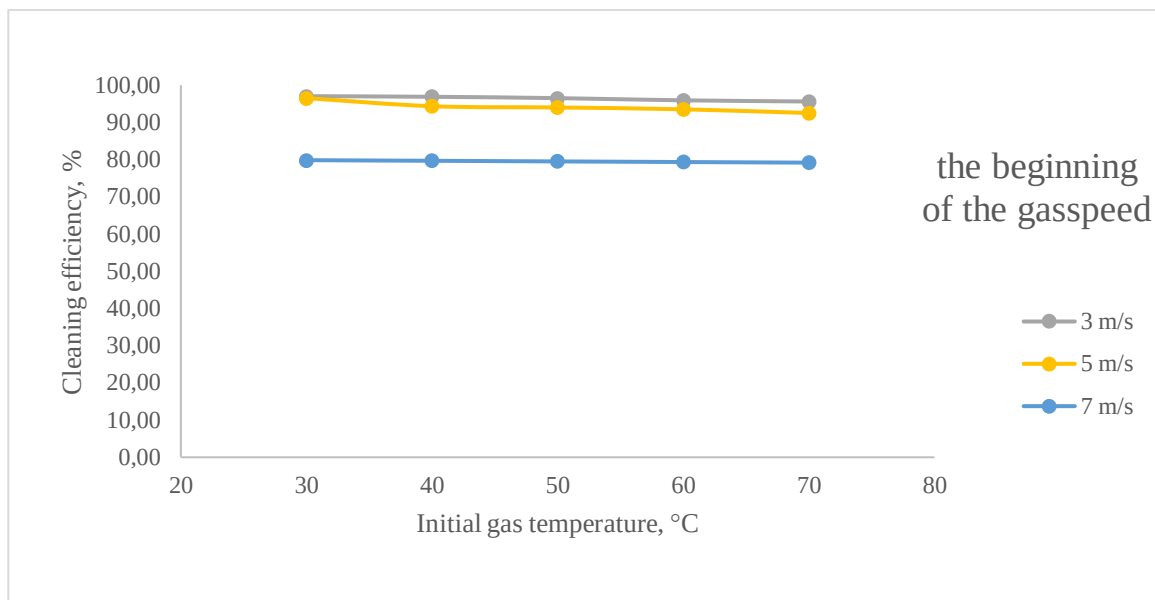
The nature of the absorbents used in the cleaning of oily fumes and the effect of temperature changes on the cleaning efficiency were studied. An absorber equipped with a conical nozzle was used for the study. T-750, OE-26 and I-20 oils were used as adsorbents for the experiment. The cleaning efficiency of each oil was determined at a temperature of 30÷70 °C. The obtained results are shown in Figure 4. It can be seen from the picture that the cleaning efficiency decreases with increasing temperature. The analysis obtained for each oil shows that the cleaning efficiency was found to be higher in OE-26 oil for the conical nozzle. We reached the maximum value of this indicator at 50 °C. The cleaning efficiency of OE-26 oil was found to be 97.08% at 50°C.

The speed of the gas passing through the absorber has a great influence on the efficiency of oil smoke cleaning. Therefore, experiments were conducted taking into account the change in gas velocity and the type of absorber. For the experiment, the efficiency of oil gas cleaning was determined as a result of changing the speed of the gas passing through the conical nozzle, OE-26 oil and the absorber to 3 m/s, 5 m/s, 7 m/s. The obtained results are presented in Figure 3.



5 - figure. Change in absorber cleaning efficiency when the liquid level is 0.6 m

Figure 5 shows the change in the cleaning efficiency of the absorber when the liquid level is 0.6 m. It can be seen that the efficiency decreases with the increase in temperature, and at the same time, the efficiency also decreases sharply with the decrease in the speed of the gas in the absorber [12,13]. The speed of the gas has a great influence on the efficiency of oil smoke cleaning. Therefore, experiments were conducted taking into account the change in gas velocity and the type of absorbent. Pall oil and OE-26 oil (gas velocity 3 m/s, 5 m/s, 7 m/s) were taken for the experiment. The obtained results are presented in Figure 4.[11]



6 - figure. Change in the cleaning efficiency of the absorber with a liquid level of 0.6 m in the Pall ring

Figure 6 shows that the efficiency of gas cleaning decreases with increasing temperature. Nevertheless, it can be seen that the efficiency of cleaning has decreased sharply with the reduction of the speed of the gas in the absorber.

During the experiments, OE-26 oil and the speed of the gas passing through the absorber were changed in the range of 3 m/s, 5 m/s, 7 m/s, resulting in efficiency of 97.08%, 95.00%, 83.33%. was found to be equal to It can be seen that the smaller the gas velocity, the higher the cleaning efficiency.

Expanded Conclusion. The research conducted provides an in-depth analysis of various factors influencing the efficiency of air cleaning systems for oily smoke gases. By integrating Computational Fluid Dynamics (CFD) modeling, laboratory experiments, and field evaluations, the study offers a comprehensive perspective on optimizing air purification technologies. The findings not only validate the effectiveness of different absorbent materials but also highlight the intricate interplay between various operational parameters and system performance.

Absorbent Materials: A Deeper Dive The selection of absorbent materials plays a pivotal role in the effectiveness of air cleaning systems. The study's results show that OE-26 oil emerged as the most effective absorbent, achieving a maximum cleaning efficiency of 97.08% at 50°C. This superior performance can be attributed to the specific chemical and physical properties of OE-26, which allow for enhanced interaction with oily smoke gases. The study also observed significant variations in efficiency among different absorbents, such as T-750 and I-20, which underscores the importance of tailored selection based on the specific characteristics of the pollutants and operational conditions. The variations in performance among absorbents can be explained by differences in their adsorption capacities, surface areas, and chemical reactivity. For instance, absorbents with higher surface areas and better chemical affinity for oily compounds are likely to perform better. The results suggest that future research should focus on developing and testing novel absorbent materials with optimized properties for enhanced gas cleaning efficiency. [8,9].

Temperature Sensitivity: Implications and Strategies. Temperature is a critical factor influencing the absorption process. The study's finding that cleaning efficiency decreases with increasing temperature can be attributed to several mechanisms. Higher temperatures generally lead to reduced gas solubility and increased kinetic energy, which can disrupt the interaction between the gas and absorbent. Additionally, elevated temperatures can lead to increased vaporization rates and reduced viscosity of the absorbent, further impacting efficiency. To mitigate these effects, operational strategies should include temperature control mechanisms to maintain optimal conditions. For instance, incorporating cooling systems or temperature-regulated reactors can help stabilize the temperature within the optimal range. Furthermore, understanding the temperature-dependent behavior of different absorbents can guide the selection of materials with better thermal stability and performance under varying conditions.

Impact of Absorbent Height and Gas Velocity. The study's findings on absorbent height and gas velocity provide valuable insights into the design and operation of air cleaning systems. Higher absorbent levels were shown to improve cleaning efficiency, likely due to increased contact time and interaction between the gas and absorbent. This highlights the importance of designing absorbent beds with sufficient height to maximize contact and improve overall performance. Gas velocity also plays a crucial role in cleaning efficiency. The study observed that lower gas velocities resulted in higher efficiency, which can be explained by increased residence time and reduced turbulence. However, operational constraints such as space limitations and airflow requirements may necessitate a balance between gas velocity and system performance. Advanced designs such as multi-stage absorbers or variable-speed fans could offer solutions to optimize gas flow and enhance cleaning efficiency. [10]

Field Evaluations and Real-World Application. Field evaluations conducted as part of the study provided empirical data on the performance of air cleaning systems in industrial settings. These evaluations are crucial for validating laboratory findings and understanding the real-world challenges of implementing air purification technologies. Factors such as pollutant concentration, flow patterns, and operational variations can significantly impact system performance and should be considered in the design and optimization processes.

The study's field data also highlight the effectiveness of different technologies in diverse industrial environments. By comparing the performance of various absorbent materials and system

configurations, the research offers practical guidance for selecting and deploying air cleaning solutions tailored to specific industrial needs.

Future Research Directions The insights gained from this study pave the way for further research in air pollution control. Future studies could focus on several areas, including:

1. **Development of Advanced Absorbents:** Investigating new materials with enhanced absorption properties and stability under varying conditions.
2. **Optimization of System Design:** Exploring innovative designs and configurations for absorbers, including multi-stage and hybrid systems, to improve efficiency and adaptability.
3. **Long-Term Performance Evaluation:** Conducting longitudinal studies to assess the durability and maintenance needs of different absorbent materials and system components.
4. **Environmental and Economic Considerations:** Evaluating the environmental impact and cost-effectiveness of various air cleaning technologies to support sustainable and economically viable solutions.[11].

In summary, the study provides a thorough analysis of the factors affecting gas absorption efficiency in air cleaning systems. By integrating CFD modeling, laboratory experiments, and field evaluations, it offers a robust framework for optimizing air purification technologies and addressing the challenges of industrial air pollution control.

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Rezyume: Ushbu maqola havoni tozalash tizimlarida yog'li tutun gazlarining harakatini o'rganish uchun hisoblash suyuqlik dinamikasi modellashdan foydalanadi. U havo oqimi, yutilish vaqti va changni yutish xususiyatlarining tozalash samaradorligiga ta'sirini baholash uchun absorbsiya, adsorbsiya va filtrlash jarayonlarining tadqiq etadi. Sanoatda chiqadigan chiqindi

gazlarni tozalash tizimlarini turli texnologiyalarning samaradorligini o'rganib, yog'li tutun gazlarini tozalashda absorbsiya jarayonining ahamiyati haqida empirik ma'lumotlarni taqdim etadi. Laboratoriya tajribalari turli changni yutish materiallarini baholaydi, ularning real sharoitlarda samaradorligini aniqlaydi. Tadqiqotda sanoat havosining ifloslanishini nazorat qilishni yaxshilash uchun parametrlarni optimallashtirilgan.

Резюме: В этой статье используется моделирование вычислительной гидродинамики (CFD) для исследования поведения маслянистых дымовых газов в системах очистки воздуха. Оно объединяет детальное моделирование процессов абсорбции, адсорбции и фильтрации для оценки влияния схем воздушного потока, времени пребывания и характеристик абсорбента на эффективность очистки. Полевые оценки промышленных систем очистки воздуха предоставляют эмпирические данные об их эффективности при удалении маслянистых дымовых газов, подчеркивая эффективность различных технологий. Лабораторные эксперименты оценивают различные абсорбирующие материалы, выявляя их эффективность в реальных условиях. В исследовании особое внимание уделяется оптимизации параметров конструкции и эксплуатационных стратегий для улучшения контроля загрязнения промышленного воздуха.

Kalit so'zlar. Hisoblash suyuqliklari dinamikasi (CFD) modellashtirish, havoni tozalash tizimlari, yog'li tutun gazlari, yutilish samaradorligi, adsorbsiya jarayonlari, filtrlash texnologiyasi, sanoat havosining ifloslanishini nazorat qilish, changni yutish materiallari, harorat sezgirligi, gaz tezligi ta'siri.

Ключевые слова: Моделирование вычислительной гидродинамики (CFD), системы очистки воздуха, маслянистые дымовые газы, эффективность абсорбции, процессы адсорбции, технология фильтрации, контроль загрязнения воздуха в промышленности, абсорбирующие материалы, температурная чувствительность и влияние скорости газа.

ENERGY OF HEAT EXCHANGER DEVICES INCREASE EFFICIENCY

Ganijonov D.I.², Ismailov O.Y.¹, Karomova F.I.¹, Pirimov T.J.², Nurmukhamedov A.A.².

¹*Institute of General and Inorganic Chemistry of the Academy of Sciences of Uzbekistan,*

²*Gulistan State University*

Summary: Ensuring the efficiency and economy of heat exchange devices in food production enterprises is one of the important tasks. The purpose of heat exchange devices is to increase the thermal efficiency of the device by optimizing the hydrodynamic regimes of the technological flows in the pipes. By increasing the efficiency of heat exchange devices operating in food industry enterprises, while maintaining product quality, without harming the environment, production of quality products using energy-saving technological processes is one of the main tasks.

Key words: Heat exchange, convective, flow core (core), electric motor, heat conductor, pipes, optimization

Introduction. In order to deeply study the hydrodynamics of technological flows in the pipelines currently used in the food industry and to reduce energy consumption, the development of scientific and practical bases of the hydrodynamics of technological flows is an urgent scientific and technical issue.

Of the President of the Republic of Uzbekistan "intended for the years 2022-2026 Development strategy of the new Uzbekistan" Republic of Uzbekistan Implementation of tasks specified in the President's Resolution No. PQ-3682 of April 27, 2018 "On measures to further improve the system of practical implementation of innovative ideas, technologies and projects" and other regulatory and legal documents related to this activity this dissertation research serves to a certain extent.

Uzbekistan is a leading country in the production of fruits and vegetables, and in recent years, the production of canned products through their processing has been developing on a large scale. In 2022, Uzbekistan plans to allocate 400 million dollars to support the fruit and vegetable industry. In recent years, the work of enriching the technological equipment of the food industry with modern new technologies and providing it with energy-saving and safe technologies has been intensively carried out in our republic.

One of the main tasks is to produce high-quality products without harming the environment and using energy-efficient technological processes while maintaining product quality by increasing the efficiency of heat exchange devices used in food industry enterprises.

From the analysis of the literature, it became clear that the development of scientific and practical bases of the hydrodynamics of technological flows in order to deeply study the hydrodynamics of technological flows in the pipelines used in the food industry and reduce energy consumption is an urgent scientific and technical issue. By optimizing the hydrodynamic regimes of heat exchange devices in pipes and pipeline equipment, it becomes possible to reduce the power of the electric motor used for the transfer of raw materials with the help of pumps.

It is known that at least 2 environments with different temperatures are involved in heat exchange processes. A high-temperature medium that transmits its heat energy is called a heat conductor, and a low-temperature medium that receives heat energy is called a cold conductor.

Conductors should be chemically resistant to heat and cold, should not corrode their devices and should not form hard, porous, thick walls.

Therefore, when choosing heat or cold conductors, it is necessary to pay great attention to indicators such as process temperature, price, and areas of their application.

The higher the turbulence of the liquid mass and the faster its particles are mixed, the more intense the heat exchange by convection.

Thus, convective heat exchange, mechanical transfer of heat and fluid movement are strongly dependent on hydrodynamics.

The fluid participating in the heat exchange process consists of two layers, that is, the boundary layer and the core of the flow.

The core of the flow takes place during the time of heat transfer in both convection and heat conduction methods. Such heat exchange is convective heat exchange is called.

The transfer of heat from the surface of a solid to a liquid (or gas) or from a liquid (or gas) to the surface of a solid is called heat transfer.

Energy passes from the surface of the wall through the boundary layer by the method of heat conduction.

From the boundary layer, energy is transferred to the liquid core mainly by convection. The process of heat energy transfer from the wall surface to the liquid is greatly influenced by the flow mode. Heat exchange is more intensive in the turbulent flow of the liquid than in the laminar one.

Shell-and-tube heat exchangers are the most common and widely used type in various sectors of the economy. This device consists of a cylindrical shell and perforated grids with heating pipes attached to its two ends. The pipe wrap divides the entire volume of the heat exchanger into two parts: 1) pipe space; 2) space between pipes. Perforated bars are fixed to the cylindrical shell by welding. The cover is fixed to the device shell using a bolted joint. Pipes are installed in the cylindrical shell and caps for the entrance and exit of heat conductors. When heat is directed by one of the conductors, such as a liquid, into the tube cavity, it passes through the tubes and exits the cap outlet. Another heat transfer flow, for example, steam, is directed to the space between the tubes, the heating tubes give their heat to the outer surface, and turn into a liquid state (condensate) and are discharged from the lower tube of the shell. The process of heat exchange between environments is carried out through the walls of pipes.

The main goal of the work is to determine the pressure difference in the process of transferring a given liquid through a pipe with the help of a pump or to calculate the consumption and speed of the liquid in the conditions where the pressure difference is known. Fluid movement occurs through channels, pipes and technological equipment of different profiles. The movement of real liquids in horizontal pipes is expressed by various variables. Optimization of this process leads to great economic efficiency.

Heat (amount of heat) is an energetic characteristic of the heat exchange process, which is determined by the amount of energy transferred or received during the process. Bodies participating in the process of heat exchange are called heat carriers or heat conductors.

Heat transfer is the science of heat energy propagation processes.

Heat exchange processes include heating, cooling, condensation, evaporation, and evaporation. Devices designed to carry out these processes are called heat exchangers.

It is known that at least 2 environments with different temperatures are involved in heat exchange processes. A high-temperature medium that transmits its heat energy is called a heat conductor, and a low-temperature medium that receives heat energy is called a cold conductor.

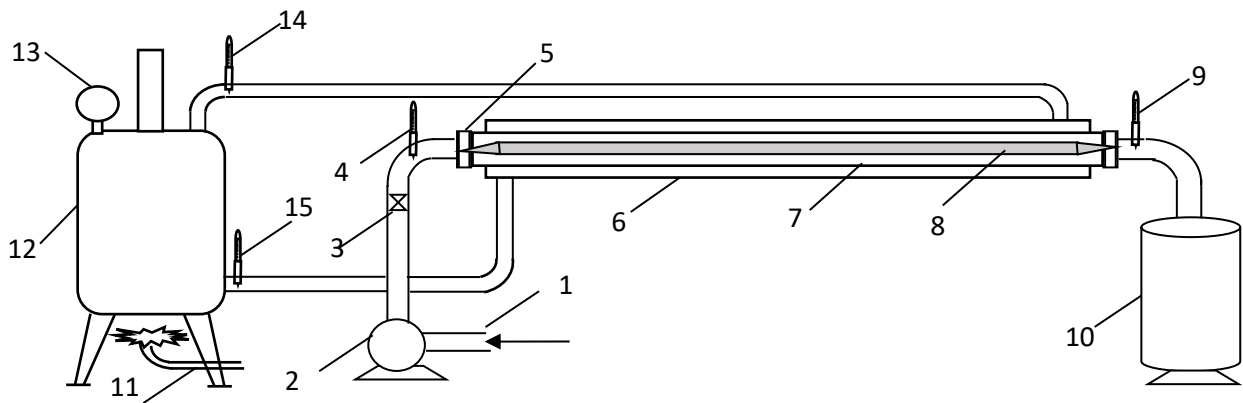
Heat and cold conductors should be chemically resistant, should not corrode their devices and should not form a hard, porous, thick layer on its walls. Therefore, when choosing heat or cold conductors, it is necessary to pay great attention to indicators such as process temperature, cost and their areas of application.

In steady processes, the temperature field of the device does not change over time. In unstable processes, the temperature changes over time. In continuously operating devices, processes are stable, and in intermittent (periodic) operating devices, processes are unstable. In addition, unstable processes occur when periodically operating devices are started and stopped, as well as when operating modes are changed. The main kinetic characteristics of the heat transfer process are the average temperature difference, the heat transfer coefficient and the amount of heat transferred.

Acceleration of heat processes leads to an increase in the productivity of equipment, an increase in their size, and a reduction in the cost of production enterprises. This, in turn, reduces the costs of operating and repairing heating equipment, increases the amount of products per worker, etc.

When heating processes are accelerated, the time required to heat the material decreases, but this should not lead to a decrease in the quality of the product.

Based on the above information, experimental work was carried out in the double-pipe heat exchanger "pasteurizer" in order to study the possibilities of increasing the temperature of the raw materials coming out of the "pipe-in-pipe" heat exchanger using special stirrups instead of turbulizers. The principle scheme of the device is presented in Fig. 1.



1 – pipe for raw materials; 2 – centrifugal pump; 3 – tap for adjustment of consumption of raw materials; 4 – thermometer for measuring the initial temperature of raw materials; 5 – nut for installing the turbulizer; 6 – external pipe of the heat exchanger; 7 – internal pipe of the heat exchanger; 8 – stirrup (turbulizer); 9 – thermometer for measuring the final temperature of raw materials; 4 – container for raw materials; 11 – gas burner; 12 – steam boiler; 13 – monometer for measuring vapor pressure; 14 and 15 – thermometers for measuring steam temperature.

Figure 1. Schematic diagram of the "pipe-in-pipe" heat exchange experimental device.

The experimental device is completely made of stainless steel, the inner diameter of the steam moving pipes is $d_{ich} = 12$ mm, the outer pipe diameter of the double-pipe heat exchanger is $D = 50$ mm, the inner pipe diameter is $d = 20$ mm, the length is $L = 1000$ mm, and the following series works continuously. The required amount of water (10 liters) is poured into the steam boiler 12 and the gas is ignited from the burner 11 and the water is heated. Its pressure is measured by 13 manometers, and its temperature by 14 and 15 thermometers. When the temperature rises to $120\text{ }^{\circ}\text{C}$, 2 pumps are activated and raw material movement is ensured through 1 pipe. The consumption of raw materials in the internal pipeline of the device is controlled by 3 taps in order to create different hydrodynamic regimes. The temperature at the entrance to the device is measured using 4 thermometers, and the exit temperature is measured using 9 thermometers. Heat-treated raw materials are collected in 10 containers.

The results obtained in the process of heating water with hot water steam in the "pipe-in-pipe" experimental heat exchanger are presented in Fig. 2.

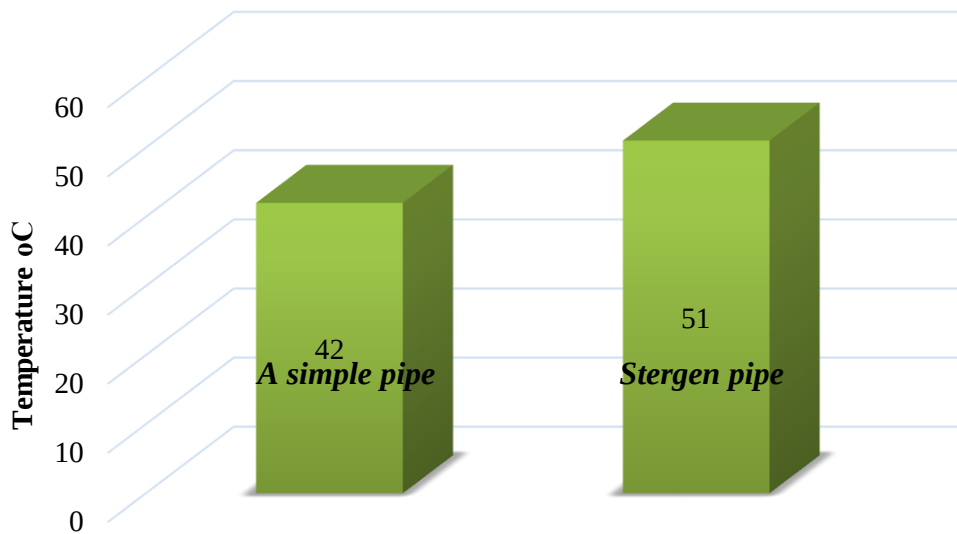


Figure 2. Temperature change of the stream leaving the double-pipe heat exchanger.

From the diagram in Fig. 1, it was found that water with an initial temperature of $t_{1q} 20\text{ }^{\circ}\text{C}$ moving in the inner pipe of the double-pipe heat exchanger, its temperature at the outlet of the pipe increases to $t_{2q} 42\text{ }^{\circ}\text{C}$ during normal movement. By installing a stern on the inside of the pipe, the movement of the moving water flow is accelerated, the pipe covers the heat surface due to the increase in the wetted perimeter, and the temperature of the flow with an initial temperature of $t_{1q} 20\text{ }^{\circ}\text{C}$ at the exit from the device increases to $t_{2q} 51\text{ }^{\circ}\text{C}$. This heat exchanger makes full use of the heat of water vapor with a temperature of $t_{q1} 20\text{ }^{\circ}\text{C}$ moving in the outer pipe, and a temperature rise of $9\text{ }^{\circ}\text{C}$ is provided compared to the conventional method.

During the experiments, the effect of heating current consumption (G , l/min) on the temperature at the outlet of the pipe was also studied in a normal pipe (without a boom) and in a pipe with a boom. The results of the experiment are presented in Figures 3 and 4.

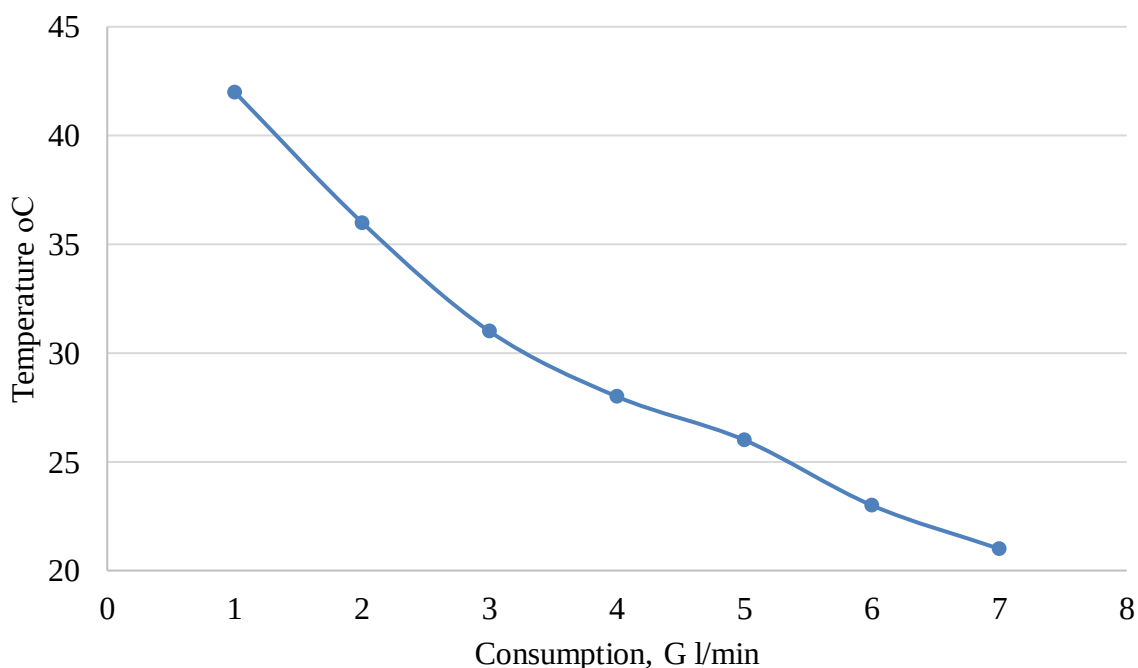


Figure 3. Dependence of the temperature change in a normal pipe on consumption.

The data of the diagram in Fig. 3 shows that the mass consumption of the heated flow in the inner tube is G , l/min. when the temperature was 42°C , the flow rate was G , 7 l/min. It was found that its temperature decreases to 21°C as it increases to.

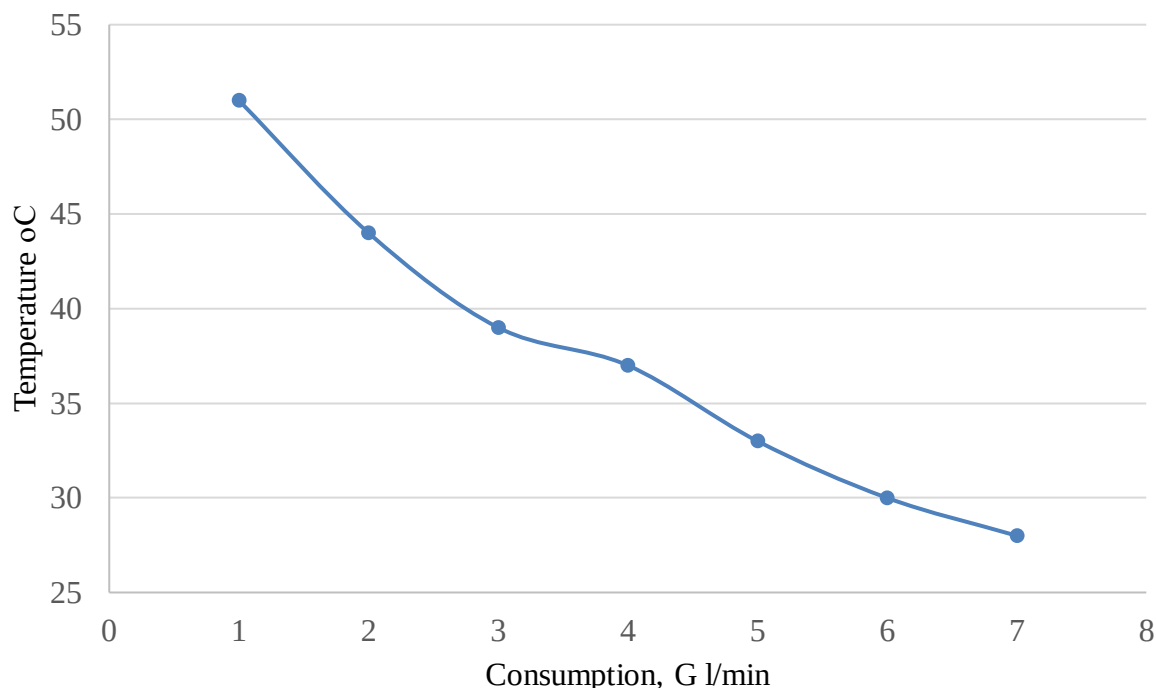


Figure 4. Dependence of the temperature change in the pipeline where the stern is installed.

From the data presented in Figure 4, it was observed that when the flow rate in the heated pipe is G_{q1} l/min, its temperature increases from 20°C to 51°C . However, with increasing consumption, it was found that the temperature of the heated flow at the outlet of the pipe decreases to 28°C .

From the data in Figures 2 and 3, it can be seen that at a constant heat capacity (tq 120°C) in the external pipe, the temperature of the flow exiting the pipe in the pipe with a stirrer is 9°C higher at a consumption of G_{q1} l/min, consumption G_{q7} When it reaches l/min, it increases to 7°C .

Conclusion: The results of the experiments carried out in the "pipe-in-pipe" heat exchange device show that during the heat treatment of food products in tubular devices, the possibility of ensuring full contact of the flow with the heated surface of the pipe by installing a stirrer inside the pipe in which the heated raw materials are moving is created, the heat exchange process of the device accelerates. Due to the increase in the speed of the flow, the accumulation of the soot mass, which is formed from organic compounds and affects the thermal efficiency of the device due to its low thermal conductivity, is prevented.

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Rezyume: Oziq-ovqat mahsulotlarini ishlab chiqarish korxonalarida issiqlik almashinish qurilmalarining samaradorligi va tejamkorligini ta'minlash muhim vazifalardan biri hisoblanadi. Issiqlik almashinish qurilmalari quvurlardagi texnologik oqimlarni gidrodinamik rejimlarini optimallashtirish orqali qurilma issiqlik samaradorligini oshirishdan iborat. Oziq-ovqat sanoati korxonalarida ishlayotgan issiqlik almashinish qurilmalarini samaradorligini oshirish orqali mahsulot sifatini saqlagan holda atrof muhitga zarar yetkazmay, energiya tejamkor texnologik jarayonlarni qo'llagan holda sifatli mahsulot ishlab chiqarish asosiy vazifalardan biri hisoblanadi.

Резюме: Обеспечение эффективности и экономичности теплообменных устройств на предприятиях пищевой промышленности является одной из важных задач. Назначением теплообменных устройств является повышение термического КПД устройства за счет оптимизации гидродинамических режимов технологических потоков в трубах. Одной из основных задач является производство высококачественной продукции с использованием энергоэффективных технологических процессов без вреда для окружающей среды при сохранении качества продукции за счет повышения эффективности теплообменных устройств, работающих на предприятиях пищевой промышленности.

Kalit so'zlar: Issiqlik almashinish, konvektiv, oqim o'zagi (yadrosi), elektrodvigatel, issiqlik eltkich, quvurlar, optimallashtirish.

Ключевые слова: Теплообмен, конвективный, проточное ядро (ядро), электродвигатель, теплопроводник, трубы, оптимизация.

**CLEANING NITROGEN OXIDES FROM NITROUS EXHAUST GASES USING
TRIBUTYL PHOSPHATE SOLUTION**

**Umarov Kh.Sh¹., Namazov Sh.S¹., Usanbayev N.Kh¹., Temirov U.Sh²., Saydullayev A.A³.,
Ganiyev P. Kh⁴.,**

¹*Institute of General and Inorganic Chemistry of the Academy of Sciences of the Republic of
Uzbekistan*

²*Navoi State Mining and Technological University*

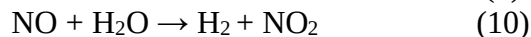
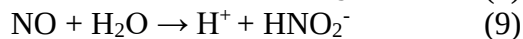
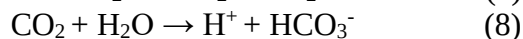
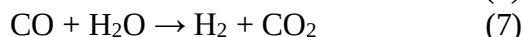
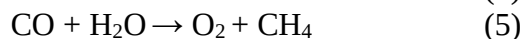
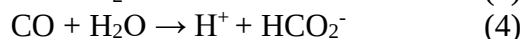
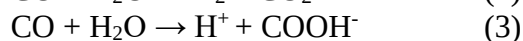
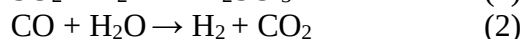
³*Tashkent Institute of Irrigation and Agricultural Mechanization Engineers*

⁴*Chirchik State Pedagogical University.*

Summary: *This paper presents the results of absorption of residual nitrous gases using a mixture of water and tributyl phosphate in step absorbers for its subsequent regeneration and production of nitric acid on its basis. The results of the study can find particularly wide application in industries characterized by non-constant emission of nitrogen oxides with a wide range of nitrogen oxide content. The dependence of the degree of absorption and regeneration on the temperature and ratio of the mixture of water and tributyl phosphate is determined.*

Key words: *absorber, nitrous gases, tributyl phosphate, nitrogen oxides, nitric acid, ecology, purification of nitrous gases.*

The paper [1] presents the results of studies of the levels of environmental and public health risks from exposure to various pollutants, such as suspended solids, sulfur dioxide, nitrogen dioxide and oxide, carbon monoxide, and copper. It is shown that all registered pollutants are harmful to the human body, causing damage to the respiratory system, skin, nervous system, eyes, and metabolic disorders. Thus, suspended solids, nitrogen dioxide, and benzopyrene have the greatest impact on endocrine system diseases, eating disorders, and metabolic disorders. Respiratory diseases are affected by sulfur dioxide and nitrogen dioxide, carbon monoxide and nitrogen, and benzopyrene. Diseases of the eye and its adnexa are affected by sulfur dioxide, carbon monoxide, and phenol. Diseases of the nervous system, skin, and subcutaneous tissue diseases are affected by carbon monoxide, nitrogen oxide and dioxide, formaldehyde, and benzopyrene. Recent literature data indicate that the amount of sulfur dioxide, nitrogen dioxide and oxide, carbon monoxide, suspended solids, and copper is increasing. This will lead to adverse effects on both the soil and the human body. The effect of these substances also leads to a change in the pH of atmospheric precipitation (3-15) and, as a result, can affect both the soil and the human body.



In the work [2] in order to determine the optimal conditions for the effective absorption of nitrogen and sulfur oxides, the characteristics of ferromanganese nodules, in which the active component is manganese (IV) oxide MnO_2 , are considered. This method includes reactions of

absorption of nitrogen (II) oxide by manganese (IV) oxide MnO_2 in the presence of nitric acid HNO_3 with the formation of manganese nitrate $\text{Mn}(\text{NO}_3)_2$; also reactions of absorption of sulfur (IV) oxide SO_2 by manganese (IV) oxide MnO_2 with the formation of manganese sulfate MnSO_4 . Special installations for the study and development of the sorption process have been developed. The results of experimental studies of the sorption process of nitrogen (II) oxide NO and sulfur (IV) oxide SO_2 by a suspension based on ferromanganese nodules are presented. The possibility of absorption of nitrogen oxide (II) NO from a gas mixture with the degree of extraction up to 85%, sulfur oxide (IV) SO_2 from the corresponding gas mixture up to 99% has been established. The main parameters of influence on the system operation process are specified: time of reaching a constant mode, temperature of the working suspension, mixing method. The most optimal conditions for the most efficient implementation of the process of absorption of nitrogen oxide NO and sulfur oxide SO_2 up to 85% and 99%, respectively, from model mixtures corresponding to exhaust gases are given.

In the work [3] the possibilities of the technology of non-catalytic reduction of nitrogen oxides to reduce the formation of secondary pollutants: ammonia, carbon monoxide and nitrogen oxide (I) are considered. The conditions for the process of nitrogen oxide reduction by products of thermal decomposition of urea with minimal formation of the above pollutants are determined.

The possibility of reducing the release of nitrogen oxides into the gas phase during coal oxidation with nitric acid by introducing urea into the process has been studied. A thermodynamic analysis of the reactions occurring during coal oxidation with nitric acid and in the presence of urea has been performed. It has been shown that when 0.2 parts by weight of urea are added to one part by weight of coal, the content of nitrogen oxides in the gas phase decreases by 95.54%. The possibility of capturing nitrogen oxides with aqueous solutions of nitric acid has been tested. It has been shown that the lower the concentration of nitric acid and the lower its temperature, the more completely nitrogen oxides are captured from the gas phase [4-6].

It should be noted that the chemical industry makes a significant contribution to the development progress of many countries in the world. One of the serious problems of the industry is nitrogen oxide emissions. The maximum permissible average daily content of nitrogen oxides calculated as N_2O_5 in the atmospheric air of populated areas should not exceed 0.1 mg/m^3 while simultaneously complying with the requirement for a one-time maximum content of nitrogen oxides of no more than 0.3 mg/m^3 . In the production of nitric acid, the main problem is emissions of nitrous gases. There are various methods for neutralizing nitrous gases: purification of gases from nitrogen oxides in an equal-flow hollow tower; purification of gases from nitrogen oxides in combined-type devices; purification of gases from weakly oxidized nitrogen oxides, absorption of nitrogen oxide with ammonium sulfite solutions; oxidation and absorption of nitrogen oxides with aqueous solutions of oxidizers; purification of gases from nitrogen oxides with aqueous solutions of hydrogen peroxide; absorption of weakly oxidized nitrogen oxides with aqueous solutions of potassium permanganate; absorption of highly oxidized nitrogen oxides; absorption of nitrogen oxides with organic sorbents; adsorption of nitrogen oxides with solid sorbents; purification of gases from nitrogen oxides and other impurities with peat-alkaline sorbents with the production of peat-nitrogen fertilizers; absorption of nitrogen oxide with solutions of ferrous sulfate of tributyl phosphate (TBP) used as an absorber. The application of TBP for the purification of nitrogen oxides is its high absorption capacity and absorption rate, desorption occurs quite easily when the pressure is reduced or heated to 369-378 K. With repeated use of TBP, the absorption rate does not decrease. It has been established that the absorption of nitrogen oxides by TBP is accompanied by the formation of solvates $\text{TBP} \cdot \text{NO}_2$ or $2(\text{TBP}) \cdot \text{N}_2\text{O}_4$ and the physical dissolution of NO_2 when dissolved above stoichiometric. With a decrease in gas oxidation, the overall solubility of nitrogen oxides increases due to the absorption of N_2O_3 .

The effect of pressure on the absorption process was studied with the following change in physicochemical and hydrodynamic parameters: pressure - 0.35-1.0 MPa, nitrogen oxide concentration - 0.04 - 5.8 vol.%, oxidation degree - 30-95%, acidity - up to 15 wt. %, liquid overflow height on the tray - 0.035-0.1 m, real linear gas velocity (W) in the absorber - 0.25-0.6 m/s, irrigation

density - $0.85\text{--}5.1\text{ m}^3/\text{m}^2\text{h}$, temperature - $293\text{--}319\text{ K}$. It is shown that the absorption rate increases linearly with increasing concentration and oxidation of nitrogen oxides at all studied pressures due to an increase in the driving force of the process with a change in the concentration of nitrogen oxides from 0.2 to 5.8% [7-15].

There is a method for absorbing nitrous gases with nitric acid condensate fed from a refrigerator to the middle part of an absorption column. The absorption is carried out with an additional supply of nitric acid taken from the column baffle plate, regenerated from unreacted nitrogen oxides and diluted to a concentration of 5-10%, in two streams, one of which is directed to the first plate from above in an amount of 1.0-2.0 kg of liquid/kg of gas, and on the other side in an amount of 0.09-0.12 kg of liquid/kg of gas under the baffle plate, and regeneration is carried out by feeding air into the regenerator in an amount of 0.04-0.1 kg of gas/kg of liquid [16].

There is a method for the complete capture of nitrogen oxides from the tail nitrous gases of nitric acid plants. The method consists of absorbing nitrous gases with lead hydroxide and then regenerating it according to the following scheme: Nitrogen oxides are passed through a scrubber irrigated with a suspension of lead hydroxide in a saturated solution of nitrite and sodium nitrite; the resulting basic nitrite and lead nitrate are separated from the mother liquor and treated with nitric acid to convert nitrite into nitrate. The nitrogen oxides released in this process are used to saturate the product nitric acid. After separating the crystals, the mother liquor is mixed with lead hydroxide and fed back into the process; The resulting lead nitrate solution, containing some of the nitrate in the form of crystals, is treated with ammonium nitrate solution to dissolve the crystals and then with ammonia to convert the lead nitrate to ammonium nitrate. The released lead hydroxide is separated from the liquid and, after washing with water, returned to the process. The remaining liquid is a saturated solution of ammonium nitrate and is sent for evaporation [17].

There is a method [18] according to which the obtained solutions of nitrates and nitrites formed after the absorption of nitrous gases are treated with nitric acid in order to oxidize nitrites into nitrates, and the nitrogen oxides released in this process are used in the sulfuric acid system. Nitrogen oxides in the form of various oxides are captured from the tail gases with a soda or alkaline solution until the content in them is no more than 0.06% NO, after which the gases are released into the atmosphere. The solutions obtained after alkaline absorption, which are a mixture of nitrite (80%) and sodium nitrate (20%), containing an admixture of sodium sulfate, are sent to inversion located in the head of the system, where they are converted into solutions of sodium nitrate, released after evaporation, as finished nitrogen fertilizer. In this case, 15-25 kg of sodium nitrate are obtained per ton of sulfuric acid. Losses of nitric acid with exhaust gases are no more than 5 g per 1 ton of sulfuric acid. Fresh nitric acid is used for inversion, the system is fed by nitrogen oxides released after inversion. This will allow inversion to be carried out almost without costs.

In progress [19] sulfocarbon obtained from wood as a sorbent, which allows to obtain a high-quality sorbent, amenable to restoration and replacing calcium or magnesium cations with sodium or hydrogen ions in solutions. The production of sulfocarbon from wood sawdust and its application is as follows. Wood sawdust, released to 8-10% moisture content and freed from impurities, is loaded into a reactor, where it is treated with concentrated sulfuric acid (specific gravity 1.84) at a ratio of 7-7.5 weight parts of acid to one part of sawdust (4 liters of acid per 1 kg of sawdust). The mixture is stirred for an hour, and then the resulting sulfocarbon is washed from the acid. Further processing is carried out depending on the application: with a one-percent solution of H_2SO_4 or a ten-percent solution of NaCl. If the sorbent is to be stored or transported, it should be dried. The use of sulfocarbon obtained from sawdust can be done either by filtering solutions through it or by mixing it with solutions by heating and filtering through filter presses. The dosage of sulfocarbon depends on the content of the salts to be removed, the consistency and color of the solutions. Sulfocarbon is regenerated with a one percent solution of ammonium sulfate or a ten percent solution of NaCl.

In the work [20] the influence of temperature on the degree of purification of exhaust gases from nitrogen oxide and nitrogen dioxide by a urea solution was studied. It was shown that with an increase in temperature the degree of purification increases. The degree of conversion of nitrogen

dioxide in the temperature range of 30–80°C is 90–98%, while the conversion of nitrogen oxide is from 13 to 58%. It was found that the addition of an oxidizer, nitric acid, up to 10% to a urea solution increases the degree of conversion of nitrogen oxide by 15–20%. The addition of oxygen increases the conversion of nitrogen oxide into nitrogen by 40%. The influence of the content of active components of the reaction mixture on the degree of conversion of nitrogen oxides in the exhaust gases was studied. The optimal composition of the reaction mixture was selected: 10–20% urea; 5–10% nitric acid. It has been shown that the optimal conditions for the conversion of nitrogen oxide and dioxide are: solution temperature of 30–35°C; urea solution consumption for purification of no more than 4 m³/h; oxygen content in the gas for purification of at least 7%; the number of revolutions of the rotor apparatus blades of no more than 1500 rpm. It has been shown that at a urea solution temperature of 30–35°C, a urea solution consumption of 4 m³/h, and a number of revolutions of the rotor apparatus blades of 1500 rpm, the degree of purification from nitrogen oxides of 98–100% is achieved, which is much higher than when using a sodium hydroxide solution.

In progress [21] It is given that the production of oxalic acid is based on the interaction of nitric acid with sucrose. As a result of this process, up to 200 kg of nitrogen oxides are emitted into the atmosphere per ton of the resulting product. This leads to excessive gas pollution of the atmosphere and deterioration of sanitary and hygienic working conditions in production. Based on theoretical and experimental studies, a new method of thermal decomposition of nitrogen oxides has been developed, providing sanitary cleaning of exhaust gases during the production of oxalic acid to maximum permissible concentrations. During the study on a plasma torch, it was found that by thermal decomposition of nitrogen oxides, their concentration from any to the initial can be reduced to equilibrium at a given temperature. By introducing gaseous reducing agents, the reaction of thermal decomposition of nitrogen oxides can be shifted towards their decomposition into the original elements. The concentration of nitrogen oxides after decomposition can be brought to 0.1–0.3% with an initial concentration of 2–3%. Thermal decomposition of nitrogen oxides in the presence of coke begins at a temperature of 500°C. At 1000°C, the degree of decomposition of nitrous gas approaches 100%, this problem has not yet found its comprehensive solution. A detailed study and analysis of the methods of absorption of nitrogen oxides by water is a chemisorption process that leads to the formation of a multicomponent system containing the initial NO, N₂O₄, NO₂, N₂O₃ and the final products H₃O⁺, NO₃⁻, NO₂⁻ consists of the following stages: diffusion of nitrogen oxides (NO, NO₂) from the gas phase into the liquid through a two-layer film at the gas-liquid boundary; formation of nitric and nitrous acids as products of the interaction of nitrogen oxides with water; decomposition, or rather disproportionation of nitrous acid and the return of the resulting nitrogen oxide to the gas phase [22].

There is a technology for processing nitrogen oxides into nitric acid by absorption with water and aqueous solutions of nitric acid. However, when processing nitrous gases with a volume content of nitrogen oxides of less than 4%, water absorption is not very effective. In this case, the exhaust gases under industrial conditions contain nitrogen oxides after absorption in quantities (0.1–0.3 vol.%) significantly exceeding the permissible content (0.005 vol.%). This reduces the degree of raw material utilization and requires the use of catalytic purification, which significantly increases the cost of production.

There is a technology which is implemented by catalytic oxidation of ammonia to produce nitrogen oxide, its oxidation to nitrogen dioxide with subsequent two-stage absorption of nitrous gases. At the first stage, nitrogen oxides are absorbed by water and aqueous solutions of nitric acid to a residual content of nitrogen oxides in the gas of 15–2 kPa. The remaining nitrogen oxides are absorbed by a solution containing nitric acid, water and TBP at the following ratio of components by weight%: nitric acid 2–5; water 1.6 TBP the rest with subsequent regeneration of the solvent with water by counter-current washing, feeding the aqueous phase to the acid absorption stage, and the regenerated absorbent for absorption of nitrogen oxides. The method ensures production of 58% acid and extraction of nitrogen oxides from gases to a residual content of 0.005 vol. %. of re-extraction of

HNO₃ in the form of weak solutions of HNO₃ is required. The potential of TBP as a more effective absorber compared to water is not fully utilized, since TBP is used only for the absorption of weak nitrous gases (up to 15 kPa), and at higher concentrations of nitrogen oxides, less effective water absorption is used.

There is a method for obtaining nitric acid, which includes absorption of nitrous gases by a heterogeneous mixture of nitric acid, water and tributyl phosphate, followed by isolation of the target product; absorption is carried out by a heterogeneous mixture of absorbents with a mass ratio of organic and aqueous phases (0.2 - 1.0): 1.0, and isolation of the target product is carried out by settling the resulting mixture with the return of the organic solution of nitric acid to the stage of absorption of nitrous gases.

The ratio of the organic and aqueous phases in the absorption column is selected within the range (0.2 - 1): 1 in such a way that after mixing the nitric acid solution in TBP and the steam condensate in the column, the mass concentration of HNO₃ in the organic solution after their redistribution between the liquid phases is in the range of 2 - 15%. The specified range of acid concentrations in TBP and liquid phase ratios ensures the highest absorption rate. With an organic and aqueous phase ratio of less than 0.2 : 1, as a result of processing nitric acid between the phases, good regeneration of TBP is achieved, but its amount is so small that it does not ensure the required efficiency of the absorption process. With an organic and aqueous phase ratio of more than 1: 1 after mixing with the steam condensate, the concentration of nitric acid in TBP is more than 15% and such a mixture poorly absorbs weakly oxidized nitrous gases. According to the known method, the processing of nitrogen oxides into nitric acid includes three stages: absorption of concentrated nitrous gases with water to a residual content of NO, 2-15 kPa, extraction of nitric acid from TBP with water, absorption of the remaining nitrogen oxides with a mixture of water, nitric acid and TBP. The unit for processing nitrogen oxides according to the proposed method includes two main stages: absorption of nitrogen oxides by the mixture and settling to separate the liquid phases. According to this article, TBP can be considered not as an absorber, but as a catalyst for the absorption process, and not pure TBP is used as a catalyst, but a 28-30 % solution of nitric acid in TBP [23].

The purpose of this work is the absorption of residual nitrous gases and the production of nitric acid. To conduct the experiments, a laboratory setup was used, consisting of six reaction vessels, the first reactor for obtaining nitrogen oxides, five reactors - nitrogen oxide absorbers. In the first reactor, a mixture of nitrogen oxide is formed by the interaction of copper with non-concentrated nitric acid (59%). The remaining reactors absorb the incoming nitrogen oxide from the first reactor. To conduct the experiment, 80 ml of a mixture of TBP and water were placed in five reactors (absorber volume 100 ml). Nitrogen oxides obtained in the first reactor were passed through the solution using a water-jet pump. After the end of the experiment, all solutions were separately brought to the 100 ml mark, from which an aliquot was taken to determine nitrogen. In addition, the solution was regenerated and nitric acid was obtained. The total content of nitrogen oxides in the solutions was determined according to Kjeldahl with subtraction from the total nitrogen contained in the original nitric acid [24].

Table 1

The degree of absorption of nitrous gases in a mixture of water and tributyl phosphate depending on temperature and concentration

Water:TBP ratios	The degree of absorption of nitrous gases in absorbers, in terms of N %					General degree of penetration, %
	absorber No. 1	abs -r No. 2	abs -r No. 3	abs -r No. 4	abs -r No. 5	
Solution temperature, 35°C						
1:0.1	36.20	26.64	13.75	5.94	1.97	84.50

1:0.2	37.14	26.05	13.98	6.09	1.98	85.24
1:0.4	38.60	26.41	14.28	6.26	2.02	87.57
1:0.6	39.08	26.48	14.31	6.28	2.04	88.26
1:0.8	39.25	26.50	14.33	6.30	2.05	88.43
1:1	39.37	26.57	14.36	6.33	2.07	88.70
1:1.2	39.43	26.61	14.38	6.34	2.19	88.87
Solution temperature, 30°C						
1:0.1	37.86	27.90	13.94	5.98	1.99	87.67
1:0.2	38.63	28.24	14.11	6.09	2.00	89.07
1:0.4	39.20	28.82	14.36	6.30	2.02	90.70
1:0.6	39.28	28.98	14.40	6.32	2.04	91.02
1:0.8	39.29	29.02	14.42	6.34	2.06	91.13
1:1	39.37	29.59	14.48	6.36	2.08	91.88
1:1.2	39.45	29.69	14.51	6.38	2.10	92.13
Solution temperature, 25°C						
1:0.1	39.94	28.88	13.99	6.03	2.01	90.85
1:0.2	40.76	30.07	14.67	6.11	2.02	93.63
1:0.4	40.95	30.86	15.39	6.31	2.02	95.53
1:0.6	40.99	30.97	15.60	6.35	2.04	95.95
1:0.8	41.08	31.10	15.85	6.36	2.06	96.45
1:1	41.13	31.17	16.06	6.37	2.09	96.82
1:1.2	41.17	31.23	16.10	6.39	2.10	96.99
Solution temperature, 20°C						
1:0.1	40.95	29.93	15.08	6.09	2.03	94.08
1:0.2	41.89	31.76	15.34	6.17	2.03	97.19
1:0.4	42.51	32.14	15.59	6.35	2.05	98.64
1:0.6	42.60	32.20	15.69	6.39	2.06	98.94
1:0.8	42.65	32.26	15.86	6.40	2.07	99.24
1:1	42.66	32.27	16.06	6.31	2.08	99.38
1:1.2	42.69	32.31	16.12	6.38	2.11	99.68

Table 2

Dependence of the degree of regeneration on the ratio of water and tributyl phosphate and temperature

Indicators	Water to Tributyl Phosphate Ratios						
	1:0.1	1:0.2	1:0.4	1:0.6	1:0.8	1:1	1:1.2
Regeneration temperature, 75°C							
Absorber No. 1	34.69	35.62	37.28	39.12	40.10	41.08	42.83
Absorber No. 2	35.50	36.34	38.69	40.05	41.33	42.15	44.57
Absorber No. 3	36.41	37.83	39.14	40.56	42.29	43.97	45.80
Absorber No. 4	37.64	39.15	40.86	42.28	44.03	45.80	48.07
Absorber No. 5	39.26	41.83	43.57	44.89	46.37	48.26	50.19
Regeneration temperature, 80°C							
Absorber No. 1	56.61	58.80	59.40	59.97	60.88	62.19	63.75
Absorber No. 2	56.98	58.96	59.88	60.59	61.64	63.08	64.53
Absorber No. 3	57.60	59.27	60.46	61.52	62.58	63.84	64.82
Absorber No. 4	58.43	59.81	61.15	61.96	62.94	64.17	65.20
Absorber No. 5	58.85	60.14	61.76	62.24	63.18	64.37	65.60
Regeneration temperature, 85°C							

Absorber No. 1	75.48	75.94	76.12	76.50	77.09	77.34	77,80
Absorber No. 2	76.04	76.57	77.83	77.98	78.02	78.25	78.46
Absorber No. 3	76.88	77.12	77.95	78.09	78.27	78.51	78.69
Absorber No. 4	77.40	77.68	77.99	78.25	78.49	78,70	78,82
Absorber No. 5	77.55	77,82	78.10	78.33	78.58	78,76	78,89
Regeneration temperature, 90°C							
Absorber No. 1	93.12	93.18	93.22	93.25	93.30	93.36	93.45
Absorber No. 2	93.25	93.28	93.33	93.38	93.45	93.49	93.56
Absorber No. 3	93.72	93.80	93.87	93.91	93.96	94.04	94.11
Absorber No. 4	94.17	94.25	94.30	94.37	94.42	94.46	94.53
Absorber No. 5	95.18	95.24	95.29	95.33	95.38	95.42	95.47
Regeneration temperature, 95°C							
Absorber No. 1	99.16	99.37	99.49	99.61	99.63	99.68	99.70
Absorber No. 2	99.29	99.41	99.52	99.64	99.65	99.67	99.71
Absorber No. 3	99.48	99.56	99.61	99.66	99.68	99.70	99.73
Absorber No. 4	99.54	99.57	99.64	99.70	99.74	99.75	99.76
Absorber No. 5	99.58	99.63	99.67	99.69	99.74	99.76	99.79

The results of the experiments are given in Tables 1 and 2. Chemical analysis of the solutions used for absorption and extraction of nitric acid established the degree of absorption of nitrous gases depending on the temperature, ratios of TBP and water. Based on the results obtained, it can be concluded that the absorption of nitrous gases using a mixture of water and tributyl phosphate in step absorbers is 84.50 - 99.38% depending on the cleaning conditions. With a water and TBP ratio of 1: 0.2 and a nitric acid concentration of 5% and a temperature of 35°C, the absorption degree is 85.24%. A decrease in temperature by 15°C and an increase in the water and TBP ratio to 1: 1 makes it possible to increase the nitrogen oxide absorption degree by approximately 15% (Table 1). Preliminary research results have shown that using a mixture of water and tributyl phosphate for nitrogen oxide absorption at normal temperatures and pressures in five absorbers, it is possible to absorb up to 97.19% of nitrogen oxides and almost completely regenerate TBP at a temperature of 95°C, which can be reused for absorbing nitrous gases. Thus, the dependence of the absorption and extraction degree of nitric acid on the temperature and water and TBP ratio and on the number of absorbers has been determined.

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Rezyume: *Ushbu maqolada chiqindi nitroza gazlarini suv va tributilfosfat aralashmasidan foydalanib, uni keyingi regeneratsiya qilish va uning asosida nitrat kislota ishlab chiqarish uchun bosqichli absorberlarda singdirish natijalari keltirilgan. Tadqiqot natijalari, ayniqsa keng doiradagi azot oksidi tarkibidagi azot oksidlarining vaqti-vaqti bilan doimiy chiqindi bo'lmagan emissiyasi bilan tavsiflangan sohalarda ishlab chiqishda keng qo'llanilishi mumkin. Yutilish darajasi va regeneratsiyaning haroratga va suv- tributilfosfat aralashmalari nisbatiga bog'liqligi aniqlandi.*

Резюме: *В данной работе приведены результаты поглощения остаточных нитрозных газов с использованием смеси воды и трибутилфосфата в ступенчатых абсорберах для дальнейшего его регенерации и получения на его основе азотной кислоты. Особо широкое применение результаты исследования может найти в производствах, для которых характерен непостоянный выброс оксидов азота с широким диапазоном содержания оксидов азота. Определена зависимость степени поглощения и регенерации от температуры и соотношении смеси воды и трибутилфосфата.*

Kalit so'zlar: *absorber, azotli gazlar, tributilfosfat, azot oksidi, azot kislotalari, ekologiya, azotli gazlarni tozalash.*

Ключевые слова: *абсорбер, нитрозные газы, трибутилфосфат, оксиды азота, азотная кислота, экология, очистка нитрозных газов.*

WATER SOLUBILITY AND APPLICATION OF GM-1 BRAND ADHESIVE BASED ON GIPAN AND UREA IN BUILDING MATERIALS

Turaev Z.B¹., Fayziyev J.B².

¹Karshi Engineering-Economics Institute, Republic of Uzbekistan, Karshi.

²Tashkent Scientific Research Institute of Chemical Technology" LLC, Tashkent, Republic of Uzbekistan.

Summary: In this study, the physicochemical properties of the water-soluble adhesive (GM-1) obtained based on GIPAN and urea, as well as its potential application in construction materials, were investigated. The primary objective was to analyze the mechanical strength, elasticity, solubility in water, reactivity, degree of polymerization, and modification processes of the GM-1 adhesive. The adhesive was prepared under laboratory conditions using MS7-H550-S equipment through heating and mixing of the components. To study the molecular structure of the adhesive, an infrared (IR) spectroscopy analysis was conducted, which showed that the modified structure was formed by -SONH₂ and -COONa groups between GIPAN and urea. The application of the GM-1 adhesive in wood composites demonstrated its high adhesion, uniform distribution, and flammability. The study results showed the high efficiency of the GM-1 adhesive in wood materials, while SEM analysis confirmed its uniform distribution, making it promising for use in construction and industrial materials.

Keywords: GIPAN, urea, polymer adhesive, GM-1, adhesion, construction materials, wood composites, IR spectroscopy, modification, polymerization, physicochemical properties.

To obtain adhesive from these compositions, both in production conditions and in the laboratory, special heating mixers of the MS7-H550-C brand were used. To prepare the adhesive, 62 g of GIPAN and 20 g of urea were mixed, with the addition of boiling water depending on the fluidity of the total mixture. The heating and mixing process was carried out at a temperature of 90-100°C for 50-60 minutes. As a result, GM-1 brand adhesive was obtained.

When obtaining the proposed GIPAN and urea-based adhesives, the ratio of the starting components was studied, and it was found that the optimal mass ratio is 3:1, which is explained by the improved physical and mechanical properties of these adhesives. In the production of polymer binders, an output value of 86% was achieved at a pH of 8.0-8.5.

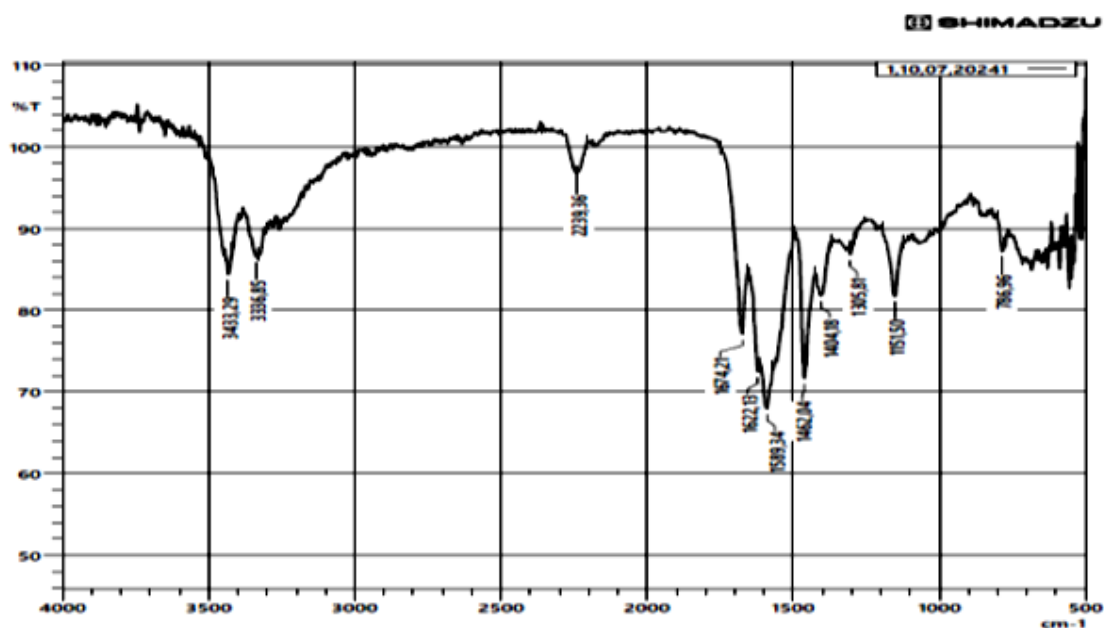


Figure 1. IR spectroscopic analysis of water-soluble (GM-1 brand) glue obtained based on GIPAN and urea.

When modifying GIPAN with urea, the functional groups $-\text{SONH}_2$ and $-\text{COONa}$ contained in GIPAN interact, resulting in partial modification. Adhesive mixtures consisting of modified GIPAN and urea have good water solubility and are of great importance for the adhesion of wood materials.

In the hydrolysis of polyacrylonitrile-containing secondary raw materials, GIPAN and urea mixtures containing functional groups of amines and carboxylic acids were obtained. The results of the IR spectroscopic analysis show that the absorption bands in the $1404\text{--}1622\text{ cm}^{-1}$ range characterize the functional groups $-\text{COONa}$. Moreover, the absorption bands appearing in the $3433\text{--}3336\text{ cm}^{-1}$ range belong to the amino functional groups contained in the raw material.

In this experimental study, the water-soluble glue obtained based on GIPAN and urea was branded GM-1 and the optimal conditions for the formation of the glue's polymer composition, including temperature, time, and component ratio, were studied. For GM-1 brand adhesive composites, reactions were conducted for 1.0 hours at different ratios to increase product yield. It was established that the 3:1 mass ratio demonstrated the highest result compared to other variants (Fig. 2).

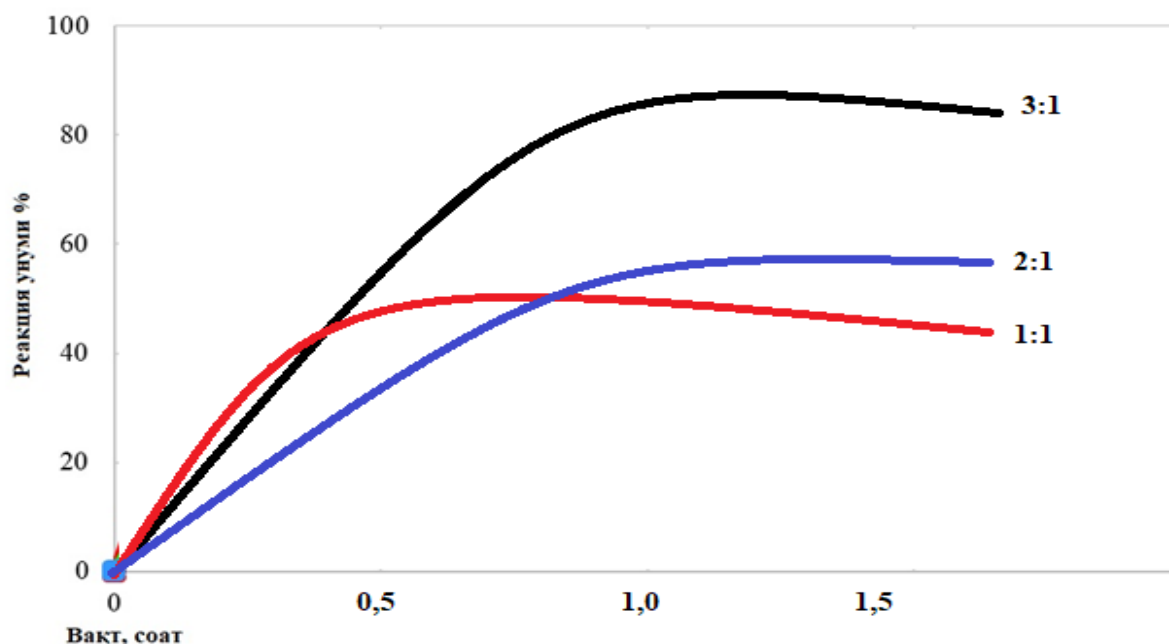
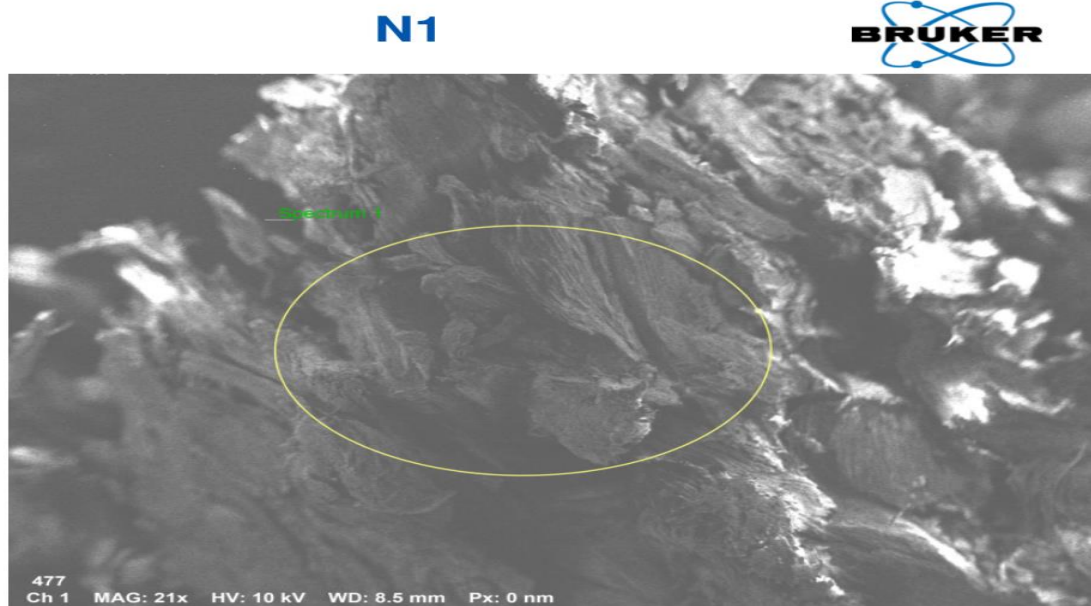


Figure 2. The dependence of the reaction yield (GM-1 brand) obtained based on GIPAN and urea on time at different mass ratios.

A morphological assessment of the surface of wood particles treated with GM-1 brand adhesive obtained from GIPAN and urea was conducted. The study was conducted using scanning electron microscopy (SEM) and elemental analysis. The results of SEM analysis are presented in Figure 3.1, which show that at a 500-fold increase, the components of GM-1 brand adhesive mixtures are evenly distributed in the material.

Figure 3. Analysis of GM-1 brand glue-processed wood-cutting plates (DSP) using a scanning electron microscope (SEM).

Elemental analysis of materials obtained by treating wood materials with GM-1 branded



polymer adhesive revealed carbon, oxygen, sodium, characteristic of cellulose, as well as aluminum in the form of a mixture. Furthermore, the nitrogen present in the GM-1 brand adhesive was not detected in this elemental analysis.

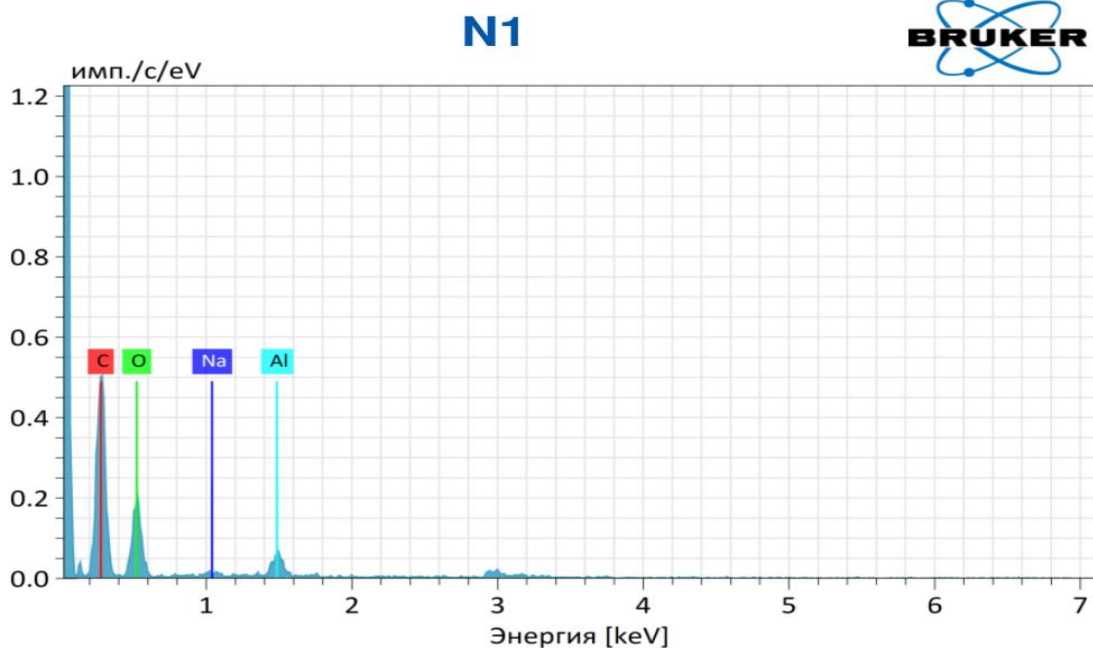
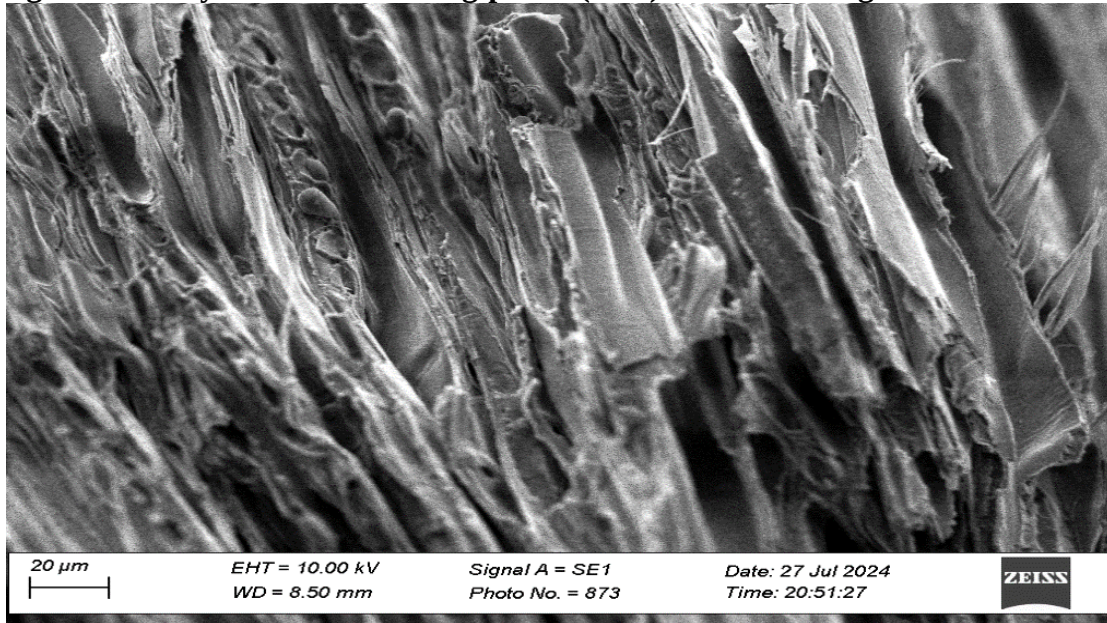


Figure 4. Elemental analysis of materials treated with GM-1 brand adhesive obtained from wood pulp.

Figure 5. Analysis of wood-cutting plates (DSP) obtained using GM-1 brand adhesive



using a scanning electron microscope (SEM).

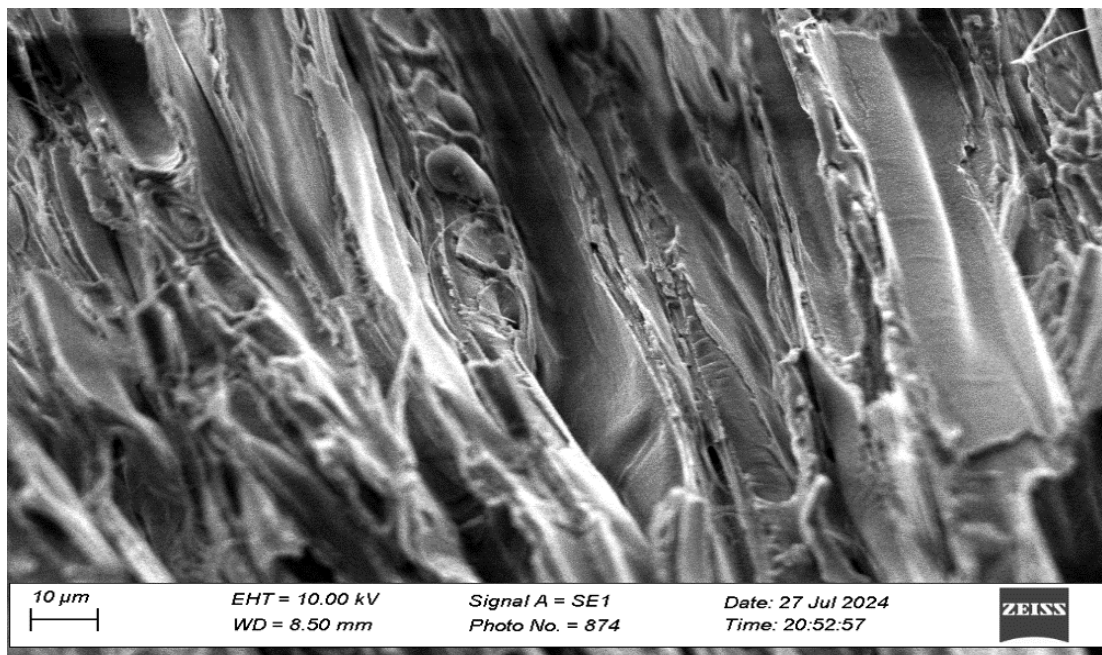
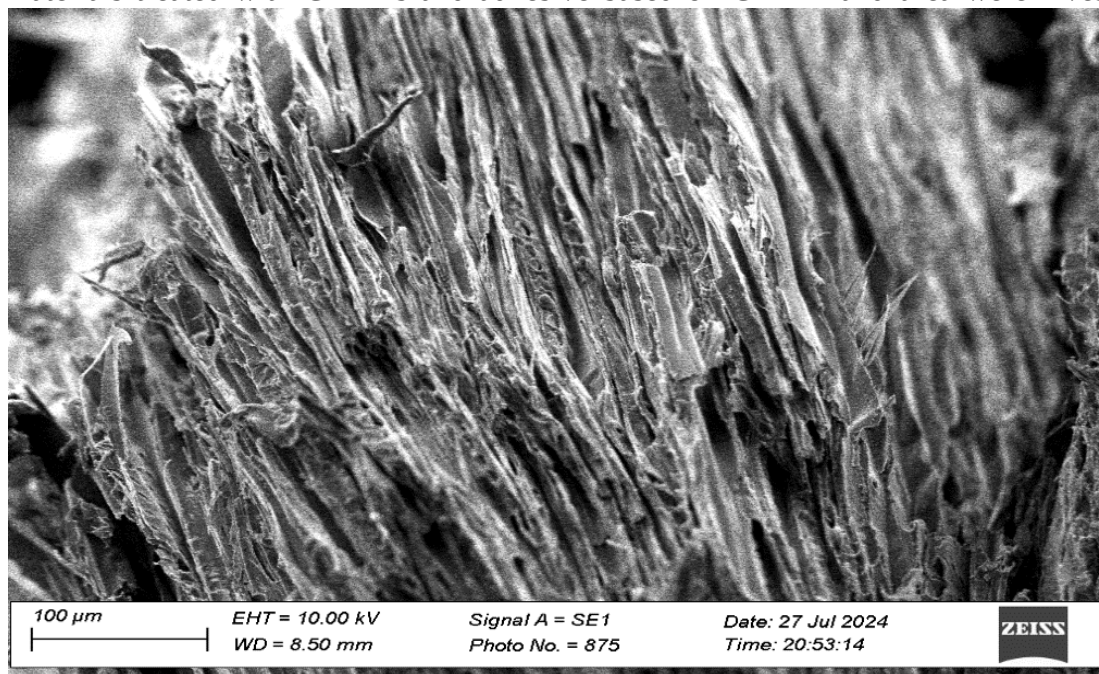


Figure 6. Analysis of wood-cutting plates (DSP) obtained using GM-1 brand adhesive with an increase of 10 nm was carried out using a scanning electron microscope (SEM).

Figure 7. Analysis of wood-cutting plates obtained using GM-1 brand adhesive with a magnification of 100 nm was carried out using a scanning electron microscope (SEM).

Materials treated with GM-1 brand adhesive based on GIPAN and urea were investigated



using scanning electron microscopy and elemental analysis on samples presented in Figures 3, 4, and 5 at magnifications of 20, 10, and 100 nm, respectively. Analysis results show that the polymer adhesive in wood-cutting building materials is evenly distributed.

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Rezyume: maqolada GIPAN va mochevina asosida olingan suvda eruvchan yelimning (GM-1) fizik-kimyoviy xossalari hamda uni qurilish materiallarida qo'llash imkoniyatlari ko'rib chiqilgan.

Резюме: в статье рассматриваются физико-химические свойства водорастворимого клея (GM-1), полученного на основе GIPAN и мочевины, а также возможности его применения в строительных материалах.

Kalit so'zlar: GIPAN, karbamid, polimer yelim, GM-1, adgeziya, qurilish materiallari, yog'och kompozitlari, IQ-spektroskopiya, modifikatsiya, polimerlanish, fizik-kimyoviy xossalari.

Ключевые слова: GIPAN, мочевины, полимерный клей, GM-1, адгезия, строительные материалы, древесные композиты, ИК-спектроскопия, модификация, полимеризация, физико-химические свойства.

A METHOD FOR OBTAINING CHEMICALLY PRECIPITATED CHALK DISTILLED LIQUID

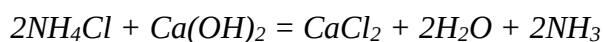
Vafaev O.Sh., Kurbanova A.A.

Tashkent Scientific Research Institute of Chemical Technology LLC, Tashkent, Republic of Uzbekistan

Summary: Currently, the most pressing issue worldwide is the protection of the environment from toxic production factors, among which research in the field of ammonia utilization of soda ash production waste is of great importance.

The development of new methods for processing distillate fluids is a significant factor that has an impact not only on the environment, but also on the economy of the Republic of Uzbekistan. The use of waste as raw material - for the production of new types of products - is the most appropriate disposal, in which not only the amount of waste is reduced, but also import-substituting targeted products are obtained.

Distilled liquid is the result of distillation of the mother liquor. The distillation process is the regeneration of ammonia from the mother liquor using lime milk with a concentration of CaO 140 n.u.:



The rate of this reaction depends on the degree of dispersion of the milk, as it is determined by the rate of its dissolution. The resulting ammonia is distilled by heating the liquid to 95-115° with sharp steam.

Keywords: soda ash, distillery liquid, distillation, chemically precipitated chalk, carbonization.

The results of the conducted research have established that the chemical composition of the distiller fluid tends to change specifically depending on the quality of the raw materials used to carry out technological processes and the systemic operating mode of the equipment.

During the X-ray analysis of the distillate composition, it was established that the main phases are calcium chloride and sodium chloride.

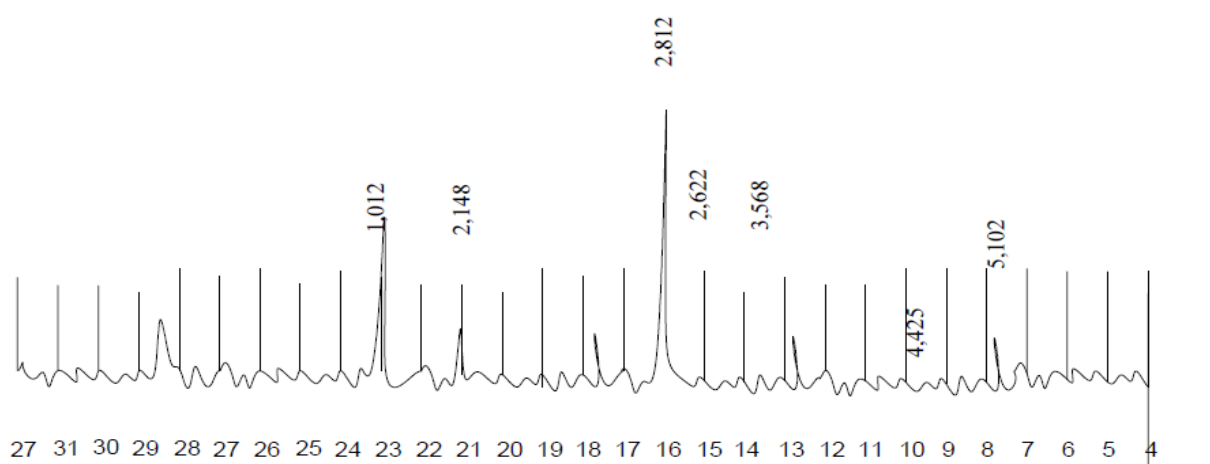


Figure 1. X-ray image of distillation fluid

The diffraction maxima show the presence of calcium chloride and sodium chloride phases. The main peaks indicate a predominance of the calcium chloride phase. Let's consider the results of the analysis below:

Diffraction maxima $d = 5.102, 4.425, 3.568 \text{ \AA}$ show the main phase of calcium chloride.

Low-intensity diffraction maxima $d = 2.622, 2.812, 2.148 \text{ \AA}$ denote the phases of sodium chloride.

This clearly shows the presence of calcium chloride and sodium chloride phase diffraction maxima in the composition. Calcium chloride phase is one of the main phases and predominates over other phases in the composition.

In the technology of obtaining chemically precipitated chalk from distillation fluid for the process of carbonization, a gas furnace from lime-burning furnaces is used. The furnace gas is the main component for carrying out the carbonization process in this technology, and the percentage (%) by volume) of components in its composition plays an important role in the formation of chemically precipitated chalk in sufficient quantity and quality.

The results of the analysis of the gas furnace from the furnaces of the "Luminous firing and lime quenching" workshop of the "Kungrad Soda Plant" JV LLC are presented in Table 1.

The analyses were conducted in a KGA-1 gas analyzer by the absorption method, in which 40% solution of potassium hydroxide, 40% solution of oxygen - pyrogallol solution - A (in an alkaline medium), carbon dioxide (II) - suspension of half-copper chloride in NH_4OH is used as the absorbing solution for determining the concentration of carbon dioxide gas.

Table 1.

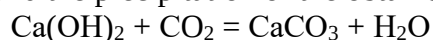
Results of the analysis of the furnace gas from the lime-fired furnaces

№	Indicators Name		Analysis results	
	Composition	Molecular weight	kg/hour	% (vol.)
1	Carbon monoxide (IV) CO_2	44,01	7492,23	25,89
2	Carbon monoxide (II) CO	28,00	-	-
3	Oxygen O_2	32,00	778,54	3,70
4	Nitrogen N_2	28,01	11584,27	62,89
5	Humidity	-	-	7,52
6	Common	kg/hour	19855,04	100
7	Temperature	$^{\circ}\text{C}$	40,00	

The distillation fluid is first separated from the mechanical suspension by filtration. After filtration, the liquid part of the distillate is carbonized.

During the carbonization process, the residual molecules remaining after the distillation process are carbonized. It contains active calcium oxide CaO molecules, which are initially present in calcium hydroxide Ca(OH)_2 . For the carbonization process, the carbon dioxide concentration in the furnace gas must be at least 21%. The results of the chemical analysis of the furnace gas are presented in Table 1.

Overall, the carbonization process, the absorption of carbon dioxide CO_2 into the distillation fluid, and the precipitation of the obtained chemically precipitated chalk - proceeds as follows:

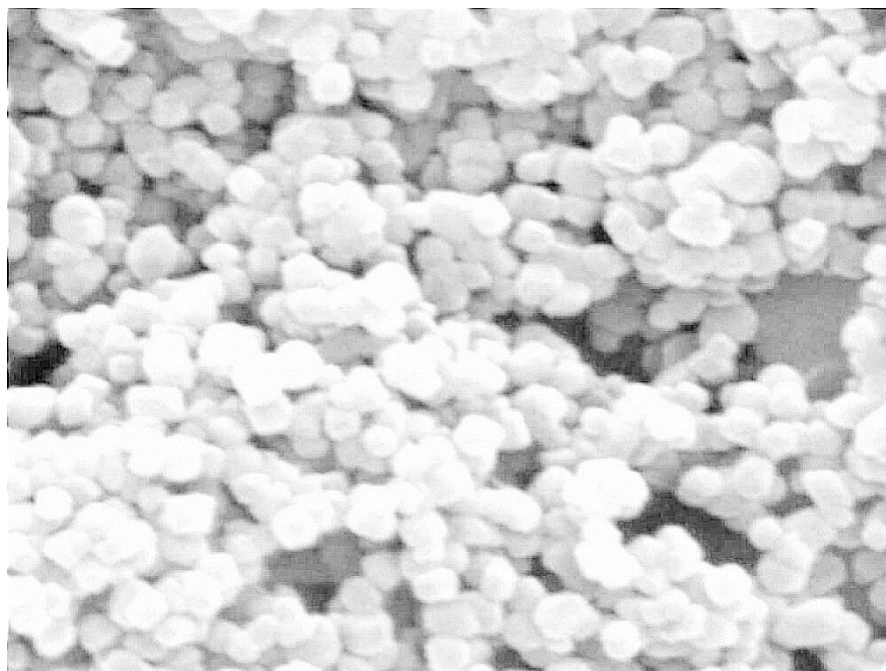


The filtrate carbonization process is carried out to purify the distillation fluid from dissolved lime molecules and to precipitate chemically deposited chalk (CaCO_3) particles. The carbonization process was carried out at a temperature of $65\text{--}75^{\circ}\text{C}$ with a pH of 7.5-8.0 using furnace gas. Carbonization processes in the temperature range of $65\text{--}75^{\circ}\text{C}$ accelerate the interaction process between ions, resulting in the formation of small CaCO_3 particles.

At temperatures below 65°C and above 75°C , the proportion of large CaCO_3 particles in the composition of chemically precipitated chalk increases. Due to the high sensitivity of particles to temperature changes, it is necessary to strictly adhere to the temperature regime throughout the carbonization process. The end of the carbonization process was tested using a phenolphthalein indicator. The influence of temperature on the formation of chemically precipitated chalk particles during carbonization is shown in Figure 1.

The resulting product - chemically precipitated chalk (CaCO_3) - is filtered from the suspension using filtration, then washed with distilled water (to prevent the precipitation of chloride ions into the finished product) and dried at 120°C . The drying time is carried out until the moisture content of the finished product does not exceed 0.5%. After that, the finished product is cooled in drying units to

The mass of the
formed CaCO_3 is g.



room temperature and then passed through a sieve measuring 0.18.

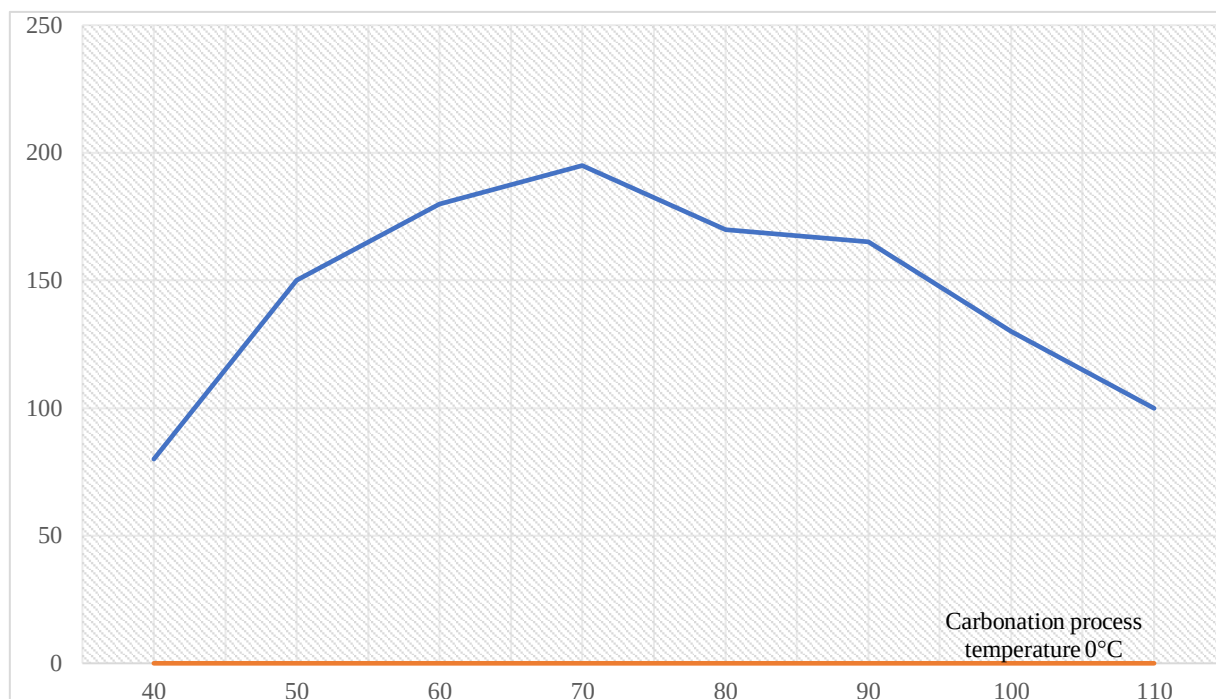


Diagram 1. The influence of temperature on the formation of chemically precipitated chalk particles during carbonization.

Figure 2. Microstructure of the obtained chemically precipitated chalk (calcium carbonate CaCO_3).

The resulting product - chemical precipitated chalk (CaCO_3) - is filtered from the resulting suspension by filtration, after which it is dried and cooled to room temperature. The results of the analysis of the obtained chemically precipitated chalk meet the requirements of GOST 8253-79.

Chemically precipitated chalk CaCO_3 (calcite) is a white, highly dispersed powder. Chemical purity, absence of impurities, given morphology and controlled particle distribution make it a universal amorphous filler, which increases the efficiency of its use in any product.

Chemically precipitated chalk (CaCO_3) is used in: paper production, in the paper industry it performs the function of a filler and pigment, gives the surface of the paper a premium class - brightness and purity; in the production of polymeric materials, including on the basis of polyvinyl chloride (PVC); in the composition of plastics (plastic masses), it corrects whiteness, increases impact strength and performs reinforcing functions; in the rubber industry, it is used to make sleeves and hoses, conveyor belts, belt belts; in rubber products, chemically precipitated chalk increases wear resistance, elasticity and stability at different temperatures; as part of oil and water-emulsion paints, it regulates viscosity, corrects shining degree and shade depth, reduces cost and regulates coverage of the composition;

Due to the formation of multi-tonnage waste in the ammonia method of soda production technology, this production is a source of soil, surface and groundwater, as well as atmospheric air pollution of the environment. In this regard, the issue of solving the problem by comprehensively processing distillation fluid into commodity products using the aforementioned technology using inexpensive components is pressing.

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Rezyume: *Maqolada kaltsiyantirilgan soda ishlab chiqarish chiqindisi – distiller suyuqligini pech gazi bilan qayta ishlash texnologiyasi muhokama qilinadi. Olingan tayyor mahsulotning tarkibi va foydalanish sohasi ham o'rganildi.*

Резюме: *в статье обсуждается технология переработки отхода производства кальцинированной соды - дистиллерной жидкости печным газом. Также были изучены состав и область использования полученной готовой продукции.*

Kalit so'zlar: *kalsinatsiyalangan soda, distiller suyuqligi, distillyatsiya, kimyoviy cho'ktirilgan bo'r, karbonizatsiya.*

Ключевые слова: *кальцинированная сода, дистиллерная жидкость, дистилляция, химически осажженный мел, карбонизация.*

RESEARCH ON THE PROCESSES OF PREPARING ADHESIVES FOR THE PRODUCTION OF DSP USED IN FURNITURE AND CONSTRUCTION

Turaev Z.B., Fayziyev J.B.

¹*Karshi Engineering-Economics Institute, Republic of Uzbekistan, Karshi.*

²*Tashkent Scientific Research Institute of Chemical Technology" LLC, Tashkent, Republic of Uzbekistan.*

Summary: *In this study, various adhesive compositions used in the production of wood-chip boards (DSP), which are widely employed in architectural and construction industries, were examined. The main objective of the research was to determine the physicochemical properties of different adhesive compositions and their impact on the properties of the final DSP product. To evaluate the effectiveness of the adhesives, various mixtures were prepared using components such as GIPAN, urea, starch, liquid glass, and epoxy resin.*

The effect of each adhesive composition on DSP was assessed by studying its key physicochemical characteristics, including mechanical strength, adhesion capacity, and water resistance. The results demonstrated that the components and their ratios in the adhesive mixtures significantly affect the quality, strength, and durability of DSP against external factors. Moreover, the findings helped to identify the advantages and disadvantages of different adhesive compositions for use in DSP. These results are of great importance for enhancing the efficiency of DSP production and ensuring its promising application in construction and architecture.

Keywords: *DSP, adhesive, GIPAN, starch, urea, epoxy resin, liquid glass, construction materials, physicochemical properties.*

Wood-cutting and reed plates (DSP) are widely used in furniture manufacturing, as well as in the manufacture of building interior elements, decorative details of mobile devices, souvenirs and packaging materials. The effective use of DSP directly depends on its physicochemical properties. This material, made from small chips, has all the basic technical parameters of natural wood. In the process of forming plates, formaldehyde resin is used as a binder, which ensures high mechanical strength of the material without reducing its quality indicators.

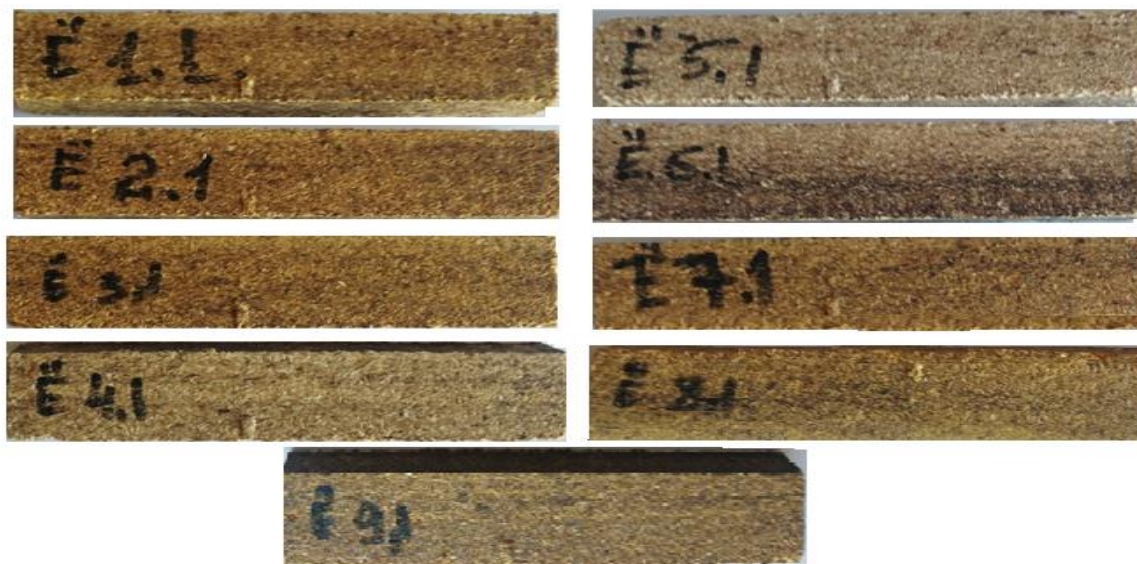
Main properties of DSP:

- Optimal mass: Lightweight construction material, the mass of which ensures its effectiveness in use.
- Technological versatility: A wide possibility of adapting plates to various production processes
- Functional efficiency: High efficiency and material strength characteristics in production.
- Decorativity and aesthetics: Attractive appearance DSP is important in the interior and design.

Technical characteristics of the DSP: Wood-cutting plates are made from dried wood waste. The prepared raw material is mixed with formaldehyde resin and pressed at high temperature. The binding mass is 12-18% of the total mass. After cooling, the finished products are laminated and cut to achieve standard sizes.

Products are classified based on quality indicators. Woodworking: The process of processing wood and its products includes giving them exact dimensions, shapes and characteristics. Such technological operations as cutting, bending, gluing, assembling and finishing are carried out with the help of special tools and technological machines. Woodworking products include: materials and semi-finished products - boards, beams, fan, wooden boards; finished wood products - constructions and structures, wagons and cooperative products, furniture, musical instruments, sports equipment, office supplies, containers, shelves and others. Woodworking has existed since ancient times in the form of handicrafts and artisanal production.

Currently, wood slabs are widely used as a building material for furniture manufacturing, as well as in construction and other industries. In 1978, the world produced 45 million cubic meters of wood chipboard (DSP) per year. Global demand for DSP is constantly growing, and between 2012 and 2016, demand increased from 75 to 88 million cubic meters. The main consumers of DSP in the world are China, which accounts for a quarter of the world's DSP consumption, and Europe, which



accounts for another 40% of the total volume. From 2012 to 2016, the largest increase in DSP consumption was recorded in China - 14.8%, North America - 4.1% and Europe - 3.5%. In 2016, the production of DSP in Russia amounted to 6.6 million m³, and domestic consumption - 5.2 million m³. DSP exports increased by 30% compared to 2015 and amounted to 1.6 million m³ in 2016. Exports to the CIS countries - the traditional market for Russian DSP - made up 81% of the total volume in 2016.

Рисунок 1. Образец DSP, полученный из древесных стружек.

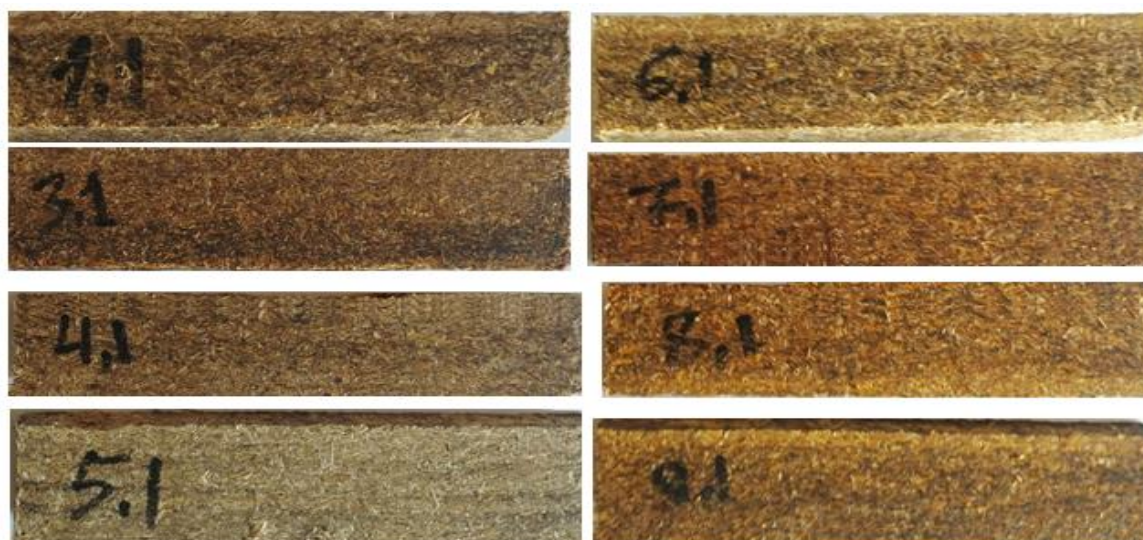


Figure 2. DSP sample, obtained from reed strips.

In the process of manufacturing a building material based on DSP, including wood and reed, the strength and durability of the resulting product are ensured by forming a composite layer obtained as a result of their modification. The material's strength, elasticity, and durability can be further enhanced by using the obtained adhesive, which ensures the necessary properties of the material.

The proposed composition of GM-1, GK-2, GJ-3 and EP-4 adhesives.

Table 1.

Proposed GM-1 brand adhesive		
№	The proposed adhesive composition	100%
1	GIPAN	62%
2	Mochevina	38%

For the preparation of adhesives from these compositions in production or laboratory conditions, special heating mixers of the MS7-H550-S brand were used. To obtain 100 g of glue, components such as GIPAN and urea were mixed with boiling water, after which the mixture was heated at a temperature of 90-100°C for 50-60 minutes.

During the tests, the second composition of the DSP adhesive was chosen for the preparation of the main adhesive composition.

Table 2.

The proposed GK-2 brand adhesive		
№	The proposed adhesive composition	100%
1	GIPAN	73,6%
2	Starch	26,4%

During testing, a new composition was developed based on the third adhesive composition chosen for the DSP material.

Table 3.

The proposed GJ-3 brand adhesive		
№	The proposed adhesive composition	100%
1	GIPAN	66,6%
2	Liquid glass	33,3%

During the tests, a new composition based on the third composition was developed Selected for the DSP material.

Table 4.

Proposed EP-4 adhesive		
№	The proposed adhesive composition	100%
1	Epicidal resin	87,2%
2	Pepa	12,7%

This study investigated the influence of various adhesive compositions on wood-cutting plates (DSP) made from wood and reed. GIPAN adhesives, urea, starch, liquid glass, and epoxy resin were analyzed based on their mechanical strength and adhesion.

The results showed that the EP-4 epoxy glue has the highest strength, while the GJ-3 glue based on liquid glass provides better adhesion. It has been shown that different adhesives contribute to the improvement of the physicochemical properties of DSP. Therefore, these adhesives are promising for the production of DSP.

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Rezyume: *maqolada arxitektura va qurilish sohalarida keng qo'llaniladigan yog'och qirindili plitalar (DSP) olish jarayonida ishlatiladigan yelimli aralashmalarning turli tarkiblari ko'rib chiqilgan.*

Резюме: *в статье рассматриваются различные составы клеевых смесей, используемых в процессе получения древесно-стружечных плит (ДСП), которые широко применяются в архитектурных и строительных отраслях.*

Kalit so'zlar: *DSP, yelim, GIPAN, kraxmal, karbamid, epoksid smolasi, suyuq shisha, qurilish materiallari, fizik-kimyoviy xossalari.*

Ключевые слова: *DSP, клей, GIPAN, крахмал, мочеви́на, эпоксидная смола, жидкое стекло, строительные материалы, физико-химические свойства.*

UDC 631.632:14

**NPCa- AND NPKCa-CONTAINING FERTILIZERS BASED ON KHUDZHAKUL
PHOSPHORITES, PHOSPHOGYPSUM AND GLAUCONITE**

Jumabaev R.F., Reymov A.M., Kurbaniyazov R.K., Madenov B.D.

Karakalpak State University named after Berdakh

Summary: *Argument: Was studied the composition of the products, which obtained by nitric acid processing of Khodzhakul phosphorite nodular flour (10.45% P₂O₅) with the addition of phosphogypsum and Krantau glauconite. It has been shown that with an increase in the rate of nitric acid from 5 to 50%, the relative content of digestible forms of P₂O₅ increases from 46.03 to 86.68%. At the same time, the strength of the granules of the resulting products ranges from 1.83-3.80 MPa. Both in composition and properties they meet the requirements of agriculture.*

Key words: *Phosphorite flour of Khodzhakul, nitric acid, complex fertilizers, production waste, phosphogypsum, glauconites, NPCa- and NPKCa-fertilizers.*

Introduction. According to the State Statistics Committee of the Republic of Uzbekistan, in 2024 the country's population was more than 37 people [1]. Every day the number of permanent residents of Uzbekistan increases by an average of 1.8 thousand people. Population growth leads to an increase in demand for food in the context of an increase in the well-being of the population, a reduction in cultivated areas and a shortage of water resources, which necessitates the intensification of agriculture [2].

Each ton of mineral fertilizers provides the annual food needs of 5-6 people. Thanks to the use of mineral fertilizers, an average of 40-50% increase in crop yield is ensured [3].

The main factor in obtaining a high and high-quality yield of agricultural crops is their adequate nutrition, primarily nitrogen, phosphorus, potassium and calcium.

A large branch of the chemical industry has been created in Uzbekistan, which working for agriculture. Three joint-stock companies – Maksam-Chirchik, Navoiyazot and Ferganaazot – produce nitrogen fertilizers, the range of which consists of ammonium nitrate, urea and ammonium sulfate.

Currently, three joint-stock companies: “Ammofos-Maxam”, “Samarkandkimiyo” and “Indorama Kokand Fertilizers” produce phosphorus-containing fertilizers, the range of which consists of ammophos, suprephos-NS, PS-Agro, nitrocalcium phosphate and simple enriched superphosphate.

JSC Dekhkanabad Potash Fertilizer Plant produces potash fertilizer in the form of potassium chloride.

Due to the growing demand for phosphate fertilizers in the world, the production of extraction phosphoric acid (EPA), obtained from phosphate raw materials, increases by an average of 1 million tons of P₂O₅ per year. In the process of obtaining 1 ton of P₂O₅ in the form of EPA, 4-6 tons of phosphogypsum (PG) are formed. Every year, 180-200 million tons of phosphogypsum are dumped. To date, the world's volume of phosphogypsum has exceeded 7 billion tons.

It is known that, Ammofos-Maxam JSC produces ammophos in terms of 130-135 thousand tons of P₂O₅ per year. This means that per 1 ton of P₂O₅ an average of 7.5-8.0 tons or 0.6 million tons of phosphogypsum is formed.

In addition to calcium, phosphogypsum contains elements necessary for the full development of plants: phosphorus, sulfur and silicon. Calcium is essential for plant development. Allows you to speed up metabolism and increase immunity and resistance to fungal diseases. Calcium promotes the absorption of nitrogen, strengthens plantings, helping them withstand temperature fluctuations.

Phosphorus is important for all agricultural crops; it improves fruiting, increases crop resistance to temperature changes, and is the main element regulating grain quality.

Sulfur plays an important role in the formation of plant turgor and participates in metabolic processes, including photosynthesis.

Silicon allows plants to better survive stressful situations. Silicon gives mechanical strength to plants, strengthens cell walls, leads to an increase in leaf area, reduces the risk of crop lodging and damage by diseases and pests. Silicon also acts as a stimulator for the development of the root system.

Unfortunately, this type of waste, as in all countries producing phosphate fertilizers, negatively affects the environment, causing irreparable damage to the lithosphere.

Based on the above, the task was set to conduct research on the production of complexly mixed fertilizers based on nitric acid decomposition of phosphorites, phosphogypsum and glauconites from the Krantau deposit.

As is known, in the EU countries it is declared that complex fertilizers must contain a minimum nitrogen content of at least 3%, and P₂O₅ and K₂O at least 5% with a total content of nutritional components of at least 20%. The work [4] discusses the experience of developing and mastering the production of complex NPK fertilizer of the 6:11:11 brand with the following characteristics: P₂O₅_{tot} - 10.8%, P₂O₅_{assim} - 10.7%, P₂O₅_{wat} - 7.4%, P₂O₅_{free} - relative, N - 5.84%, K₂O - 11.17%, CaO - 17.3%, SO₃ - 32.9%.

The granules have a static strength of 31.2 kgs/cm². The fertilizer contains an increased amount of nutritional components and does not caking. When producing 1 ton of NPK fertilizer in kind, the need for fuel is reduced by more than 20% compared to the production of 1 ton of ammoniated superphosphate.

A similar study was carried out in [5], where to obtain phosphorus fertilizer enriched with additional nutrients, the process of decomposition of apatite concentrate with sulfuric acid was carried out with the addition of ammonium hydrogen phosphate in the 1st version, and ammonium and potassium hydrogen phosphates in the 2nd version.

Objects and methods of research. In this work, we studied the process of obtaining NPCa- and NPKCa-containing fertilizers based on the decomposition of phosphate raw materials with an incomplete norm of nitric acid, adding waste from the production of extraction phosphoric acid (EPA) - phosphogypsum and glauconite Krantau glauconite.

The following raw materials, composition, and weight were used for the experiments. %: phosphate rock from the Khodzhakul deposit: P₂O₅ – 10,45; CaO 19,35. MgO – 0,30; CO₂ – 4,03; Fe₂O₃ – 3,50; Al₂O₃ – 1,54; SO₃ – 1,10; F – 1,58; SiO₂ – 28,0; insoluble residue – 1,64; H₂O – 2.62. Krantau glauconite sands: SiO₂ - 68,91; CaO - 1,15; P₂O₅ - 0,15; CO₂ - 0,41; Al₂O₃ - 8,95; Fe₂O₃ - 5,59; FeO - 1,15; MgO - 1,25; K₂O - 2,89; Na₂O - 1,71; SO₃ - 0,24; TiO₂ - 0,44; MnO - 0,04; ZnO - 0.011; H₂O - 2,29. phosphogypsum, stored in dumps OJSC "Ammophos-Maxam": P₂O₅-1,15; SO₃ – 51,17; CaO-36,84; Fe₂O₃-0.094; insoluble residue – 15,0.

The experiments were carried out as follows. The calculated amount of nitric acid with a concentration of 56% was slowly poured into a thermostated glass beaker, in which there was a sample of phosphorite from the Khodzhakul deposit, at its rates of 5 to 50% of the stoichiometry for the formation of monocalcium phosphate. The duration of contact between the components of the reaction mixture was 30 minutes. After decomposition of phosphorite with nitric acid, the required amounts of phosphogypsum and glauconite were added. In this case, a thick mass is formed. Therefore, for the granulation process, the required amount of water was added. Granulation and drying of samples of wet masses was carried out by the method of intensive stirring and rolling.

Chemical analysis of the products for the content of various forms of P₂O₅ and CaO was carried out according to known methods [6]. The digestible form of P₂O₅ and CaO was determined by solubility as in citric acid. The pH of the product was determined after shaking its 10% aqueous suspension for an hour. The strength of the granules was determined according to GOST 21560.2-82 using an IPG-1 device. The results are shown in table. 1.

Results and discussion. Table data 1 show that with an increase in the rate of nitric acid and the addition of the mineral glauconite, the general form of P₂O₅ in products decreases. In terms of free acidity content, products obtained at a rate of 90 and 100% do not meet agricultural requirements.

Agrochemists and soil scientists consider an affordable phosphorus fertilizer to be one in which the content of the P₂O₅ form assimilable for plants is at least 50% of the total P₂O₅ form. Based on this, the optimal rate of nitric acid for processing phosphate rock is 20-30%, at which the relative content of the digestible form of P₂O₅ in products exceeds 50% (Table 1).

And the composition of activated products is as follows (weight, %): P₂O₅tot. – 3,53-6,80%; P₂O₅assim. by citric acid – 2,15-4,59 %; CaOtot. – 14,74-22,12%; CaOassim. – 9,83-18,22%. At the same time, the ratio P₂O₅assim. by citric acid: P₂O₅tot. = 54,98-82,55%.

It should be noted that the mineral glauconite added to mineral fertilizers contains microelements necessary for plants.

Thus, the resulting complex fertilizers are quite suitable as a complex fertilizer for application under the fallow land.

It should be noted that a sufficient degree of granule formation (at least 80-90%) and granule strength (≥ 2 MPa) were achieved in the reaction mass.

This product is not promising as a single phosphorus-containing fertilizer due to the low strength of the granules. But it is of interest as an intermediate product in the production of NPCa and NPKCa fertilizers. The product obtained by processing phosmuca at a nitric acid rate of 75% is also promising.

№	Nitric acid rate %	Quantity of phosphorite, g	Amount of phosphor - gypsum, r	Amount of glauconite, r	pH	N ₂ %	P ₂ O ₅ tot %	P ₂ O ₅ assim, %	CaO tot %	P ₂ O ₅ assim/ P ₂ O ₅ tot %	CaO assim %	CaOassim/ CaOtot %	Strength of granules, MPa
1	5	100	50		7,109	0,60	6,80	3,13	22,12	46,03	11,94	53,97	2,47
2		100	100		7,48	0,45	5,27	2,67	24,13	50,66	13,52	56,03	1,83
3		100	50	50	6,948	0,45	5,42	2,79	17,23	51,47	9,83	57,05	2,26
4		100	100	100	6,581	0,30	3,91	2,15	16,89	54,98	9,83	58,20	2,04
5	10	100	50		6,521	1,17	6,67	3,86	21,68	57,87	13,17	60,74	3,08
6		100	100		6,501	0,89	5,20	3,05	23,84	58,65	14,65	61,45	2,19
7		100	50	50	5,949	0,89	5,35	3,41	17,01	63,73	10,85	63,78	2,57
8		100	100	100	5,821	0,60	3,87	2,58	16,73	66,67	10,96	65,51	2,12
9	20	100	50		5,186	2,24	6,38	4,62	20,74	72,41	14,72	70,97	3,61
10		100	100		5,127	1,72	5,03	3,68	23,05	73,16	16,84	73,05	2,56
11		100	50	50	5,017	1,73	5,17	3,83	16,42	74,08	12,36	75,27	2,95
12		100	100	100	5,266	1,18	3,78	2,83	16,33	74,86	13,08	80,09	2,58
13	30	100	50		4,808	3,21	6,09	4,65	19,79	76,35	15,78	79,73	3,79
14		100	100		4,721	2,50	4,87	3,82	22,31	78,44	18,36	83,29	2,91
15		100	50	50	4,585	2,50	4,99	4,04	15,84	80,96	13,37	84,40	3,35
16		100	100	100	4,395	1,73	3,70	3,01	16,01	81,35	13,88	86,69	2,63
17	50	100	50		4,356	4,89	5,56	4,59	18,08	82,55	15,47	85,56	3,80
18		100	100		4,295	3,87	4,52	3,76	20,70	83,18	18,22	88,02	2,92
19		100	50	50	4,252	3,88	4,64	3,97	14,74	85,56	13,37	90,70	3,69
20		100	100	100	4,197	2,75	3,53	3,06	15,24	86,68	14,06	92,19	2,67

It should also be noted that a waste product from the production of EPA - phosphogypsum - has been added to the composition of complex fertilizers. These substances can serve as ameliorants for solonchaks soils.

Conclusions

The results of laboratory experiments convincingly indicate the fundamental possibility of obtaining PKCa- and NPKCa-fertilizers with good granule strength by mixing phosphogypsum or a mixture of phosphogypsum with glauconites with the products of nitric acid processing of Khodzhaikul nodule phosphate flour. The technology for producing these types of fertilizers can be carried out on the basis of equipment for the production of any type of phosphorus-containing fertilizers. The proposed method for new types of complex fertilizers will reduce the rate of nitric acid.

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Rezyume: *Argument: Xo'jako'l fosforitli tugunli unini (10,45% P₂O₅) nitrat kislota bilan qayta ishlash natijasida fosfogips va Krantau glaukoniti qo'shib olingan mahsulotlarning tarkibi o'rganildi. Nitrat kislota tezligining 5 dan 50% gacha oshishi bilan P₂O₅ ning hazm bo'ladigan shakllarining nisbiy tarkibi 46,03 dan 86,68% gacha ko'tarilishi ko'rsatilgan. Shu bilan birga, hosil bo'lgan mahsulotlarning granularining kuchi 1,83-3,80 МПа oralig'ida. Tarkibi va xossalari bo'yicha ular qishloq xo'jaligi talablariga javob beradi.*

Резюме: *Аргумент: Изучен состав продуктов, полученных при азотнокислотной переработке фосфоритовой комковатой муки Ходжакульского месторождения (10,45% P₂O₅) с добавлением фосfogипса и глауконита Крантау. Показано, что с увеличением нормы азотной кислоты от 5 до 50% относительное содержание усвояемых форм P₂O₅ увеличивается от 46,03 до 86,68%. При этом прочность гранул полученных продуктов колеблется в пределах 1,83-3,80 МПа. По составу и свойствам они отвечают требованиям сельского хозяйства.*

Kalit so'zlar: *Xo'jako'lning fosforit uni, azot kislotasi, kompleks o'g'itlar, ishlab chiqarish chiqindilari, fosfogips, glaukonitlar, NPCa- va NPKCa-o'g'itlari.*

Ключевые слова: *Фосфоритовая мука Ходжакульского месторождения, азотная кислота, комплексные удобрения, отходы производства, фосfogипс, глаукониты, NPCa- и NPKCa-удобрения.*

UDK 666.965

SILICATE MATERIALS BASED ON SAND DUNES OF THE ARAL SEA REGION

Muftullayeva M.B¹, Reymov A.M².

¹*Navoi Branch of the Academy of Sciences*

²*Karakalpak State University name after Berdakh*

Summary: *This article presents samples, experiments were conducted to determine the chemical composition, as well as the results of a study of the mineral properties of the loam of Karakalpakstan Uchsayskoye deposit.*

Key words: *ceramics, brick, loam, features.*

In Uzbekistan, dunes are a kind of dunes. They reach a height of 99 meters (sometimes more). They resemble a horseshoe or sickle in shape. In cross section, they have a long and gentle windward slope and a short steep leeward one. When there are no "horns", but the slopes are as asymmetric as those of single dunes. The crests of the chains are sinuous and usually perpendicular to the direction of the prevailing winds. The features of the dunes and their chains are clearly visible on aerial photographs. The most common are complex sands; consisting of various combinations of the forms discussed above. For example: lunkov-ridge, cellular-ridge (ridges predominate, on which and between them are holes or meshes); ridge-lunkovye, ridge-cellular (lunkovye or cellular sands predominate, but oriented ridges are visible between wells or meshes), etc. In explanatory inscriptions to complex sands, the forms prevailing in them The reliefs are given in second place, after the accompanying forms. The construction materials industry of the Republic of Uzbekistan uses only ceramic bricks as wall materials, which are produced by high-temperature firing and use clays as raw materials. Clay minerals are the main constituent and vital component of the soil, necessary for the existence of the plant world. Accordingly, the development of environmentally friendly, resource-saving, highly efficient technologies for the production of building materials based on the sand dunes of the Aral Sea region is very relevant. The purpose of the work is the rational use of the mobile sand dunes of the Aral Sea region in the national economy. Solving the main issues of production and application of autoclave-silicate materials based on sands. One of the widely produced silicate products based on lime-sand raw minerals is a silicate brick for production. The composition of the lime-sand mixture for the manufacture of autoclave silicate materials mainly consists of sand dunes (85-90%) and (10-15%) air lime, which is a waste product of the soda industry. The production of silicate bricks is characterized by a relatively simple technological process, a high level of mechanization and partial automation, the complexity of equipment, the possibility of using various types of sand and industrial waste. The duration of the production cycle is 5-10 times less, and capital and specific investments consumption of fuel and energy resources costs for the production of a unit of production are 1.5-2 times lower compared to similar indicators of work on the manufacture of ceramic bricks [1]. Silicate brick is an environmentally friendly material, at the same time resource-saving, since sand (85%) is mainly used for brick production, which is very affordable. According to technical and economic indicators, silicate bricks are superior to ceramic bricks. Its production requires 2 times less fuel, 3 times less electricity, 2.5 times less labor intensity of production; in the end, the cost of silicate bricks turns out to be 25-35% lower than ceramic ones. In terms of physical and mechanical properties, silicate bricks are 2-3 times superior to ceramic bricks (Table 1).

Table 1.

Physical and mechanical properties of silicate bricks depending on the composition of the charge

№	The composition of the mixture, %	Volume weight, kg/m	Water absorption, %	Compressive strength, MPa

1	Sand dune (10) + water (90)	8	2,6	11,3
2	Sand dune (15) + water (85)	7,6	3,3	11,5
3	Sand dune (20) + water (80)	7,9	3,1	11,9
4	Sand dune (25) + water (75)	7,7	2,7	13,5

The main binder components of autoclaved silicate materials are air lime and lime-belite binders, which are obtained on the basis of carbonate minerals. The Southern Aral Sea region is rich in carbonate rocks: limestones, chalk and marls, represented by 37 deposits. At the same time, these marls have not been practically studied and are not used in the national economy, although they could be excellent raw materials for the production of binders widely used, in particular, for the production of silicate blocks (wall materials), bricks, anti-filtration coatings on the side walls of channels, etc. In order to meet the growing needs for materials for housing, civil and cultural construction, the further development of autoclave materials production is of particular importance in the conditions of Central Asia. This is caused primarily by the fact that certain regions of Uzbekistan are without water or low-water areas, more than 1.5 million m³ of Portland cement-based concrete mix is consumed annually for anti-filtration measures. Especially in the conditions of Karakalpakstan, the issue of concreting canals, rivers and No. 7 (61) July 2019 drying lakes, which use expensive Portland cement, respectively increasing the cost of anti-filtration products, is acute. The increasing volume of construction and installation works in the field of water management facilities requires the maximum use of cheaper building materials based on local raw materials and industrial waste. Such materials are autoclave-silicate materials based on sand dunes and lime-belite binders (IBBS) obtained on the basis of local marls. These binders are high-quality substitutes for more expensive and inaccessible Portland cement in certain areas [2].

Binders (IBB) are obtained by low-temperature firing (900-11000C) of natural marls, marl or sanded limestones. The main components of lime-belite binders are free calcium oxide and β -bicalcium silicate. When using 70 lime-belite binder instead of air lime, the mechanical strength of autoclave hardening products increases significantly. After long-term storage of samples based on lime-belite binders, their physical and mechanical parameters become even higher. It was found that under conditions of hydrothermal treatment (temperature - 1750C, pressure - 0.8 MPa), the strength of the obtained lime-belite binders increases sharply. In the case of IBV1 without filler, it reaches 40.0-42.0 MPa, and with additives of soluble anhydrite – 45.0-47.0 MPa, and in IBV2, respectively, 43.0-45.0 and 50.0-51.0 MPa, which is due to the influence of the filler and acceleration of the formation of neoplasm and hydration structure formation in the system [3]. On the basis of lime-belite binders and sand dunes, it is possible to obtain autoclave hardening products with high physical and mechanical properties.

The introduction of silicate materials in the construction industry brings greater economic efficiency, due to the production of binders by waste-free, low-cost low-temperature hydrothermal treatment, respectively, the cost of materials will be lower, and the raw material base will be rationally used. Thus, the use of sand dunes as raw materials for the production of silicate materials leads to resource conservation of clay minerals and partial solution of environmental protection problems.

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Rezyume: Ushbu maqolada namunalar tanlab olindi, kimyoviy tarkibini aniqlash bo'yicha tajribalar o'tkazildi, shuningdek, Uchsay konining Qoraqalpog'iston hududidagi barhan qumining mineral xususiyatlarini o'rganish natijalari keltirilgan.

Резюме: В данной статье были отобраны пробы, проведены опыты по определению химического состава, а также представлены результаты изучения минеральных свойств барханского песка на территории Каракалпакстана Учсайского месторождения.

Kalit so'zlar: keramika, g'isht, barxan qum, xossasi

Ключевые слова: керамика, кирпич, барханный песок, свойства

APPLICATION OF HIGH-SILICON WASTE IN THE PRODUCTION OF ADDITIVE CEMENTS OF JSC UZMETKOMBINAT AND JV LLC «Uz-Shindong Silicon»

Iskandarov M.I., Akhmedova D.U.

Scientific laboratory and testing center "Strom" of the Institute of General and Inorganic Chemistry of the Academy of Sciences of the Republic of Uzbekistan, Tashkent

Summary: *This article provides information on the effect of adding microsilica metallurgy waste as an active mineral additive to cement up to 20%, as well as the results of its physical and mechanical properties and influence on the physical and chemical properties of cement.*

Key words: *metallurgical waste microsilica, active mineral additive, physical and chemical properties, cement additive, physical and mechanical properties.*

Active mineral pozzolanic additives have been purposefully used for many decades to modify Portland cement-based compositions to increase the strength, durability, impermeability and chemical resistance of the resulting materials and structures. One of the most active and widely used pozzolanic modifiers in the cement industry is ultra-dispersed ferrosilicon production waste, which is called microsilica (MS), "white soot", "silica ash", etc. It contains up to 95% pure amorphous silica, which is microscopic spherical particles with an average specific surface area of about 20 sq. m/g and a size of 0.01–0.1 μm , which is 100 times smaller than the average grain size of cement [1–3]. This highly active mineral additive consists mainly of silicon oxide with an admixture of aluminum, iron, calcium, magnesium, potassium, carbon, and sulfur oxides. When introduced into the composition of Portland cement, it exhibits the ability to actively react with lime, released during hydrolysis of C_3S hydration and hardening of Portland cement (PC) with the formation of water-insoluble hydrate compounds of the type calcium hydrosilicate CSH (I) according to the reaction: $\text{SiO}_2 + \text{Ca}(\text{OH})_2 + n\text{H}_2\text{O} = (1-1.5) \text{CaO} \cdot \text{SiO}_2 \cdot (0.5-2.5) \text{H}_2\text{O}$. As a result, an additional amount of calcium silicates is formed in the "cement - water" system and a constrained state is created due to the involvement of the active part of the siliceous additive in the process of forming the structure of cement stone, thereby giving this structure increased density and strength during hardening of cement. In addition, the addition of ultrafine silica increases the degree of hydration of cement and thereby improves the technological and operational properties of concrete. Laboratory studies on the use of MS as an active additive for concrete, conducted by M.S. Dubensky and A.A. Kargin, S.A. Emralieva showed that the relationship between the amount of the additive introduced and the increase in the strength of the mortar and concrete stone is linear. With an increase in its introduction in the amount of 5 to 25%, a gradual increase in the compressive strength of concrete was noted, which, with a dose of MS of 25%, almost 2 times exceeds the strength of concrete on pure PC [4, 5].

In Uzbekistan until 2016 there was no production of ferrosilicon, and therefore, the issue of recycling waste - microsilica (MS) - did not arise. In 2017 in the city of Angren, a plant for the production of ferrosilicon from local quartz rocks was put into operation JV Uz-Shindong Silicon LLC, where, along with the main products, 9-10 tons of MK are generated daily, and during the year its amount reaches about 3.3 thousand tons. If we take into account that on the territory of Uzmetkombinat JSC there is also a ferrosilicon production plant with a capacity of 15 thousand tons per year, then the total volume of waste in the form of MS exceeds 10 thousand tons per year, which poses a solution to environmental problems associated with the disposal of MS waste for ferrosilicon manufacturers. In this direction, in the testing laboratory of the Scientific and Research Center "Strom" of the Institute of General Chemistry of the Academy of Sciences of the Republic of Uzbekistan, comprehensive studies are being conducted to determine the physical, chemical and technological properties of MK and its influence on the process of hydration and hardening of PC.

From the data in Table 1 it follows that the chemical composition of the MS JV LLC Uz-Shindong Silicon is represented by a predominant content of silicon oxide (SiO_2) in the amount of 89.86%, in small quantities there are oxides of aluminum - 0.97%, calcium CaO - 1.41%, magnesium

MgO - 0.34%, iron Fe₂O₃ - 0.38%, sulfuric anhydride SO₃ - 0.73% and alkaline oxides R₂O - 2.62%, which indicates the presence in the composition of the original sand of impurities of aluminosilicate compounds, calcium and magnesium carbonates, feldspar, gypsum, etc.

Table 1. Chemical composition of starting materials

Name of material	Mass fraction of oxides, %								
	Losses during calcination	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	CaO	MgO	SO ₃	R ₂ O	others
PC clinker JSC "Bekabadcement"	17.04	50.25	7.90	2.70	11.26	1.77	0.51	-	8.64
MS JV LLC "Uz-Shindong Silicon"	3.24	89.86	0.97	0.38	1.42	0.34	0.73	2.62	0.44
Microsilica JSC "Uzmetkombinat"	2.61	92.70	0.76	1.08	0.28	0.22	0.37	1.58	0.42
Gypsum stone	H ₂ O at 400°C 19.1	1.52	0.13	0.14	33.04	0.20	43.46	-	2.55

Chemical composition of MS JSC Uzmetkombinat differs from MK of JV LLC Uz-Shindong Silicon by a higher content of silicon dioxide SiO₂ (92.7%) with small impurities of other oxides: (CaO-0.28; Al₂O₃-0.76; Fe₂O₃-1.18; MgO-1.20; R₂O-1.54; etc. - 0.42)%. In terms of SiO₂ content, the presented MK samples comply with the requirements of StateST Uz 901-98 "Additives for cements. Active mineral additives and filler additives. Specifications" imposed on siliceous filler additives for cement. Ultradispersed MK contains mainly X-ray amorphous SiO₂. It contains impurities of crystalline silica and calcium-magnesium aluminosilicates Ca (Fe, Mg, Al) Si₂O₆. The study of the MS structure showed that in the same section of the MC under study, the percentage content of each element has a slight difference. For example, the content of various elements in three MS samples is: Ca - (16; 15; 18)%, O - (58.2; 56.2; 57.0)%, Si - (37.7; 36.1; 37.7)%, etc., which is apparently due to the inconsistency of the chemical composition of the quartz-containing raw materials supplied to the plant for processing. When calculating the Student criterion, the value $t = 13.47 > 2.07$ was obtained, which characterizes MS as an active mineral additive.

In obtaining additional cements with the addition of MK, Portland cement clinker and gypsum rock, in the ratios given in Table 2, were subjected to joint grinding to a fineness estimated at 10-12% residue on sieve No. 008. The content of gypsum rock in the batch was constant (5%), and the amount of PC clinker varied in the range (75-90%) taking into account the amount of MS introduced after grinding (5-20%).

Table 2. Effect of MS on the strength properties of Portland cement

Name and ratio of components (mass%):			W/C	The ultimate strength of samples under bending/compression (MPa), through:		
Clinker	Gypsum	MS		3 days	7 days	28 days
MS JV LLC "Uz-Shindong Silicon"						
95	5	-	0.39	4.0/20.5	4.6/28.8	6.3/41.2
90	5	5	0.38	5.1/22.7	6.1/32.1	7.9/48.5
88	5	7	0.40	5.5/25.4	6.2/35.5	9.1/47.5
85	5	10	0.41	5.4/18.7	5.8/32.5	8.7/55.3
80	5	15	0.41	4.9/17.4	5.5/27.5	6.6/47.3

75	5	20	0.41	4.2/16.7	4.3/22.5	2.8/45.5
MS JSC "Uzmetkombinat"						
95	5	-	0.37	4.9/17.2	5.2 /29.6	7.0/41.3
90	5	5	0.30	4.9/19.1	5.2 /29.9	7.3/41.4
85	5	10	0.32	5.2/19.1	5.5/30.6	7.4/45.8
80	5	15	0.34	3.9/12.7	4.7/26.7	6.2/36.7
75	5	20	0.36	3.4/12.7	4.4/21.8	6.3/32.8

It was found that introduction of up to 20% MS of Uz-Shindong Silicon JV LLC has a positive effect on the physical and mechanical properties of PC, increasing its strength both in bending and in compression. The difference in the strength indicators of cement without additives and cement with the addition of 5% MS by the 28th day is 1.6 MPa in bending. Increasing the amount of MS to 7% in the initial period sharply increases the strength of PC, and by the 28th day it remains at the level of cement with 5% MS. With an increase in the MS dose, the picture of formation of strength indicators of additional cement sharply changes in the opposite direction, i.e. in the initial period (3 days) a decrease in the strength indicators of the samples is noted, and by the 28th day - their sharp increase both in bending (9.92 MPa) and in compression (59.89 MPa). With a further increase in the MS content to 15-20%, some decrease in the strength indicators of additive cements was noted, however, they are significantly higher (55.4-56.8 MPa) than those of non-additive PC (43.1 MPa). Apparently, such an effect is achieved by filling the pores of the cement stone with spherical microparticles of MS and hydrosilicate gel, additionally formed in the process of hydration of the additive cement and a decrease in the capillary porosity and permeability of the cement stone, and it is known that the increased density and low permeability of the cement stone ensures its high resistance to the effects of frost and aggressive mineral salts.

MS of JSC Uzmetkombinat, in a dose of 5% does not reduce the strength indicators of cement stone and they remain at the level of non-additive PC during all periods of hardening, and in an amount of 10% by 7 and 28 days of hardening, an increase in the strength of cement stone is noted. A further increase in the MK content in cement to (15-20)% per 1 brand reduces its strength, which is explained by a higher content of amorphous SiO_2 in MS of JSC Uzmetkombinat, which has a plasticizing effect and, reducing the water demand of the cement mortar, slows down the process of hydration of C_3S with the release of $\text{Ca}(\text{OH})_2$.

Thus, the fundamental possibility of obtaining additional PC grades 400-500 with the addition of ultrafine MS has been established, for the implementation of which the Organization Standard OS 00186200-12:2019 "Condensed microsilica. Technical conditions" was developed and put into effect by the order of JSC Uzmetkombinat.

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Rezyume: Ushbu maqolada metallurgiya chiqindisi mikrokremnezemni tsementga faol mineral qo'shimcha sifatida 20 % gacha qo'shib, tsementning fizik-kimyoviy xossasiga tasiri va fizik-mexanik ko'rsatkichlari natijalari o'rganilganligi xaqida ma'lumot berilgan

Резюме: В данной статье приведены сведения об эффекте добавления отхода металлургии микрокремнезема в качестве активной минеральной добавки в цемент до 20%, а также результаты его физико-механических показателей и влияния на физико-химические свойства цемента.

Kalit so‘zlar: metallurgiya chiqindisi mikrokremsnezem, faol mineral qo‘shimcha, fizik-kimyoviy xossasi, tsementga qo‘shimcha, fizik-mexanik ko‘rsatkichlari

Ключевые слова: отхода металлургии микрокремнезем, активная минеральная добавка, физико-химические свойства, добавка в цемент, физико-механические показатели.

**EMISSIONS OF CO₂ AND TOXIC GASES FROM POWER PLANTS AND THEIR
IMPACT ON THE ENVIRONMENT**

Rakhmonov I.U¹., Usmanaliev S.U²., Uzakov N.Ch¹., Najimova A.M³.

¹*Tashkent State Technical University named after Islam Karimov, Tashkent, Uzbekistan*

²*“Thermal power plants” JSC*

³*Karakalpak State University named after Berdakh*

Summary: This article, the principles of how and where CO₂ and toxic gases are generated in thermal power plants are illustrated through diagrams, with a detailed discussion on methods to achieve emissions reduction of CO₂ and toxic gases. Additionally, the impact of each pollutant gas on living organisms and the environment is thoroughly presented through their characteristics. The article concludes with information on implementing renewable energy sources to reduce the impact of CO₂ on the environment.

Key words: Thermal power plants, greenhouse gas emissions, Net-zero emissions, Fuels, Forecast, Atmosphere, Methods, Carbon neutrality, Renewable energy sources, Pollutants, Nitrogen oxides, Nitrogen dioxide, Sulfur dioxide, Carbon monoxide, Dust, Ammonia, Ozone, PM₁₀, PM_{2.5}, harmful gases.

According to the International Energy Agency (IEA), in 2022, global CO₂ emissions related to energy increased by 0.9% or 321 Mt, reaching a new record high of over 36.8 Gt. Currently, oil and gas operations account for nearly 15% of global energy-related emissions, equivalent to 5.1 billion tons of greenhouse gas emissions. In the IEA's scenario for achieving net-zero emissions by 2050, the emission intensity of these activities is expected to decrease by 50% by the end of the decade. Along with a reduction in oil and gas consumption, this will lead to a 60% decrease in emissions from oil and gas operations by 2030.

Forecast of total emissions of oil and gas fuels for 2022-2030.

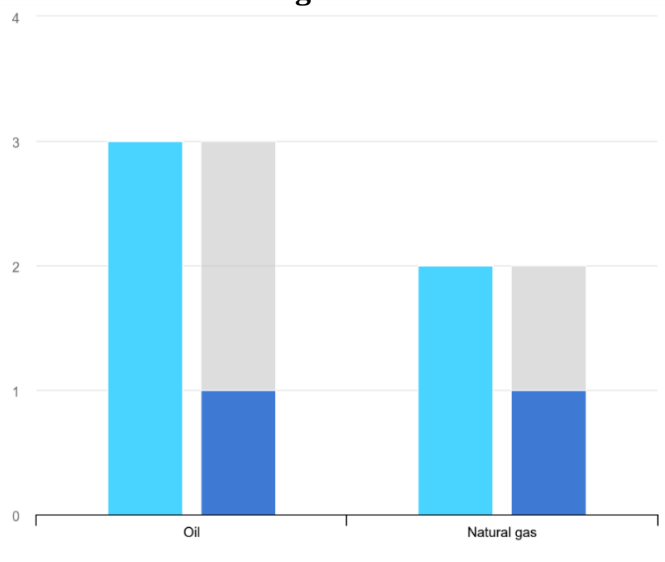


Figure 1. Forecast of fuel emissions.

When analyzing the composition of CO₂ emissions by sources from 1990 to 2021, it can be noted that 79.1% of all emissions come from gas, while 9.7% from oil, 6.6% from coal, and 4.6% from the combustion of other gases, resulting in CO₂ emissions being released into the atmosphere (Figure 2).

CO₂ emissions by source during 1990-2021 (billion tons)

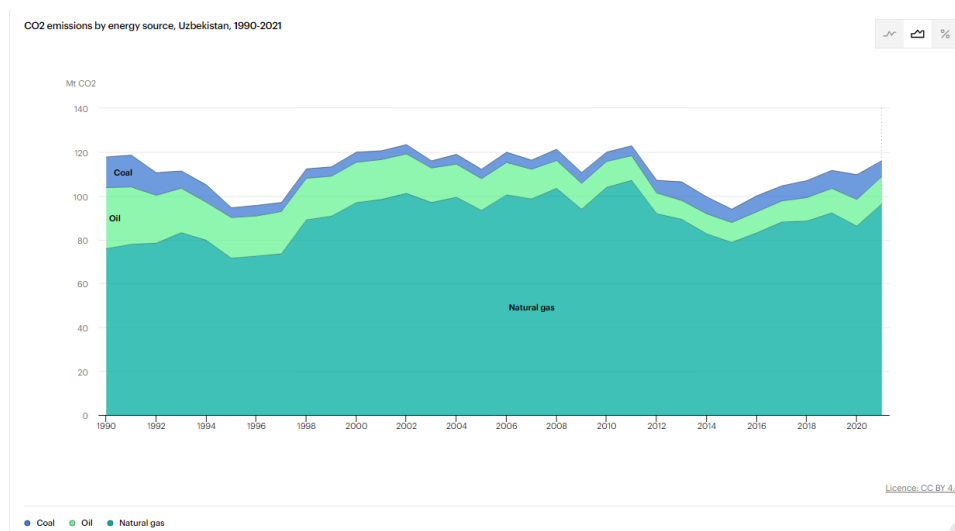


Figure 2. Volume of CO2 emissions by source.

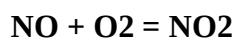
Considering the change dynamics from 2010 to 2021, it can be noted that CO2 emissions have increased from all sources. The largest increase was recorded for gas, rising from 85.2 million tons in 2010 to 96.2 million tons in 2021. For coal, emissions increased from 5.2 million tons to 8.1 million tons, while cement emissions rose from 2.9 million tons to 4.7 million tons. It is worth noting that the smallest increase (0.9 million tons) was observed for oil, which grew from 10.9 million tons in 2010 to 11.8 million tons in 2021[1,2].

Currently, there are three main methods to achieve carbon neutrality:

1. Directly reducing emissions and transitioning to renewable energy sources – hydropower, solar energy, wind energy;
2. Capturing CO2 from the air;
3. Compensating by investing in projects that reduce carbon emissions.

In thermal power plants, the concentration of major pollutants measured at stationary monitoring points includes nitrogen oxides (NO), nitrogen dioxide (NO2), sulfur dioxide (SO2), carbon monoxide (CO), suspended particles (dust), as well as ammonia (NH3) and ozone (O3) (Figure 3).

Nitric oxide (NO) is a colorless, odorless, highly reactive gas that is harmless to humans on its own, classified as a risk level 3. However, when sunlight warms the air, nitric oxide transforms into the more hazardous nitrogen dioxide (NO2) through photochemical oxidation (Formula 1).



Formula 1. Nitrogen dioxide.

Nitrogen dioxide (NO2) is a reddish-brown gas that forms "fox tail," classified as a risk level 2 substance. Major anthropogenic sources include high-temperature combustion processes in thermal power plants, industrial facilities, and vehicle engines using various fuels (natural gas, coal, gasoline, diesel).

Nitrogen oxides play a crucial role in photochemical processes in the troposphere under the influence of solar radiation, often leading to the formation of photochemical smog, high concentrations of ozone and formaldehyde at the surface, and acid rain.

The effects of nitrogen oxides on humans can lead to dysfunction of the lungs and bronchi, increased sensitivity to respiratory infections, and asthma attacks. Children and adults with cardiovascular diseases are more susceptible to the effects of nitric oxide.

Sulfur dioxide (SO2) is a colorless gas with a distinctive sharp odor (the smell of burning sulfur), classified as a risk level 3 substance. Major sources include emissions from ferrous and non-ferrous metallurgy, as well as the production of ceramics, caprolactam, linoleum, roofing felt, glass,

polystyrene, mineral fiber boards, food, textiles, and paper industries, as well as thermal power plants (TPPs, state power stations, and boilers).

At concentrations above the maximum permissible levels, the effects of sulfur dioxide can significantly increase the incidence of various respiratory diseases, affecting the mucous membranes and leading to inflammation of the nasopharynx, bronchitis, coughing, hoarseness, and throat pain. High sensitivity to sulfur dioxide is particularly observed in individuals with chronic respiratory conditions and asthma.

High concentrations of sulfur dioxide can cause serious harm to plants. Acute damage from sulfur dioxide manifests as white spots on broadleaf plants (especially spinach, lettuce, cotton, and alfalfa) and pine needles. The effect of SO₂ on soil reduces its fertility due to acidification. Additionally, the presence of sulfur dioxide accelerates the corrosion of metals in the air.

Carbon monoxide (CO) is a colorless, odorless gas, also known as carbon oxide, classified as a risk level 4 substance. It is produced as a result of the incomplete combustion of fuels (coal, gas, oil) under conditions of oxygen deficiency and at low temperatures.

Of all carbon monoxide emissions, 63% come from the energy sector, 21% from the metallurgy industry, 11% from the transportation system, and 5% from the construction industry. Extreme concentrations are often observed in areas with increasing anthropogenic loads: during peak traffic hours or under conditions that promote inversion, which hinders air circulation.

When inhaled, carbon monoxide forms strong complex compounds with hemoglobin in human blood, blocking the flow of oxygen. This can lead to headaches, nausea, and at high concentrations, it can be fatal.

Ammonia (NH₃) is a colorless gas with a sharp, distinctive odor (the smell of ammonia), classified as a risk level 4 substance. It is produced during the decomposition of organic compounds containing nitrogen.

Anhydrous ammonia gas is lighter than air and therefore rises, typically dispersing and not accumulating in low-lying areas. However, at high relative humidity, anhydrous ammonia can form heavier vapors that may accumulate at ground level or in depressions.

Approximately 80% of the ammonia produced industrially is used as fertilizer in agriculture. Ammonia is also utilized in refrigeration, the production of plastics, explosives, textiles, pesticides, paints, and other chemical products. It is present in many household and industrial cleaning solutions. Household products containing ammonia are produced with 5-10% ammonia, while industrial solutions may have concentrations as high as 25%, making them caustic.

Exposure to high concentrations of ammonia in the air can cause a burning sensation in the nose, throat, and respiratory tract, potentially leading to respiratory damage. Inhalation at lower concentrations can result in coughing and irritation of the nose and throat. The odor of ammonia serves as an early warning of its presence, but its intensity may diminish, reducing the ability to detect it at lower concentrations.

Ammonia reacts immediately upon contact with moisture on the skin, eyes, mouth, and respiratory surfaces, potentially causing chemical burns.

Ozone (O₃) is a gas that exists both in the upper layers of the atmosphere and at ground level, classified as a risk level 1 substance.

Depending on its location in the atmosphere, ozone can be "good" or "bad" for the environment and human health. Stratospheric ozone protects life on Earth from harmful ultraviolet radiation from the sun. However, tropospheric ozone is a pollutant and a major component of urban smog, making it harmful to breathe.

Ozone at ground level (in the troposphere) is formed through chemical reactions driven by solar radiation, with higher concentrations likely occurring during warm seasons. Breathing ozone can lead to coughing, shortness of breath, and irritation of the respiratory tract. Children and the elderly, particularly those with lung diseases, are especially sensitive to ozone exposure.

Suspended particulate matter (dust) is a widespread air pollutant, consisting of a mixture of solid and liquid particles in suspension. Suspended particles include fine particles such as PM10 and PM2.5.

PM10 and PM2.5 are fine particles with diameters less than 10 microns (PM10) and 2.5 microns (PM2.5), which remain suspended in the air. They are generated from construction, manufacturing (especially cement, ceramics, brick production, etc.), road surface erosion, and the friction of brake pads and tires, as well as the combustion of solid fuels (coal, oil).

In large cities, PM2.5 particles are constantly present in the air, and people inevitably breathe them in. If more harmful particles enter the body than are expelled on a daily basis, they accumulate in the body. The main risk of PM2.5 is not the sharp changes in concentration, but the chronic exposure of these particles to the body. Symptoms of "poisoning" from PM2.5 can develop insidiously.

The average urban resident breathes in about 200 billion PM2.5 particles each day, with half of them accumulating in the lungs. Such exposure can occur without severe immediate consequences; however, over time, PM2.5 levels in the body can exceed critical thresholds[3,4].

This leads to an increased risk of respiratory and cardiovascular diseases, such as asthma, respiratory illnesses, and elevated mortality rates from cardiovascular issues, respiratory diseases, and cancer.

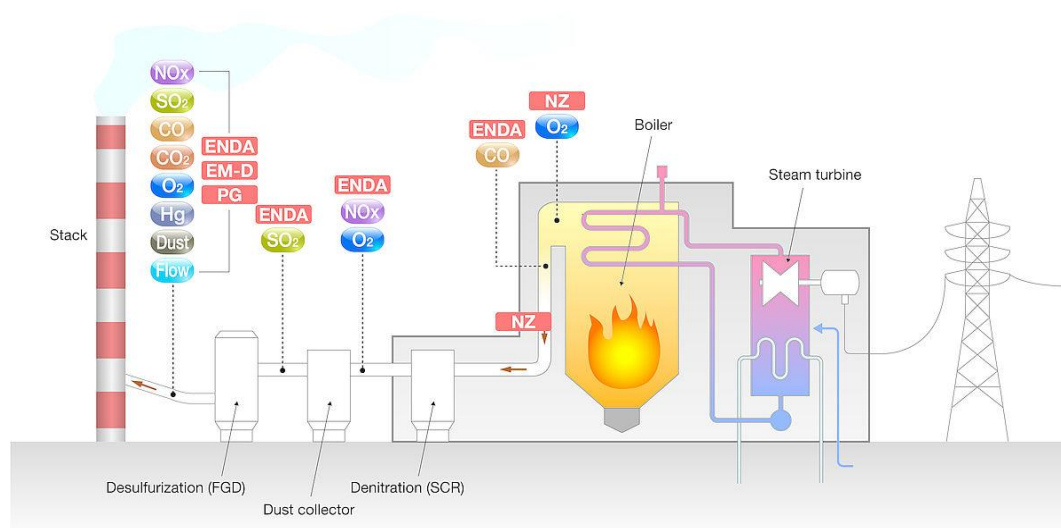


Figure 3. Harmful gases released during the production of electricity from a thermal power plant.

Today, the production of clean electrical energy, the reduction of carbon dioxide (CO₂) emissions, and achieving zero emissions have become key issues for many countries, particularly in fulfilling the Paris Agreement. As a result, numerous scientific studies are being conducted in many countries to reduce CO₂ emissions.

Uzbekistan has set a goal to rapidly develop renewable energy sources and transition to a carbon-free energy sector. According to adopted documents, by 2030, the country aims to reduce greenhouse gas emissions by 35% compared to 2010 levels, increase the installed capacity of renewable energy sources to 15 GW, and raise their share in total electricity generation to over 30%. Additionally, it plans to improve energy efficiency in industry by at least 20%[5].

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Rezyume: Ushbu maqolada, issiqlik elektr stansiyalarida CO₂ va toksik gazlar qanday va qayerda hosil bo'lish prinsiplari diagrammalar orqali ko'rsatilgan, shuningdek, CO₂ va toksik gazlarning chiqindilarini kamaytirish usullari haqida batafsil muhokama qilingan. Har bir ifloslantiruvchi gazning tirik organizmlar va atrof-muhitga ta'siri ularning xususiyatlari orqali batafsil taqdim etilgan. Maqola, shuningdek, CO₂ ning atrof-muhitga ta'sirini kamaytirish uchun qayta tiklanadigan energiya manbalarini joriy etish haqida ma'lumot bilan yakunlanadi.

Резюме: В данной статье принципиально рассматриваются способы и места генерации CO₂ и токсичных газов на тепловых электростанциях с иллюстрациями в виде диаграмм, а также подробно обсуждаются методы снижения выбросов CO₂ и токсичных газов. Кроме того, подробно представлены воздействия каждого загрязняющего газа на живые организмы и окружающую среду через их характеристики. Статья завершается информацией о внедрении возобновляемых источников энергии для уменьшения воздействия CO₂ на окружающую среду.

Kalit so'zlar: Issiqlik elektr stansiyalari, issiqxona gazlari chiqindilari, nolga teng chiqindilar, yoqilg'ilar, prognoz, atmosfera, usullar, karbon neytrallik, qayta tiklanadigan energiya manbalari, ifloslantiruvchilar, azot oksidlari, azot dioksidi, sulfid dioksidi, karbon oksidi, chang, ammiak, ozon, PM₁₀, PM_{2.5}, zararli gazlar.

Ключевые слова: Тепловые электростанции, выбросы парниковых газов, нулевые выбросы, топлива, прогноз, атмосфера, методы, углеродная нейтральность, возобновляемые источники энергии, загрязнители, оксиды азота, диоксид азота, диоксид серы, угарный газ, пыль, аммиак, озон, PM₁₀, PM_{2.5}, вредные газы.

UDC 677.055.5

METHOD OF PRODUCING DOUBLE-LAYER DOUBLE-SIDED PLUSH KNITTED FABRIC WITH HIGH HEAT-INSULATING PROPERTIES

Allamuratova T.K.

Karakalpak State University named after Berdakh

Summary: *in order to produce knitwear with high heat-protective properties and increased dimensional stability, a structure and method for producing a new double-layer knitwear with plush loops inside the fabric based on the jersey smooth surface have been developed. The knitwear weave pattern of the new structure contains two rows of plush weave connected by broaches, forming a double-layer knitwear. As a result, the plush broaches are folded inside the fabric, which improves the bulk density and heat-protective properties of the knitwear.*

Key words: *double-layer knitwear, jersey smooth surface, plush, knitting machine, loop-forming system.*

Introduction. Knitwear production technology, i.e. the process of processing textile threads into knitwear, can have a significant impact on the quality of knitwear by appropriate selection of raw materials for knitwear of a given purpose, choice of weave and optimal parameters of the loop structure, as well as the use of finishing. Along with the threads used to make knitwear, weave is its most important quality characteristic and determines the properties of knitwear: stretchability, unraveling, surface density, thickness, dimensional stability, etc.

Knitwear is a system of threads bent into loops. The arrangement of loops in knitwear and the connections between loops can be very diverse and are determined by the knitwear weave [1].

Currently, when producing knitted fabrics and products, double-layer weaves are often used, which allow for all sorts of patterned effects and modification of the knitwear structure and properties. Knitwear with double-layer weaves can be obtained on knitting machines of all types. Knitwear with double-layer weaves from reverse and modern flat knitting machines is especially widely used.

The issues of expanding the range and improving the quality of double-layer knitwear, creating new structures and developing effective methods for knitting knitwear with optimal parameters are currently being studied by many researchers both in our country and abroad [2-4].

Knitwear is characterized by a large variety of weaves; using different weaves, it is possible to obtain knitwear with different properties, patterned or structural effects. Double-layer knitwear is formed by combining main, derivative and patterned weaves. Such combinations can have an unlimited number of options, which depend on the purpose of the knitwear, the required properties and the patterned effect that needs to be obtained.

Knitwear produced from ground threads by any main, derivative or patterned weave with additional threads or bundles of staple fibers knitted into the ground, forming enlarged platinum arcs or pile pulls, is called knitted plush weaves.

The most important feature of the plush knitwear structure is the method of fixing the plush thread to the knitwear ground. The quality of the knitwear, its appearance, the consumption of raw materials during production, etc. depend on this indicator.

Plush knitwear can be obtained on the basis of main, derivative, patterned and combined weaves. Plush knitwear on the basis of main weaves is obtained by introducing an additional thread into the structure of the knitwear of the derivative satin weave and the derivative rib weave [5-7].

Changing the structure of the knitwear of the base weave, i.e. the production of plush knitwear on the basis of various main, derivative, patterned and combined weaves, mainly affects the physical and mechanical properties of plush knitwear. And the creation of a patterned effect on the fabric is achieved by using additional threads of different colors, alternating the plush surface with a smooth surface on the fabric, forming broaches of different heights on the fabric and broaches using

additional threads of different colors, etc. Plush knitwear belongs to the class of knitted weaves that have high heat-protective properties. The main factors determining the thermal properties of knitwear are its thickness. With an increase in the thickness of the knitwear, its thermal resistance increases proportionally. Research work on increasing the thickness of plush knitwear is carried out in two directions: increasing the pile height of one-sided plush knitwear; production of knitwear with double-sided pile.

Double-sided plated plush knitwear, produced on the basis of the main weaves, is obtained by introducing a plush thread into the structure of the satin, rib and purl satin.

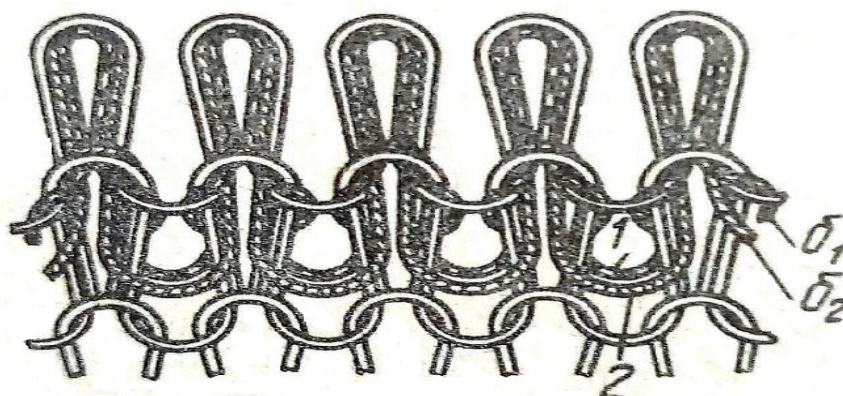
The advantages of producing plush knitwear are the simplicity of obtaining both loop and cut plush and the high productivity of the equipment. When producing plush knitwear, it is easy to regulate the consumption of raw materials, the thickness of the knitwear by changing the length of the plush broaches, and also to reproduce various patterns on the fabric, using raw materials with different properties and different colors [8].

As is known, to obtain plush knitwear on all knitting machines, it is necessary to lay ground and plush threads on the needles.

The process of laying a plush thread on different machines occurs differently depending on the knitting conditions and the design of the machine. Since the double-sided plush has plush drawstrings on both sides of the knitwear, the plush thread must be laid on the needles of one or the other needle bed, while maintaining the parameters of feeding the plush threads. The parameters of feeding the plush thread are the needle and loop angles. The parameters of feeding the plush thread depend mainly on the location of the break line for knitting this thread.

It is known that from the structure of double-sided plush knitwear, plush broaches come out on both sides, in connection with which the break line for the plush thread knitting should be on both needle beds, as well as for ground ones. To obtain plush broaches of the same size on both sides of the knitwear, the depth of their knitting should be the same [9].

Another direction in the field of producing knitwear with high heat-protective properties is obtaining knitwear with double-sided pile. The production of plated plush knitwear with double-sided arrangement of plush broaches significantly expands its range. One of such structures of double-sided plush knitwear, obtained on the basis of smoothing, is proposed in the work. The structure of the knitwear is shown in Pic. 1, where 1 is a plush broach from the front side, 2 is a plush broach from the back side. [10,11].



Pic. 1. Structure of double-sided plush knitwear

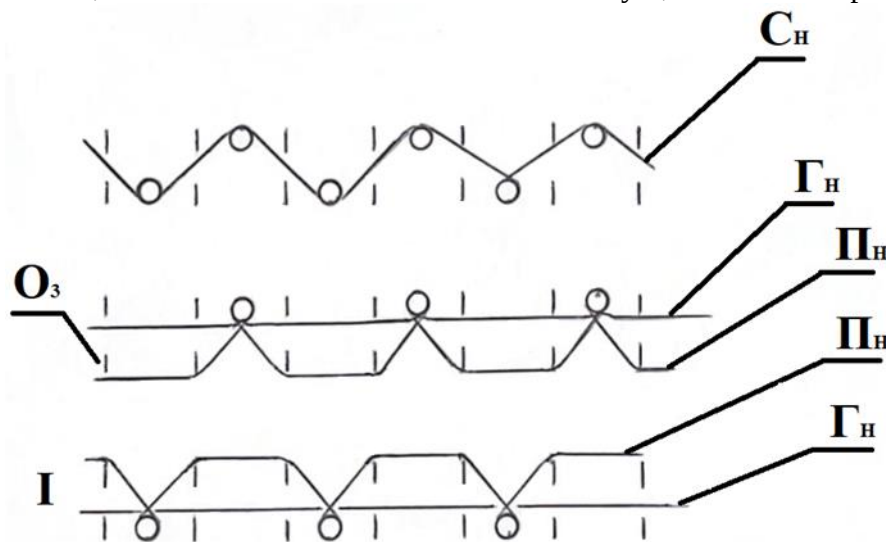
It is evident that these ivy broaches are arranged symmetrically relative to the base weave. As for the ivy threads σ_1 and σ_2 , which respectively form ivy broaches 1 and 2, they are laid simultaneously with the ground thread a_1 , forming together with it the loops of the base weave. For this purpose, the machine has a special sinker with three necks. One neck of the sinker serves for laying and knitting the ground thread a , the second is intended for the ivy thread σ_2 , which forms ivy broaches 2 on the back side, and the third is for the ivy thread σ_1 , which forms ivy broaches 1 on the front side of the knitwear. The threads are brought under the needle hook in the following order: the first to be brought out is the ivy thread σ_1 , the second is the ivy thread σ_2 , and the third is the ground

thread a. After the formation of the ivy loops, the ivy threads 1 are transferred to the front side of the fabric under the action of the flow directed at it and form a pile surface on the front side of the knitwear.

The disadvantage of this method of producing double-sided ivy knitwear is that the height of the ivy broaches is different on the front and back sides. The decrease in the height of the front ivy broaches occurs as a result of their transfer from the back side to the front side. The front ivy broaches, due to the elasticity of the thread, will tend to move back to the back side of the knitwear. The appearance of the fabric from different sides will be different: if the pile on the back side is constant and stable, then on the front side its density will be less and uneven. The method is unreliable and difficult to feel.

Experiment result found discussing. In order to produce knitwear with increased shape stability and high heat-protective properties, developed a structure and method for producing a new double-layer double-sided plush knitwear based on reverse stitch, where the interlacing rapport contains two rows of plush weave, since the connecting thread made of lycra connecting both rows makes it possible for the plush broaches to be inside the fabric [12].

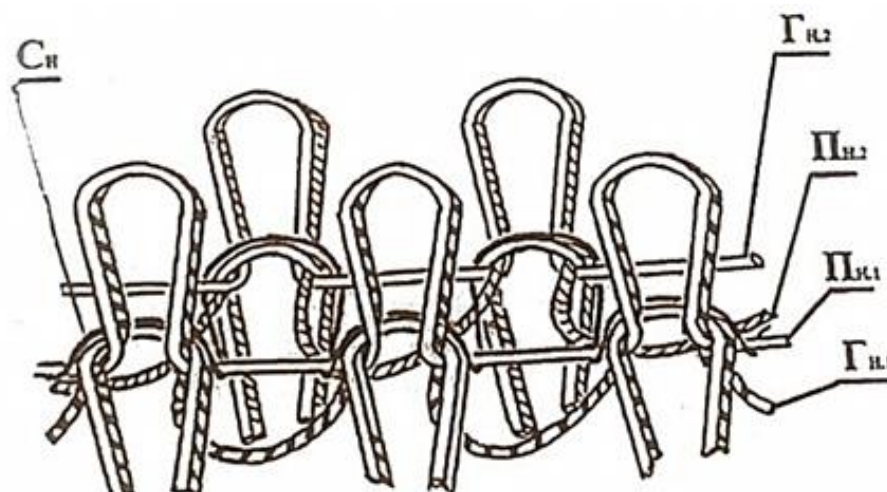
Pic. 2 shows a graphic representation of a double-layer, double-sided plush knitwear inside a fabric based on purl stitch; Pic. 3 shows the structure of a double-layer, double-sided plush knitwear.



Pic. 2. Graphic recording of double-layer double-sided plush knitwear

The graphic record shows that with the first loop-forming system, an ivy row is knitted from the ground thread Γ_H and from the ivy thread Π_H , while the ivy broaches are formed on the second needle bed of the machine from cotton yarn (I system), the needles on both needle beds are staggered in an elastic rapport. In the second input of the loop-forming system of the machine, the ground thread Γ_H together with the ivy thread Π_H are knitted on the second needle bed (II system), and the ivy broaches are formed on the beater teeth O_3 of the first needle bed, thus the ivy row is knitted on both sides of the knitwear on the basis of the purl surface. After each knitted ivy row, the ivy broaches are dropped using a remover. In the reverse input of the loop-forming system III, a connecting thread C_H is laid on the needles of both needles from lycra thread, which connects both rows of weaving, while the plush broaches are laid inside the pallet, forming a double-layer double-sided plush knitwear of a new structure (Pic. 2).

Double-layer double-sided plush knitwear (Pic. 3) contains ground thread $\Gamma_{H.1}$ and ivy thread $\Pi_{H.1}$, from which the first ivy row is knitted, the second ivy row also consists of ground thread $\Gamma_{H.2}$ and ivy thread $\Pi_{H.2}$. Connecting thread C_H , from lycra thread, in turn connecting both rows makes it possible for the ivy broaches to be inside the fabric.



Pic. 3. Structure of double-layer double-sided plush knitwear

Conclusion. Double-layer double-sided plush knitwear of a new structure based on the reverse surface, consisting of plush threads inside the fabric on both sides of the knitwear increases the volume surface, shape stability, increases heat-protective properties, also in this weave the fastening of plush threads increases, which improves the quality of the knitwear its operational requirements. The production of double-layer double-sided plush knitwear on circular and modern flat knitting machines does not require design changes.

The proposed method is easy to implement and does not reduce the productivity of the machine.

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Rezyume: *issiqlik va shakl saqlash xususiyati yoqori bulgan trikotaj ishlab chiqarish mahsadida kundalang glad asosida mato tarkibida tukli halqali yangi ikki qatlamli trikotajning tuzilishi va olish usuli yaratildi. Yangi tuzilishdagi trikotajning o'rilish rapporti ikki qatlamli trikotajni hosil qiladigan, protyajka bilan bog'langan ikki qator tukli o'rilishdan tarkib topgan.*

Natijada tukli protyajka mato ichkarisida joylashib, trikotajning hajm zichligini kamayttirib, issiqlik saqlash xususiyatini yaqshilaydi.

Резюме: с целью выработки трикотажа с высокими теплозащитными свойствами и повышенной формоустойчивостью разработаны структура и способ получения нового двухслойного трикотажа с плюшевыми петлями внутри полотна на базе кулирной глади. Раппорт переплетения трикотажа новой структуры содержит два ряда плюшевого переплетения, соединенные протяжками, образующие двухслойный трикотаж. В результате плюшевые протяжки складываются внутри полотна, что уменьшает объемную плотность и улучшает теплозащитные свойства трикотажа.

Kalit so'zlar: ikki qatlamli trikotaj, kundalang glad, tuk, trikotaj mashinasi, halqa hosil qilish tizimi.

Ключевые слова: двухслойный трикотаж, кулирный гладь, плюш, трикотажная машина, петлеобразующая система.

UDC 677.055.5

DEVELOPMENT OF AN EFFECTIVE DESIGN SCHEME OF THE GUIDE IN A TWO-CONTOUR ROTARY MACHINE

Allamuratova T.K., Turenliyazov A.A.

Karakalpak State University named after Berdakh

Summary: the article presents a new effective design and principle of operation of the guide for uniform tensioning of the knitted fabric on double-loop circular machines.

Key words: guide, two-contour circular turning machine, pulling force, curved ring, double-layer knitwear, uniformity of structure, cylinder, uniformity.

Introduction. The most important and urgent problem in the knitting industry is to improve the quality, improve and update the range of products.

In the field of knitting technology, a fundamental position has been adopted that underlies the design of knitwear - the dimensions of fabrics and products in a conditionally equilibrium state with the specified filling parameters of the machine are completely determined by the length of the thread in the loop. It was also found that the change in the length of the thread in the loop significantly affects the physical, mechanical and operational characteristics of knitted fabrics, shrinkage processes, defects in the appearance of the fabrics (zebriness, banding, etc.). Thus, the length of the thread in the loop and the modulus of the loop are reasonably taken as the main criteria for the quality of knitted products. However, the length of the thread in the loop is not controlled in production conditions. What are the reasons for this situation?

One of them is that the knitting process is influenced by the properties of raw materials, the design of the mechanism, the supply of thread, the draw of the web and the parameters of the knitting mode. Changing these factors makes the knitting process insufficiently stable, as a result of which the length of the thread in the loop is reproduced with deviations. Therefore, due to the change in the length of the thread in the loop, most types of knitted fabrics are structurally heterogeneous, and when knitting with simple and combined weaves, they have a visible zebra (stripe). The structural heterogeneity of the fabric reduces the grade of knitted products. In addition, due to changes in the length of the thread in the loop, the linear dimensions and surface density of the knitwear are unstable; allowances for the dimensions of the products increase at the same time. When cutting the canvas, parts of products, additional waste occurs. Some of the products are cut out in a smaller size, or they turn into non-grade products. There is a problem of completing piece products, matching them in pairs (hosiery, gloves). This makes it difficult to automate the process and reduces labor productivity.

The effect of the pulling force on the length of the thread in the loop is mainly determined by the change in the tightening of the thread. Qualitatively, this effect is characterized by the fact that with an increase in the tension of the web, the length of the thread in the loop increases. Thus, when the tension level of the web changes during knitting, systematic errors (deviations) in the length of the thread in the loop occur.

Changes in the pulling force have a twofold effect on the quality of the manufactured knitwear: firstly, they lead to deviations in the length of the thread in the loop, and secondly, with a constant length of the thread in the loop, they cause a change in the geometry (shape) of the loops, and consequently the dimensions of the products produced. In the latter case, the control of linear dimensions and indicators of the density of the fabric horizontally R_g and vertically R_v carries incorrect information about the quality of the knitting process.

Thus, when controlling linear dimensions, it is necessary to ensure a constant level of drawback and its control.

When knitting on the same machine, deviations in the tension of the web are mainly determined by the way the web is stretched, the design of the drawback mechanism, the shape and

size of the shiroitel. Deviations of the tightening force of the loops along the perimeter of the tubular web lead to a change in the structural characteristics of the web sections: indicators of loop density and surface density.

Analysis of the features of the guides for pulling the knitted fabric. In the work [1] it is noted that the unevenness of the pulling force of various types of pulling mechanisms ranges from 7 to 62%, therefore their use causes a significant fluctuation in the surface density of knitwear.

There is a known guide for pulling knitted fabric in two-contour circular knitting machines, made in the form of a cylindrical ring that is rigidly mounted vertically in the cylinder and at an angle of 45° to the direction of the loops in the loop formation zone [2, 3].

The main disadvantage of this design is to obtain a knitted fabric with an uneven loop structure due to the inequality of the pulling forces of the loops from the needles of the disk and from the needles of the cylinder due to different tension forces. In addition, if it is necessary to ensure the equality of the tension of the webs at different values of friction with the touching surfaces, as well as the vibrations of the webs, there is no possibility of changing the location of the ring-shaped guide.

In another well-known guide for pulling knitted fabric in two-contour circular knitting machines, made in the form of a ring, mounted rigidly in the cylinder of the machine. In this case, the ring is rigidly connected to three corners fixed inside the cylinder with the possibility of adjusting the installation height, while the angles between them $\varphi=120^\circ$, and vertical grooves are made in the vertical bases [4, 5].

The disadvantage of this design is the uneven distribution of the drawback force along the circular perimeter of the resulting knitted fabric due to the different lengths of the drawback horizontally, the cross-section of the length of the forming drawn loops whose values range from 730-750 mm, and vertically the length of the forming knitted fabric reaches up to 680-700 mm. This difference in the lengths of the generators leads to an uneven production of the web. Due to the unequal angles of coverage of the screen with a cloth, the difference in the forces stretching the loop columns at the edge and in the center of the draw rollers is approximately 10%. As a result of research, it can be noted that it is also not possible to obtain a stable surface density of knitwear. With a high quality of raw materials, the instability of the surface density of knitwear will depend on the technological and design parameters of knitting.

In order to ensure the uniformity of the loop structure along the entire perimeter of the knitwear produced on a two-contour rotary machine, the design of a ring-shaped guide designed for pulling the knitted fabric has been improved [6, 7].

When developing two-layer knitwear on a two-contour rotary machine, two problems arise: due to the fact that the loops formed on the upper and lower cylinders are affected by different pulling forces, the length of the loops turns out to be different, which negatively affects the quality of knitwear;

due to the different angles of coverage of the web widener, the difference in the forces stretching the loop columns at the edge and in the center of the pull rollers is approximately 10%, since the length of the web at the edges of the pull roller is 730-750 mm and 680-700 mm in the center. This difference in the lengths of the generators leads to uneven structures of the resulting web.

The solution to the first problem is the possibility of adjusting the installation of the guide in height.

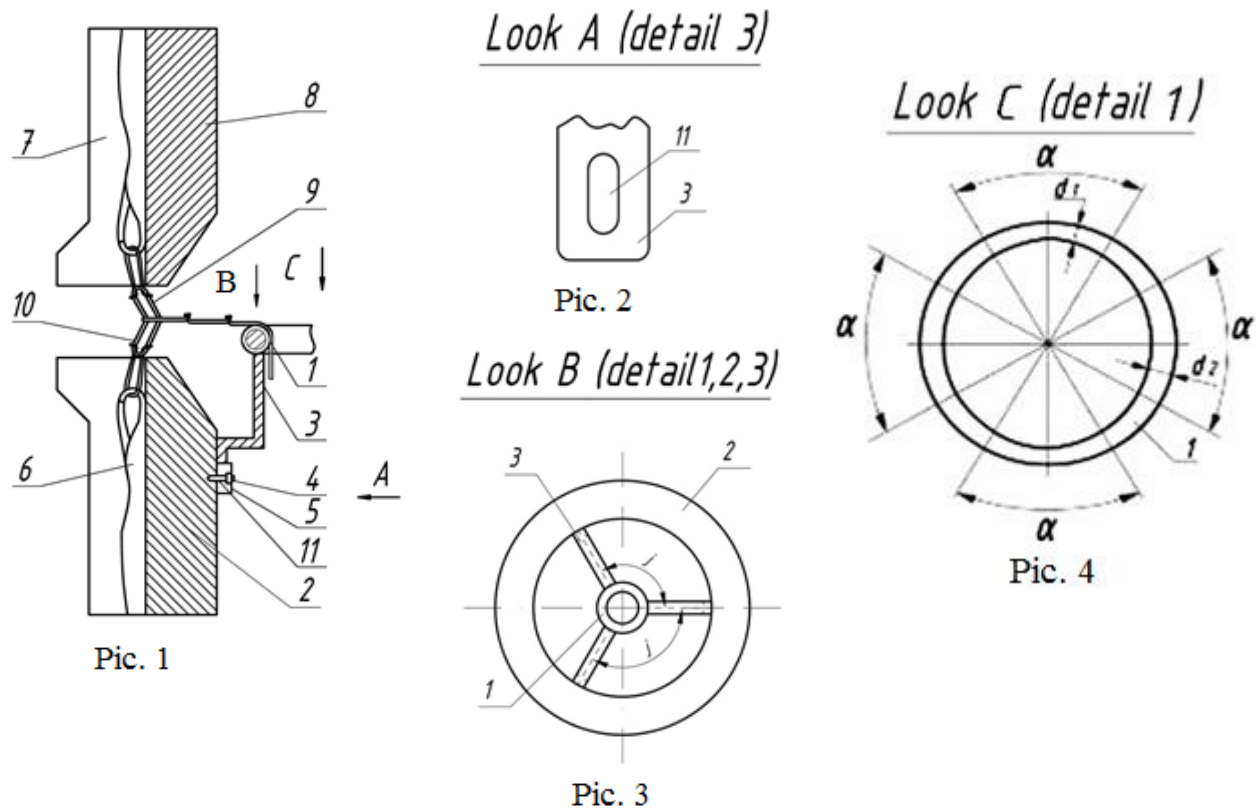
The second problem, ensuring evenness along the entire perimeter of the knitted fabric, is solved by improving the design of the guide by equalizing the tension forces of the pulled loops. Two variants of new designs of the ring-shaped guide are proposed for pulling the knitted fabric:

in the first variant, the extreme part of the ring-shaped guide roller is made above the central part by $\Delta=30-35$ mm [6, 7];

in the second variant, the diameter of the extreme part of the wire of the draw roller of the ring-shaped guide d_2 is made 30-35 mm thicker than the diameter of the wire in the central part d_1 [8,9].

Results and discussions. With an increase in the angle of inclination of the forming loop column of knitwear, not only does the length of the forming column increase, but the tightening force of the knitwear loops at the edges decreases. At the same time, it becomes possible to align the pulling forces of the knitwear loops both in the center and along the edges of the pulling zone.

The recommended design is to ensure evenness around the perimeter of the knitted fabric produced on two-contour circular machines, which allow you to obtain high-quality knitted fabrics.



Pic. 1. Shows a guide for pulling knitted fabric on two-contour circular machines

The essence of the design of the guide for pulling knitted fabric on two-contour circular machines is that the guide is made in the form of a ring mounted rigidly in the cylinder of the machine, while the ring is rigidly connected to three corners fixed inside the cylinder with the possibility of adjusting the installation height, while the angles between them $j=120^\circ$, and vertical grooves are made in the vertical bases, and the ring wire is made with different diameters along the perimeter with smooth transitions between them. The ring is divided into four identical parts with a girth angle α from 75° to 80° , while the opposite parts of one pair of ring parts are made large from 30 mm to 35 mm relative to the diameters of the other opposite pair of ring parts, and all four parts of the ring are connected by appropriate transitional parts of the ring with girth angles β from 10° before 15° , the connection of the ring parts is carried out by welding. Should note that the ring can be made of plastic.

The invention is explained by a drawing, where in Pic. 1 is a general diagram of the guide in the loop formation zone; in Pic. 2 - View A in Pic.1; in Pic. 3 - View B in Pic.1; in Pic. 4 - View C in Pic. 1. The rotary machine is made in the form of a circle consisting of an upper cylinder 8 and a lower cylinder 2 (only part of the cylinders are shown in Pic.). The design consists of a guide 1 in the form of a ring, which is divided into four identical parts with a girth angle α from 75° to 80° , while the opposite parts of one pair of ring parts are made with a large diameter d_2 from 30 mm to 35 mm relative to the diameters d_1 of the other opposite pair of ring parts. All four parts of the ring

are connected by the appropriate transitional parts of the ring with the girth angles β from 10^0 to 15^0 , the connection of the ring parts is carried out by welding.

The guide 1 is installed horizontally inside the lower cylinder 2. The guide 1 is rigidly connected (see Pic. 3) with three corners 3 (the angle between them $j = 120^\circ$), in the vertical bases of which there are grooves 11 (see Pic. 2). The corners 3 are connected to the lower cylinder 2 by means of screws 4 with washers 5. In the looping zone, the needles 6 of the lower cylinder 2 form loops 10, and the needles 7 of the upper cylinder 8 form loops 9 (see Pic. 1). The ring is installed in the machine as indicated in Pic. 4. In this case, the x-x axis passes through the central part of the wire with a large diameter d_2 , and the y-y axis passes through the center of the wire with a diameter d_1 . These wire zones with diameters d_1 and d_2 will be manufactured separately. Zones α and $\alpha\alpha$ will be joined together by welding or glued together with glue [8].

The proposed design works as follows. Needles 6 of the lower cylinder 2, moving up and down vertically, form loops 10, and needles 7 of the upper cylinder 8, moving back and forth vertically, form loops 9. Loops 9 and 10, clasping the guide 1 at certain angles, are then pulled down. At the same time, due to the vibrations of the loops 9 and 10 and the different values of the friction forces of the loops 9 and 10 with the surfaces of the upper cylinder 8 and the lower cylinder 2, the tension of the loops will be different. By adjusting the vertical installation of the corners 3 of the guide 1 by means of screws 4 and washers 5, it is possible to select the necessary position of the ring 1, ensuring uneven tension of the loops 9 and 10. At the same time, the pulling of the loops 9 and 10 along the edges of the guide 1 due to its execution from a wire with a large diameter d_2 , relative to the diameter d_1 from 30 to 35 mm, the alignment of the lengths of the web is ensured along the entire perimeter of the guide 1.

Conclusion. A new effective design of the guide has been developed that allows the alignment of the pulling forces of the knitwear loops both in the center and along the edges of the pulling zone, thereby obtaining high-quality knitwear. The variability of the ring wire diameters ensures the uniformity of the knitted fabric, eliminating the difference in the lengths of the forming draw loops.

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Rezyume: maqolada ikki ignadonli aylana oborot mashinasida trikotaj matosining bir tekis taran'likda tortilishini taminlab beruvchi yunaltiruvchining yangi natijali konstrukciyasi va ishlash tartibi keltirilgan.

Резюме: в статье проводится новая эффективная конструкция и принцип работы направителя для равномерной по натяжению оттяжки трикотажного полотна на двухфонтурных круглооборотных машинах.

Kalit so‘zlar: yunaltiruvchi, ikki ignadonli aylana oborot mashinasi, tortish kuchi, egri chiziqli aylana, ikki qatlamli trikotaj, tuzilishining bir tekisliligi, celindr, bir tekkis.

Ключевые слова: направитель, двухфонтурная круглооборотная машина, сила оттяжки, криволинейное кольцо, двухслойный трикотаж, равномерность структуры, цилиндр, равномерность.

THREE-STEP METHOD FOR THE SYNTHESIS OF COPPER PHTHALOCYANINE AT HIGH TEMPERATURE AND ITS STUDY

Fayziyev J.B¹, Jalilov A.T¹, Yodgorov N².

¹*Tashkent Scientific Research Institute of Chemical Technology" LLC, Tashkent, Republic of Uzbekistan.*

²*Institute of General and Inorganic Chemistry of the Uzbek RFA*

Summary: *Copper phthalocyanine pigment is widely used in industry and scientific research, particularly as a pigment, catalyst, and for photochemical applications. The synthesis of this compound is a complex process conducted at high temperatures. In our study, we examine a three-stage method for synthesizing copper phthalocyanine. In the first stage, raw materials are prepared and mixed using solvents. In the second stage, the reaction is carried out with gradual heating of the medium, during which the temperature is progressively increased. In the third stage, the resulting substance is stabilized and then examined for quality analysis. This method ensures the production of high-quality and highly efficient copper phthalocyanine pigments and allows for the study of the stability of the substance's modifications.*

Key words: *Phthalocyanine, plastics, coloring, textiles, paper industry, symmetry, subphthalocyanines, triazolhemiporphyrazines, phthalic anhydride, urea, copper sulfate, magnesium acetate, pigment.*

Scientific research is being conducted worldwide to improve the properties of phthalocyanine-based pigments and their effective use. One of the important directions in these studies is the development of safe methods and simplification of the synthesis process of phthalocyanine pigments, the creation of new types of them that are soluble in water and solvents. At the same time, special attention is paid to the issues of increasing the production of phthalocyanine pigments, finding new structural formulas aimed at targeted changes in their anticorrosive properties, static and dynamic strength, and expanding their application areas.

It is possible to use various metals in the synthesis of phthalocyanines. As a result of reactions using phthalic anhydride, metal salts, urea, and catalysts, copper, cobalt, nickel, iron, and tin phthalocyanines were obtained. High efficiency in the synthesis process was achieved through the use of trichlorobenzene, nitrobenzene, ethylene glycol, and 1-chloronaphthylene as reaction media for 4 hours at a temperature of 170–200°C. Arsenic pentoxide, iron (III) chloride, zirconium (IV) chloride, and boric acid were used as catalysts in this process. Specifically, when nitrobenzene was used as a solvent and ammonium molybdate as a catalyst for the synthesis of Co (II) phthalocyanine, an efficiency of 70–98% was achieved.

Since phthalocyanines have a dense blue-green color, they are used as coloring and dyes. In 1987, more than 45,000 tons of phthalocyanine were produced. Phthalocyanines were originally used as ink for ballpoint pens, dyes for plastic and metal surfaces, and dyes for jeans and other clothing. Most of the research on these compounds was supported by the textile and dye industries. Recently, phthalocyanines have been demonstrated and implemented in practice as photocells in photocopying devices.

Phthalocyanines are very heat-resistant, inert in acid-base conditions, insoluble in many solvents, have high color strength and light resistance, and are important as high-quality blue, blue-green, and green pigments in the dyeing, textile, and paper industries, and their colors are extremely pure and beautiful. Phthalocyanine dyes are cheap to produce due to their ease of synthesis and easy interaction with the starting materials.

In recent years, phthalocyanines have been studied for use in second harmonic generation, third harmonic generation, and optical reflecting devices. Low-symmetry phthalocyanines are primarily used in telecommunications systems, data processing, and high-speed electro-optical switches, especially when they exhibit secondary nonlinear optical properties. Low-symmetry phthalocyanines

are electron-giving or electron-absorbing molecules in a macrocycle. They are used as binding substituents or subphthalocyanins, and triazolhemiporphyrasins are used to reduce symmetry. Non-centered compounds (such as subphthalocyanins, triazolhemiporphyrasins) can provide varying degrees of nonlinear optical responses with rich charge flow structures.

With excellent stability and proven suitability for chemical semiconductor diode lasers, phthalocyanins have become excellent materials for storing long-term optical data on single-record, multi-readable disks (WORM). Point-to-point laser heating applied to phthalocyanine, which can be converted into thin films, sublimates this material point by point, and the holes formed in this way are optically visible. The operation of reading or writing is carried out by taking into account.

For high-temperature synthesis by heating, a special container of high-temperature, acid-resistant stainless steel with a capacity of 1000 ml, a high-temperature furnace, a glass tube, a rubber hose, and the following substances are required:

1. Phthalic anhydride 1 mol;
2. 5 moles of urea;
3. Copper sulfate 0.25 mol;
4. Magnesium acetate 0.0005 mol;
5. Concentrated sulfuric acid 20 ml (93%).

Mixed with 1 mole of phthalic anhydride, 5 mole of urea, and 0.25 mole of copper sulfate. The reaction process was carried out in a special furnace. The FAITHFUL furnace allows you to accurately control the temperature and safely carry out the process.

Experimental part:

In the first stage, the mixture is held at 200°C for one hour, while the mixture dissolves into a homogeneous liquid state and a catalyst is added.

In the second stage, it rises from 200°C to 300°C and is held for one hour, while the reaction mixture becomes solid.

In the 3rd stage, it rises from 300 °C to 350 °C and is held for one hour, while the reaction mixture is held for 1 hour until the white smoke is exhausted.

Table 1

The influence of the ratio of starting materials and temperature obtained for the production of CuPc pigment by heating on the yield of pigments.

№	FA:Ka:CuSO ₄	T, °C	ω, %	№	FA:Kar:CuSO ₄	T, °C	ω, %
1	1:1:0,25	300	33,7	9	1:5:0,25	300	83,5
2		350	38,6	10		350	89,4
3		375	36,8	11		375	86,3
4		400	33,1	12		400	83,2
5	1:3:0,25	300	48,3	13	1:7:0,25	300	83,5
6		350	65,6	14		350	89,3
7		375	62,7	15		375	85,3
8		400	60,1	16		400	83,7

The results obtained showed that the yield of copper phthalocyanine pigment was 89.4% at a ratio of 1:5:0.25 and a temperature of 350°C. It has been established that these results are optimal

conditions for the synthesis of CuPs.

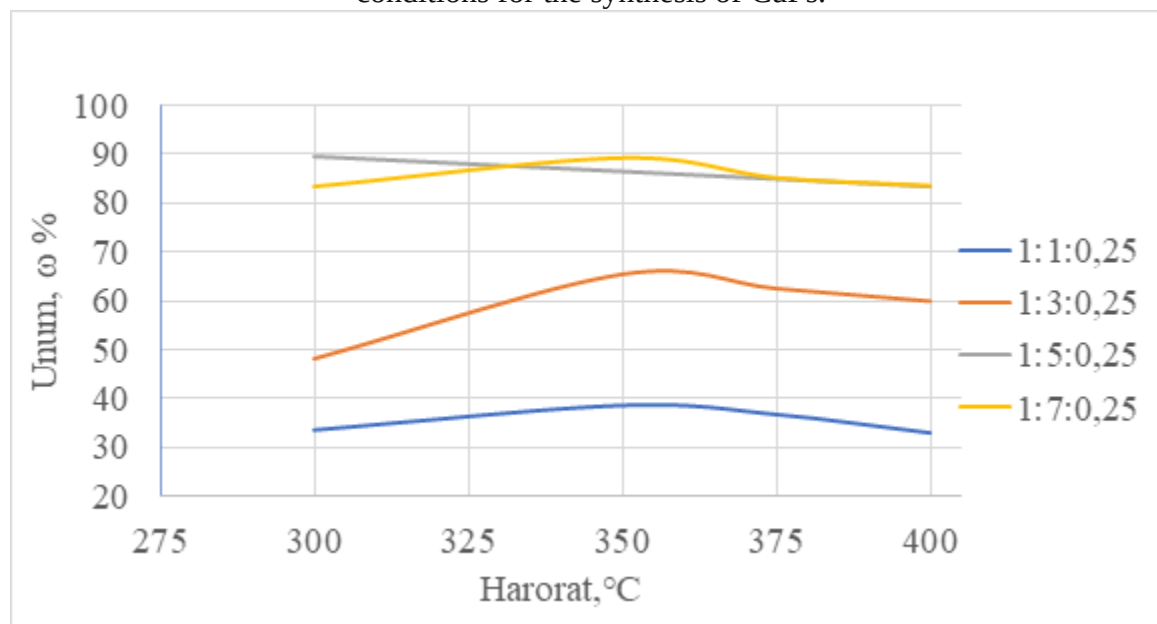


Figure 1. Graphical representation of the influence of the ratio of starting materials and temperature on the yield of CuPc pigments obtained by heating.

During the process, a gas outlet tube is installed on the top of the furnace, and the hose connected to the tube is immersed in a vessel with water, so that the outlet gas does not affect the reaction and is safe. As a result, a porous blue substance is formed in the container. The resulting substance was cooled to room temperature and mixed with 30 ml of concentrated (93%) sulfuric acid, resulting in a dark dark green solution. The resulting solution is cooled to 50°C and mixed with hot water. The solution dissolves to form a blue precipitate, the separated yellowish-brown liquid is carefully poured into another container and disposed of. The precipitate is neutralized by adding distilled water and a 3% solution of Na₂CO₃ and filtered using a vacuum pump in a Büchner funnel. The filtered dark blue substance was copper phthalocyanine, which was dried in a drying cabinet at 100°C for two hours. Dried copper phthalocyanine is crushed in a mortar and passed through a sieve.

Based on these results, it can be concluded that copper phthalocyanine obtained by the method (B) yielded better results when used in the sulfuric acid smelting process with a 93% concentration.

Table 2

Testing of the copper phthalocyanine pigment synthesized by heating at different temperatures.

№	Test pigments	Start temperature °C	End temperature °C	Observed changes
1	CuPc-65	160	280	Oq tutun
2	CuPc-75	180	250	Oq tutun
3	CuPc-85	200	210	Oq tutun
4	CuPc-93	250	250	O'zgarishsiz

Based on experiments, we observed that the processes of copper phthalocyanine pigment synthesis are carried out in two different ways. The copper phthalocyanine pigment obtained for analysis was synthesized by the second method, i.e., by heating. We investigated the process of determining the modification of the copper phthalocyanine pigment obtained after synthesis. Our previous research has established that the copper phthalocyanine obtained belongs to the β-modification. The reason is that the demand for β-modification of phthalocyanins is higher, as β-modification is more stable than α-modification, while α-modification is unstable. For testing, the copper phthalocyanine pigment obtained from the sample was heated to 250°C, and data on its stability was collected.

The IR spectrum of the investigated copper phthalocyanine pigment is shown in Figure 2.

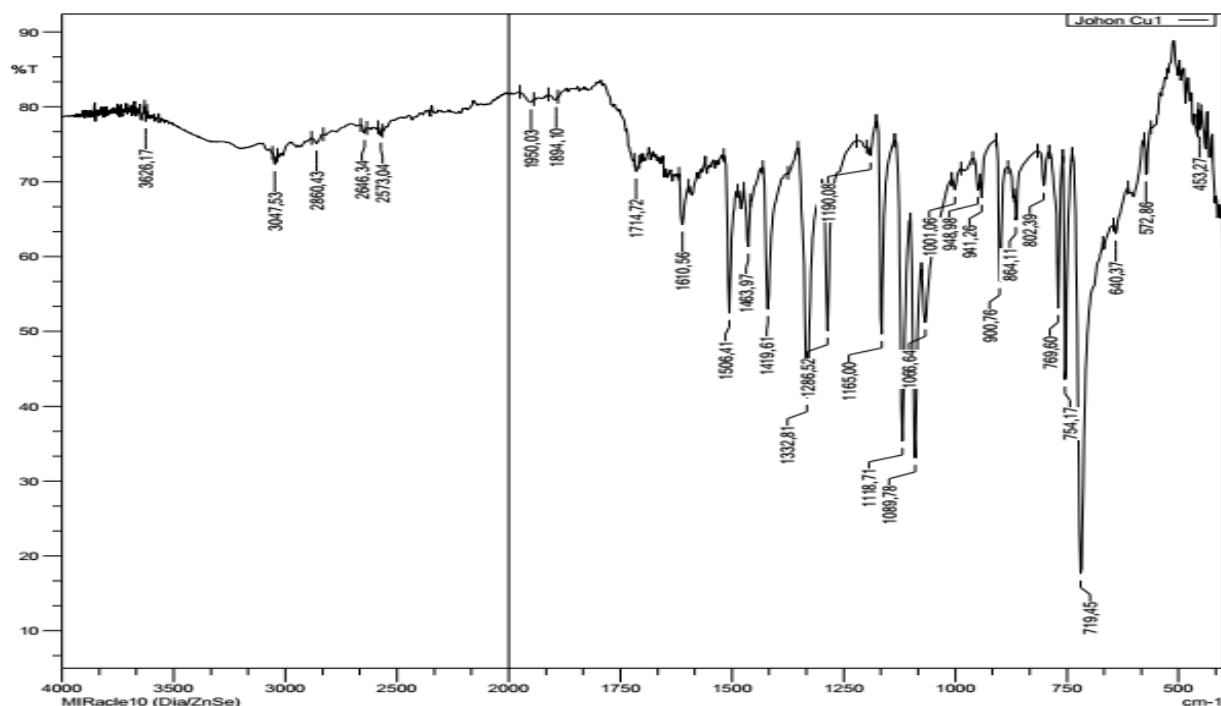


Figure 2. IR spectrum of copper phthalocyanine pigment

Table 3

Analysis of the IR spectrum of copper phthalocyanine

№	CuPc functional groups	Ziminov et al CuPc absorption regions	Absorption regions of synthesized CuPc
1	C-H	3047 sm ⁻¹	3047,53 sm ⁻¹
2	C=C	1612 sm ⁻¹	1610,56 sm ⁻¹
3	-N=	1507 sm ⁻¹	1506,41 sm ⁻¹
4	Izoindol	1465-1421 sm ⁻¹	1464-1420 sm ⁻¹
5	Pirrol	1333 sm ⁻¹	1332,81 sm ⁻¹
6	S-N plain	1287 sm ⁻¹	1286,52 sm ⁻¹
7	S-N+ isoindole plane	1165 sm ⁻¹	1165 sm ⁻¹
8	Benzene rings	947 sm ⁻¹	946,98 sm ⁻¹
9	Isoindole +N atoms	900 sm ⁻¹	900,76 sm ⁻¹
10	Phthalocyanine rings	754 sm ⁻¹	754,17 sm ⁻¹

Comparison of the absorption bands with Ziminov et al. yielded the results presented in Table3.

The reaction of the synthesis of the obtained substance, based on the analysis of the IR spectrum of the substance, is presented as shown in Figure 3.

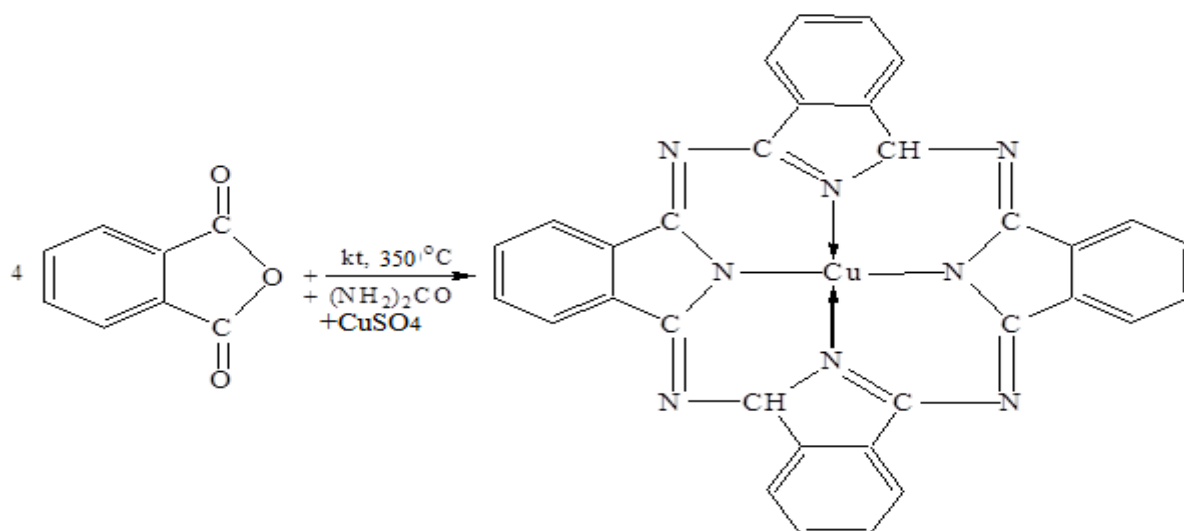


Figure 3. The reaction of copper phthalocyanine pigment production.

Based on the above formula, the change in pigment yield during synthesis was studied depending on the temperature. It has been found that the optimal temperature for the synthesis of copper phthalocyanine pigment is 350°C. Based on the conducted experiments, the copper phthalocyanine pigment yields the highest result at 350°C. It has been observed that the pigment's intensity is better than that obtained at low temperatures. High temperatures lead to a certain decrease in the yield of the resulting pigment. Therefore, the pigment was synthesized at a temperature of 350°C. As shown in Figure 3, a temperature of 350°C was chosen for the synthesis of a high-yielding pigment.

This study investigated the process of obtaining copper phthalocyanine pigment at high temperatures using a three-stage synthesis method. Using this method, the processes of raw material preparation, step-by-step heating, and stabilization of the reaction product were determined. The high efficiency and stability of the copper phthalocyanine pigment were ensured. According to the research results, the synthesized modified copper phthalocyanine pigments can be suitable for industrial and scientific research, especially for pigment, catalyst, and photochemical applications. This methodology allowed for the improvement of the quality of the pigments obtained and the analysis of their modifications.

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Rezyume: ushbu tadqiqotda yuqori haroratda mis ftalotsianin pigmentini uch bosqichli sintez usuli orqali olish jarayoni o'rganildi. Bu usul orqali xom ashyoni tayyorlash, bosqichma-bosqich qizdirish va reaksiya mahsulotini stabillashtirish jarayonlari aniqlandi.

Резюме: в данном исследовании изучен процесс получения пигмента фталоцианина меди методом трехстадийного синтеза при высоких температурах. С помощью этого метода были определены процессы подготовки сырья, поэтапного нагрева и стабилизации продукта реакции.

Kalit so'zlar: ftalotsianin, plastmassalar, bo'yoqlar, to'qimachilik, qog'oz sanoati, simmetriya, subftalotsianinlar, triazolgemiporfirazinlar, ftal angidridi, karbamid, mis sulfat, magniy atsetati, pigment.

Ключевые слова: фталоцианин, пластмассы, крашение, текстиль, бумага, симметрия, субфталоцианины, триазолмеипорфиразины, фталевый ангидрид, мочевины, медный сернокислый газ, ацетат магния, пигмент.

SYNTHESIS AND IR SPECTRAL ANALYSIS OF DIMETHYLUREA OBTAINED IN THE PRESENCE OF ORTHOBORIC ACID CATALYST

Jovliev S.M¹., Nurkulov F.N¹., Fayziyev J.B¹., Jalilov A.T¹.

¹Tashkent Scientific Research Institute of Chemical Technology" LLC, Tashkent, Republic of Uzbekistan.

Summary: *In this study, dimethyl urea containing oxygen and nitrogen was synthesized using local raw materials such as urea, methanol and orthoboric acid catalyst. Orthoboric acid was used as a catalyst, accelerating the reaction and increasing the efficiency of obtaining dimethyl urea, which was used as an organic additive to increase the octane number of gasoline. The structure and composition of the synthesized compound were analyzed using IR spectroscopy. When studying the effect of the obtained compound on the octane number of AI-80 gasoline using the UIT-85 device, it was found that adding 1.5% dimethyl urea increases the octane number by 7.5 units.*

Key words: *gasoline, octane number, oil, mercury, water, ethyl alcohol, natural gas, anti-knock, amines, hydrocarbons, dimethylurea, methanol.*

By the XXI st century, the growth of the automotive industry is significantly increasing the demand for petroleum products. Oil is understood as one of the largest sources of energy that meets the demand for energy in the world, which surpasses coal, nuclear energy, natural gas, and other renewable energy sources. Oil products account for 80% of global energy consumption.

Scientific research is being conducted on the modification of fuels with compounds containing active groups based on local raw materials and industrial products, the production of modifiers, and the development of effective technologies for their practical application to improve fuel quality.

As a result of the development of the automotive industry in our country, various cars are being produced. In 2020, manufacturing organizations in the automotive industry produced 280,080 cars (21.7%), 642 buses (29.3%), 4,163 trucks (30.1%), 673 tractors (6.5%), and 41 special vehicles worth more than 33 billion soums.

Throughout the world, three types of octane-increasing substances (additives and components) are used industrially - metal-containing anti-knock, ash-free anti-knock, and oxygenates (oxygen anti-knock).

Studies and testing of metal-containing additives show that, despite the highest detonation resistance, these compounds have significant reactive or ecological drawbacks. This indicates that large gasoline producers, responsible for the consumer properties of commercial products, should not consider such substances to be substances that are mixed with octane-increasing additives, including oxygenates.

Nitrogen-containing organic compounds are effective fuel additives. Numerous studies have been conducted on the use of amino acids, amides, and others as additives. Currently, nitrogen-containing additives such as aromatic amines are widely used.

Monomethylaniline-based additives surpass methyl tert-butyl ether MTBE by 10-15 times in anti-knock effectiveness. Furthermore, the introduction of this additive will reduce the proportion of reformat, which is the main high-octane component in commercial gasoline, in many refineries. Reducing reformat with a high content of aromatic compounds, in turn, positively affects the environmental characteristics of gasoline.

When oxygenates are added to gasoline in an amount of 2% by volume, they contribute to the complete combustion of the fuel. As a result, the amount of carbon monoxide in combustion products decreases by 30%. Oxygen-containing compounds have high detonation resistance and can replace high-octane aromatic compounds in commercial gasoline. It also reduces the amount of benzoprene in the exhaust gases and the intensity of carbon formation in the engine.

It consists in increasing the oxygen concentration in the absence of a mechanism of action of oxygen-containing and octane-increasing additives, which in turn reduces the heat of combustion of

the air-fuel mixture. Therefore, the decomposition of peroxide radicals slows down, and there is a rapid release of heat from the combustion chamber. As a result, the maximum combustion temperature decreases.

Oxygenates containing oxygen, used in the production of engine fuels, can be divided into two large groups: alcohols and dialkyl ethers.

In most studies, various oxygen-containing additives, such as alcohols, ethers, etc., are used as an anti-detonation agent in gasoline. Oxygen-containing additives have advantages over other types of anti-knock agents.

A new process for obtaining oxygen-containing oxygenate, i.e., diisopropyl ether (DIPE), has been developed, which increases the octane number in the fuel, which can compete with methyl tert-butyl ether (MTBE). Propylene and water were used as raw materials for this (the UOP company, the "Okhurgo" process). For reference: the octane number of DIPE is lower than MTBE.

More than 20 years of experience in using alcohol-containing fuels worldwide show that ethanol can be used not only as an octane-boosting agent, but also to convert engines to pure alcohol. Ethyl alcohol is less hygroscopic than methyl alcohol. The heat of combustion is high and the heat of vaporization is low and very low toxicity. Ethyl alcohol is also a good cleaning agent. Keeps the engine clean in new cars. In old machines, it breaks down and cleans the engine's debris. Sometimes the separated pollutants accumulate in the fuel filter and are removed by replacing the filter.

It is a valuable component of commercial fuel with high explosive resistance (octane number RON 90-93). However, the proportion of catalytic cracking gasoline is limited by its high sensitivity and high content of sulfur and unsaturated hydrocarbons. This reduces sustainability and environmental performance.

Experimental part: 50 g of urea was measured on analytical scales, placed in a 3-mouthed flask equipped with a thermometer, and heated to 150°C using a heating furnace. After the urea was liquid, 10 ml of methanol was sent through a glass tube. As a result, the urea temperature dropped to 120 °C. The urea temperature was reheated to 150°C. This process was repeated 5 times and 50 ml of methanol was added.

This mixture was boiled at 150°C for 5 hours, then the resulting mixture was thoroughly dried in a drying furnace at 60°C for 4 hours, and the resulting white crystalline solid was dissolved in 200 ml of toluene. It was observed that dimethyl urea dissolved in the resulting solution, while urea and byuret in the mixture precipitated without dissolving. The solution was filtered in a vacuum pump using filter paper on a Buchner drum. The obtained dimethyl urea solution was evaporated using a heating furnace at a temperature of 90°C, and the IR spectrum of the obtained solid white crystalline powder was analyzed.

The experiment is carried out using the following reaction:

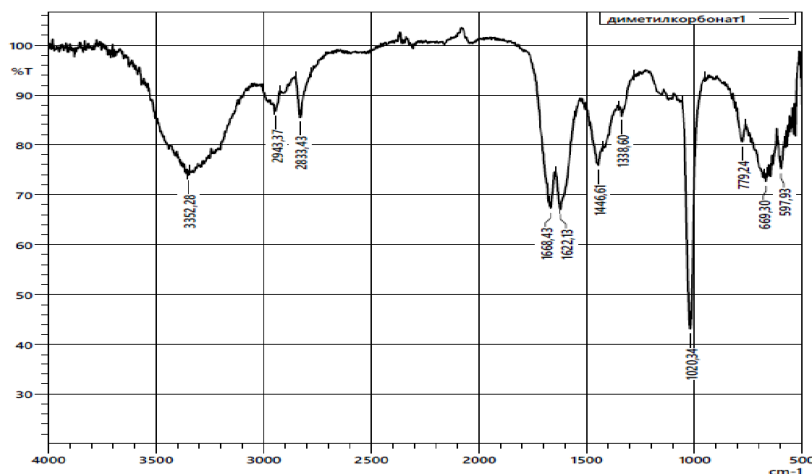
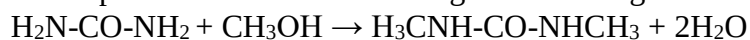


Figure 1. Analysis of the IR spectrum of dimethylcarbamate.

Based on the analysis of the IR spectrum of dimethylurea, the following conclusions can be drawn:

1. **3329.20 cm⁻¹** - this range can generally be attributed to –OH-OH-OH or –NH-NH-NH bonds. If a substance contains hydroxyl or amine groups, they correspond to this area.
2. **2933.37 cm⁻¹ and 2834.83 cm⁻¹** - these peaks typically correspond to the valence vibrations of alkanes –C–H–C–H–C–H (sp³ associated with hybridized carbon). These signals may be characteristic of methyl groups.
3. **1686.43 cm⁻¹ and 1624.13 cm⁻¹** - this range belongs to valence vibrations characteristic of –C=O–C=O–C=O (carbonyl) groups. The presence of a carbonyl group may refer to carbonate or carbamate groups.
4. **1460.67 cm⁻¹ and 1388.60 cm⁻¹** - these peaks are usually associated with –CH₃–CH₃–CH₃ or –CH₂–CH₂–CH₂ deformation vibrations in methyl or methylene groups.
5. **1028.43 cm⁻¹** - this range corresponds to the –C–O–C–O–C–O vibrations, which typically belong to the ether groups. This signal may indicate the presence of an ether or carbonate group.
6. **779.24 cm⁻¹ and 669.37 cm⁻¹** - these ranges refer to the specific vibrations of the contact or storage groups, through which the structure of the molecule can be considered.
7. **597.93 cm⁻¹** - this peak can be considered to belong to groups associated with various storage oscillations or heavy elements.

The described peaks are characteristic of the dimethyl urea molecule, indicating the presence of a –C=O–C=O–C=O carbonyl group, –C–H–C–H–C–H alkane groups, and –C–O–C–O–C–O ether groups. This spectrum confirms the presence of carbonate or carbamate groups.

The synthesized dimethyl urea was tested on directly distilled AI-80 gasoline, where it was tested to increase the octane number of the gasoline. Different types of gasoline increased by different units when used in different percentages of mass. When using AI-80 gasoline at a rate of 1.5%, it increased by 7.5 units, at a rate of 2% by 9 units, at a rate of 3% by 12 units, and at a rate of 5% by 15 units. Since this additive contains only organic matter, carbon dioxide and water are formed during combustion. The motor part does not corrode the car, does not draw and break the pulleys and pistons, and the car operates evenly without knocking.

Testing of the obtained dimethyl urea on low-octane gasoline in different percentages yielded good results, and it was proven that it increases the octane number of gasoline, which was tested on the octamer and UIT-85 apparatus. The melting point of the resulting dimethyl urea was determined. The IR spectrum of pure dimethyl urea was analyzed.

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Rezyume: ushbu tadqiqotda kislorod va azot tutgan dimetilkarbamid mahalliy xomashyolar, masalan, karbamid, metanol va ortobor kislota katalizatori yordamida sintez qilindi.

Резюме: в настоящем исследовании диметилкарбамид, содержащий кислород и азот, был синтезирован с использованием местного сырья, например, карбамида, метанола и катализатора ортоборной кислоты.

Kalit so'zlar: benzin, oktan raqami, neft, simob, suv, etil spirti, tabiiy gaz, protivostolbnyak, aminlar, uglevodorodlar, dimetilmochevina, metanol.

Ключевые слова: бензин, октанный номер, нефть, ртуть, вода, этиловый спирт, природный газ, противостолбняк, амины, углеводороды, диметилмочевина, метанол.

ORGANIZATION OF INDUSTRIAL FISHING IN THE SOUTH ARAL REGION

Bekimbetov K.M.

Nukus Innovation Institute

Summary: *In the 1920s, attempts were made to organize a meat and fish canning plant in our region. In the early 1930s, plans were outlined to expand measures to use the rich fauna of the Aral Sea region to provide cheap raw materials and food to the central authorities. Survey work began and it was planned to build the above-mentioned plant in Karauzyak with a center in Zaiyr. Based on the study of archival and historiographic materials, the author points out the colonial essence of the actions of the Soviet government.*

Key words: *Fishing industry, Aral Sea, Muynak region, Central Asian Economic Council, economies of Karakalpakstan.*

In the theory of economic life, the organization of production acts as a dynamically developing and changing complex system, capable of adapting to existing economic conditions, depending on socio-political formations and scientific and technological progress. In this regard, the history of the organization of industrial fishing in the Aral Sea is a striking example of the above thesis. Prof. L.S. Berg pointed out that in 1914 the number of fishermen in the Aral Basin numbered 10 thousand people [1]. After the establishment of Soviet power by the Decree of the Central Executive Committee of the Turkestan Autonomous Soviet Socialist Republic of March 20, 1919, fishing enterprises in the Aral Sea, owned by the joint-stock company "Khiva", private owners Y.V. Kisan, D.N. Mirkov, brothers Markov, Selekhev, Enikeev, S. A. Makeev and others were nationalized [2]. On May 5, 1920, the Turkestan Department for Fisheries and Fishing Industry was formed, which included the Aral Regional Fisheries Department (the region of the Aral Sea with the mouths of the Syr Darya and Amu Darya rivers).

As is known, back in the 1930s, the development of industrial fishing in the Aral Sea basin began, the volume of fish catch increased, and the expansion of cotton and other industrial crops began in the lower reaches of the Amudarya and Syrdarya rivers, which determined the formation of the basis for active water intake. At the same time, the main factor in this process, characterized by the sustainable functioning of the reservoir through the rational use of aquatic biological resources, was not taken into account. The main factors determining the development of industrial fishing, in addition to the state of the raw material base, are the state of the fishing fleet, international fishing conditions outside the exclusive economic zone of Russia, demand for fish products, volumes of foreign economic activity, prices for material and technical resources (especially fuel). Since the determining factors in the system of organizing industrial fishing are the availability of raw materials and the structure of the fishing fleet, it seems logical to conduct a study of the forms and methods of industrial fishing in the dynamics of the development of these factors.

The country's fishing industry was artisanal in nature. By the end of the 20s and the beginning of the 30s of the 20th century, fundamental changes took place in the fishery: the amount of catches, fishing tools and techniques, conditions and markets, organization of the fishery changed, and the next period in the development of industrial fishing began. According to developed domestic projects, trawlers with a steel hull were built at the country's shipyards, which in their technical level are not inferior to their progressive foreign analogues. The seining fleet also developed intensively. Seiners designed for fishing with purse seines and ring nets have become widespread in almost all seas. The beginning of the development of the processing fleet also dates back to the period of the 30s. The first refrigerated floating bases were built. The growth of the trawl fleet was accompanied by the development of coastal farming and the creation of a modern material and technical base for fisheries [3].

In April 1930, the First Congress was convened, and in January 1931 - the Second Congress of the Union of Fishermen of Karakalpakstan, where problems and ways of development of the fishing industry were highlighted. By this period, about 2,200 farms were united in fishing collective farms, about 3,000 workers were employed during the season in state fisheries [4]. In terms of the material and technical base of fishing in the Aral Sea, it lagged significantly behind the all-Union level.

In the southern Aral, shallow coastal fishing was practiced during seasonal fish movements; only in 1932 was net traction using a tractor motor established. Archival documents state that the required "radical technical re-equipment of fishing and the mechanization of the fishing fleet are still tasks of the future" [5].

In the structure of the economy of Karakalpakstan, the fishing industry was important. In 1931, the fish catch in the southern part of the Aral Sea amounted to 280 thousand centners, about 3,000 fishermen were employed in the industry. Large lakes that were located in the northwestern part of the republic, which were not exploited at that time, were promising. In the early 1930s, plans were outlined to expand measures to use the rich fauna of the Aral Sea region, in other words, to destroy it. Thus, the archives contain information where the head of the Main Meat of the Republic Molochnikov reports to Moscow, the People's Commissar of Supply of the USSR A. Mikoyan that "The Amu Darya River, flowing into the Aral Sea, forms a colossal number of islands, lakes, wetlands, the latter stimulate subsidence a large percentage of swamp game (ducks, geese, swans) in autumn and spring. Islands and lakes rich in vegetation, both aboveground and with root systems in the ground, favor the presence and location of wild boars and pheasants. The Amu Darya reservoir is rich in fish. The shooting of wild boars and game, due to the lack of organization of hunting, is currently insignificant and is carried out from time to time" [6]. He proposes to increase the shooting of wild boars and game, and fishing not only in the Aral Sea, but also in inland waters. He proposes to shoot up to 3,000 wild boars, 25,000 hares, 15,000 geese, 300,000 ducks of various breeds, 20,000 pheasants, and 100,000 steppe partridges during the 1933\1934 season, thereby justifying the need to build a meat and fish canning plant. At the same time, the start of design work on the construction of a meat and fish canning plant was announced. Initially, 1 million 200 thousand rubles were requested for the construction of this meat and fish canning plant. The construction of the enterprise was first planned in Karauzyak with a center in Zaire and initially had the goal of exporting raw materials and finished products outside the republic. "The choice of this area is dictated by the fact that it is located on the right side of the Amu Darya River," the archival documents indicate. - on its shore, at a distance of 25 kilometers from the Aral Sea pier along the Amu Darya, 180 kilometers from the future republican center of the KKASSR - Nukus - up. Along the Amu Darya, it is surrounded by hunting and fishing areas, as well as mainly by areas gravitating towards them with a predominant percentage in terms of specific gravity in terms of procurement and livestock raw materials. The surrounding area of the Karauzyak region is rich in grass growth, which makes it possible to carry out hay harvesting and feeding operations until the snowfall. Wetlands of places with wild reeds make it possible to breed pigs by grazing them and partially feeding them, fattening pigs, and sowing jugara with high yields, yielding 150 pounds per hectare" [7]. It was taken into account that the planned railway Chardzhuy - Kunya-Urgench - Khojeyli - Aleksandrovsk-Gai will run along the left bank at a distance of 25 km along the Amu Darya and 60 km by land, which, according to the authors of the memorandum, makes it possible to produce some of the products send by rail.

In the Muynak region, survey work began in 1930 under the leadership of prof. M.I. Ilyina. In June 1931, a resolution was adopted by the Council of People's Commissars of the USSR to begin construction of a fish canning plant on the territory of Karakalpakstan. On December 5, 1931, Muynak district became an independent administrative unit with priority for the development of fishing. In addition to fish farming, it was planned to create a salt mining trust and sulphate production in the Aral Sea.

In August 1934, the chairman of the Central Asian Economic Council N.A. Paskutsky in his letter to the chairman of the Council of People's Commissars of the USSR V.M. Molotov wrote that

“the overwhelming majority of the fish catch in the Aral Sea falls on its southern half, which is part of Karakalpakstan: in 1933 from the total catch in the Aral Sea was 377.8 thousand centners; in the waters of Karakalpakia, 185.8 thousand centners were caught, i.e. 66.9%” [8]. In January of the same year, the People's Commissar of the Food Industry of the USSR A. Mikoyan signed an order on the formation of an independent self-supporting southern office of Aralrybgotrest.

In 1934, the Muynak region exceeded the fish catch plan in the southern part of the Aral Sea. 262,800 quintals of fish were caught in the Aral Sea, including 177.9 quintals in the southern part. The species composition of the fish included bream, carp, roach, catfish, barbel, pike perch, pike, white-eye, asp, thorn (this fish was considered a sturgeon, but the appearance of the thorn is characteristic of all sturgeons; it is a large fish with a body length of about two meters and a weight of approximately about 30 kg.) [9]. Fish processing was carried out at 5 fisheries of the State Fish Trust. This was facilitated by equipping fishermen with the latest boats and fishing equipment. Thus, in 1934, 41 motor boats, 152 sailing and small boats were brought to the Muynak fishing motor station [10].

In general, the state spent about 15.6 million rubles on the development of fishing in the republic during these years. 1,448 people worked in the fields, of which 18% were women, 67.1% were local people, and the rest were Russians, Ukrainians, etc., who lived in very difficult conditions. The state demanded more and more raw materials and food, allocating 19.4 million rubles in 1935. The official launch of the enterprise took place in August 1941. The design production capacity was to be 9 million cans per year. Kh.I. Seleznev was appointed the first director of the plant. From the very beginning, seven workshops were gradually opened at the enterprise: first, a fish canning line was launched (August 13, 1941), then a meat canning line, a meat and fat building and a recycling plant (from August 5 of this year), from September 15 - a pie shop, from 20 October – food flour shop, November 1 – sausage shop [11].

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Rezyume: 1920-yillarda Qoraqalpogiston hududida go'sht-baliq konserva kombinati tashkil etishga urinishlar bo'ldi. 30-yillar boshida markaziy hokimiyat organlarini arzon xom ashyo va oziq-ovqat bilan ta'minlash uchun Orolbo'yining boy faunasidan foydalanish chora-tadbirlarini kengaytirish rejalari belgilandi. Qidiruv ishlari boshlandi va zavodni markazi Zayir bo'lgan Karauzyakda qurish rejalashtirildi. Muallif arxiv va tarixshunoslik materiallarini o'rganish asosida sovet hukumatining ushbu sohada mustamlakachilik siyosatini yoritib beradi.

Резюме: В 1920-е годы в нашем регионе были предприняты попытки организации мясо-рыбного консервного комбината. В начале 1930-х годов были намечены планы по расширению мер, по использованию богатой фауны Приаралья в обеспечении дешевым сырьем и продовольствием центральные органы власти. Были начаты изыскательские работы и планировалось строить вышеуказанный комбинат в Караузыке с центром в Зайыре. На основе

изучения архивных и историографических материалов, автор указывает на колониальную сущность действий советской власти.

Kalit soʻzlar: *Baliqchilik sanoati, Orol dengizi, Moʻynoq tumani, Oʻrta Osiyo iqtisodiy kengashi, Qoraqalpogʻiston iqtisodiyoti*

Ключевые слова: *Рыбная промышленность, Аральское море, Муйнакский район, среднеазиатский экономический совет, экономики Каракалпакстана*

EFFECTS OF THE ENVIRONMENT ON TOURIST DESTINATION CHOICE

Ermekbaeva I.

Karakalpak State University named after Berdakh

Summary: *This article investigates the influence of environmental factors on the decision-making process of tourists when selecting their travel destinations. It examines the role of natural beauty, climate, environmental quality, biodiversity, and the growing importance of sustainability in shaping tourist preferences. The research aims to provide a comprehensive understanding of how the environment affects tourism trends and offers recommendations for stakeholders in the tourism industry to align their strategies with the evolving preferences of environmentally conscious travelers.*

Key words: *tourism, destination choice, the environment*

Today, the travel and tourism sector are a significant one that affects how a nation's economy develops. Building and upgrading local infrastructure and improving the environment is one of the tourism industry's biggest advantages. Uzbekistan has enormous potential to attract local tourists and tourists from around the world. To attract and keep current consumers as well as entice new ones, marketers specializing in travel and destination marketing ought to employ distinct strategies. The purpose of the study was to investigate, within the context of Uzbekistan, the effects of the environment on tourists' choice of destination.

The majority of researchers attempted to measure the effects of destination familiarity, destination image, safety and security, travel motivations, social media, and reference groups on satisfaction, revisit intention, loyalty, purchase decision, and choice of accommodation in destinations across the globe, after reviewing the majority of related literature on factors influencing tourists' destination choice. However, this study attempts to focus on examining the influence of environmental factors on tourists' destination choice in the context of Uzbekistan.

Tourism is a significant global industry that is profoundly affected by various environmental factors. As awareness of environmental issues grows, tourists are increasingly considering environmental conditions and sustainability in their destination choices. This article introduces the context and significance of understanding how environmental factors influence tourism behavior.

The environment of a place is crucial in influencing tourists' decisions in an increasingly globalized world with an unlimited number of options. This article explores the ways in which environmental considerations affect tourists' choice of locations, emphasizing the attraction of untouched natural settings as well as the growing concern over environmental sustainability. This article makes the assumption that travelers are fully aware of the local climate where they will be traveling. This assumption makes sense because travelers are using the internet and talking to friends who have visited the places they want to visit to gain more knowledge about the destinations they are interested in visiting. The process of selecting a destination is complex, with the only visible outcome being the flow of tourists from a source market to a destination. A destination must effectively complete several stages of the destination choice (DC) process before a tourist ultimately selects it.

There are several factors that affect destinations choice of tourists:

-Natural beauty is one of the most obvious environmental elements that affects travelers' choice of destinations. Travelers looking for adventure, leisure, or a way out of the city are drawn to majestic mountains, calm beaches, green forests, and beautiful lakes. The scenic quality of a place's surroundings can greatly increase its attractiveness. For example, the breathtaking natural surroundings of places like the Great Barrier Reef, the Swiss Alps, and the Maldivian beaches contribute significantly to their stunning natural environments.

-Another important element that influences travelers' decisions is the climate. When choosing a destination, many tourists look for somewhere with perfect weather. They frequently choose sunny, warm regions for beach vacations or colder, snowier settings for skiing vacations. Weather patterns

can have an impact on travel patterns, with certain places seeing periods of high and low traffic. For instance, in the winter, when people want to get away from the cold, the Caribbean is a popular destination in North America and Europe.

-Tourists are getting more and more concerned about a destination's sustainability and environmental soundness as environmental issues gain attention. Nowadays, the most important factors are clean air, pure water, and minimal waste. As travelers seek greener, more sustainable options, tourism to places that suffer from pollution or environmental degradation may reduce. Travelers are increasingly choosing areas that support responsible tourism and conservation, as seen by the growth of eco-tourism.

-The existence of unique wildlife and biodiversity can attract large numbers of visitors. Travelers wanting to explore varied ecosystems and see wildlife in its natural settings go to places like the Amazon rainforest, African savannas, and the Galápagos Islands. In addition to maintaining these ecosystems' allure, conservation initiatives that save these habitats promote environmentally conscious travel, ensuring that future generations will be able to take pleasure in these natural treasures.

-The environment also plays a role in shaping the cultural experiences available at a destination. Traditional farming methods, artisanal products, and indigenous ways of life are frequently closely linked to the surrounding ecosystem. Travelers seeking to immerse themselves in another culture could be drawn to locations that allow them to examine how nature and culture interact.

-The sustainability of some tourism locations is being negatively impacted by climate change. Some locations are becoming less desirable or even unreachable due to rising sea levels, shifting weather patterns, and an increase in the frequency of natural disasters. For instance, tourist may fall in coastal places susceptible to erosion or hurricanes, while formerly uninviting regions may emerge as new hotspots as a result of rising temperatures. Destinations that adjust to these shifts could gain an edge over rivals in the future by reducing ecological risks or encouraging travel that is climate resilient. Future competitive advantages may go to destinations that adjust to these changes, whether through reducing environmental concerns or encouraging climate-resilient travel.

-There is a direct correlation between visitor safety and well-being and environmental health. Health-conscious tourists may find less attraction in destinations with issues like air pollution, water contamination, or a high concentration of insects that spread disease. Conversely, areas with clean surroundings and a strong medical system are more likely to attract tourists. Since the COVID-19 pandemic has increased public awareness of health dangers, many tourists now place significant importance on clean environments.

-Lastly, the choice of tourism destinations might be influenced by environmental awards and certifications, such as the Blue Flag for beaches or the Green Globe accreditation for hotels. These honors serve as a commitment to environmental care and can draw travelers that place a high value on sustainability. Destinations that obtain and promote such certifications are likely to see a rise in appeal as customers grow more environmentally conscientious.

The environment influences traveler decisions in a variety of ways. Environmental elements are playing an increasingly important role in shaping people's travel decisions, impacting everything from a destination's natural beauty and climate to its sustainability policies and health implications. Travel locations that put an emphasis on environmental sustainability and quality are expected to experience long-term success in drawing and keeping tourists as environmental awareness throughout the world continues to develop.

Destination choice is the process by which prospective visitors select a final location from a limited list. People research options and consider the benefits and drawbacks of each before selecting an area to visit [1]. Both internal and external elements (personality, motivation, travel expenses, accessibility, and the surrounding environment) influence the choice of destination. Destination marketers have to take visitor motives into account when proposing places because every site has a different kind of demand. In addition to current visitors' goals and wants, marketers also need to take

into account the motivations of potential new tourists. Destination selection has been studied in relation to aspects such as basic tourist personality qualities [2], cost or distance from a place, and climate information [3].

Central Asian nation of Uzbekistan is well-known for its dynamic culture, historical sites, and distinctive landscapes.

The excessive use of agrochemicals, the scarcity of water for plant treatment, and irrigation from the two rivers all had a negative impact on the environment in Uzbekistan. The Aral Sea, which was once the fourth-largest inland sea in the world, has evaporated or shrunk, leaving more than half of its basin as a barren, salty waste land that can be seen on tours of Uzbekistan. The population's health was severely impacted by the salt storms and dusts, which also devastated ecosystems and agriculture. The environment of Uzbekistan is negatively impacted by the salt and dust storms produced by the Aral Sea's bottom, particularly in Nukus City and the Karakalpakstan region. This also has a significant negative impact on the health of rural residents and agricultural products. The spring and autumn seasons are when dust storms primarily occur in Uzbekistan. The application of pesticides and other agricultural chemicals, particularly in rural regions, to the cotton crop is another factor contributing to environmental damage in Uzbekistan. The air in metropolitan regions is becoming more contaminated due to manufacturing and pollution.

Uzbekistan Geography Nature is heavily affected when Aral Sea began to shrink and lead to the salty soil. The State Committee for Environmental Protection was founded in 1992, but non-governmental organizations (NGOs) placed more emphasis on safeguarding water resources, such as the Amu Darya and Syr Dar Rivers, since the removal of irrigation from these rivers in order to increase cotton yields is the main cause of the Aral Sea's shrinkage. Due to the lack of law enforcement, inconsistent government economic and environmental planning, and the overwhelming power centralization, makes the implementation of policies weaker. As Uzbekistan Scenery is one of the Uzbekistan Highlights, the threats to the environment and health can be minimized while all the political parties together rise to save the environment from the root level.

Tourists' choices of destinations are significantly influenced by natural landscapes, climate, and environmental sustainability. Travelers are beginning to give top priority to locations with untouched natural settings, pleasant weather, and active conservation initiatives. Travelers' preferences for destinations are significantly influenced by their perceptions of environmental quality, including what constitutes clean air and water, scenic beauty, and noise pollution. Furthermore, travelers' decisions are becoming more and more influenced by knowledge of environmental sustainability practices, such as environmentally friendly hotels and responsible tourism programs.

In conclusion, environmental factors play a pivotal role in determining tourist destination choices. As environmental concerns continue to gain prominence, both tourists and tourism stakeholders must adapt to align with evolving expectations and practices. By prioritizing environmental quality and sustainability, destinations can enhance their appeal, improve tourist satisfaction, and contribute to a more sustainable future for the tourism industry. Addressing these factors not only meets the growing demand for responsible travel but also ensures the preservation of natural resources and cultural heritage for future generations.

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Rezyume: Ushbu maqola sayyohlarning sayohat qilish joylarini tanlashda qaror qabul qilish jarayoniga atrof-muhit omillarining ta'sirini o'rganadi. U tabiiy go'zallik, iqlim, atrof-muhit sifati, biologik xilma-xillik va turistik imtiyozlarni shakllantirishda barqarorlikning ortib borayotgan ahamiyatini o'rganadi. Tadqiqot atrof-muhitning turizm tendentsiyalariga qanday ta'sir qilishini har tomonlama tushunishga qaratilgan va turizm sanoatidagi manfaatdor tomonlarga o'z strategiyalarini atrof-muhitga e'tiborli sayohatchilarning o'zgaruvchan afzalliklari bilan moslashtirish bo'yicha tavsiyalar beradi.

Резюме: В данной статье исследуется влияние факторов окружающей среды на процесс принятия решений туристами при выборе места для путешествия. В нем рассматривается роль природной красоты, климата, качества окружающей среды, биоразнообразия и растущей важности устойчивого развития в формировании туристических предпочтений. Исследование направлено на то, чтобы обеспечить всестороннее понимание того, как окружающая среда влияет на тенденции туризма, и предложить рекомендации для заинтересованных сторон в индустрии туризма, чтобы согласовать свои стратегии с меняющимися предпочтениями экологически сознательных путешественников.

Kalit so'zlar: Turizm, joy tanlash, atrof-muhit

Ключевые слова: Туризм, выбор направления, окружающая среда

EXERCISES IN VOLLEYBALL

Kazakov A.R.¹, Allayarov I.K.².

¹*Karakalpak State University named after Berdakh*

²*Department of Nukus branch of Uzbekistan state university of physical education and sports*

Summary: *This article examines scientific opinions about the type of training, techniques and current developments in volleyball.*

Keywords: *Volleyball, training, competition, sport, competition, technique, development, game, skill, combination, speed, field.*

Volleyball differs from other sports by its essence, meaning and characteristics. The intensifying competition in modern sports competitions and the possibility of achieving high results under the influence of this situation draw attention to the need to maximize the physical and psychofunctional capabilities of athletes and their sports skills. However, it is not necessary to prove that the continuous increase in the volume and intensity of training aimed at ensuring high biophysical capacity can lead to unpleasant consequences.

Therefore, the need to achieve ultimately useful (beneficial) results in today's sports practice requires the application of innovative pedagogical technologies that form (raise), restore and strengthen work ability (physical, functional, technical-tactical capabilities) in the training process. It is possible that the direct "blind" use of such technologies will not give useful results. Therefore, in order to achieve a useful goal in the "trainer-athlete-trainer" continuous "communication" system, it is necessary to redevelop these technologies in accordance with the multifaceted capabilities of a specific "subject" (athlete) or to invent a completely new technological approach. In other words, a trainer who is "dedicated" to training a highly qualified, competitive sports team should approach his professional and pedagogical activities as a "researcher" and "inventor" creatively.

It is known that the process of training highly qualified athletes is coordinated with the goal of achieving high sports results. Therefore, the team trainer must have deep and wide-ranging theoretical knowledge, the laws of training volume, intensity, repetition, duration and direction of training in relation to the "subject" (athlete) and accurately predict the results of their opposite effect and must be able to see a useful purpose.

Working with highly qualified volleyball players and national teams, purposeful organization of training and integral preparation processes with them depends on the basis of World-scale model indicators, effective use of the results of regular observations by assistant trainers and specialists. For example, it is recommended that the amount of hours distributed by types of training for highly qualified volleyball players participating in sports improvement groups should be as follows:

- Theoretical preparation - 64 s
- UJT - 149 s
- MJT - 190 s
- Technical training - 347 s
- Tactical training - 338 s
- Integral preparation and control games - 387 s
- Referee practice - 46 s
- Adoption of standards - 36 s
- Total: - 1560 s

The number of trainings in one training year is 460. The number of sportsmen is 12 people. The number of competitions can be around 70. The physical training of volleyball players is assessed based on the following normative indicators (men):

- speed - "arch" run (94 m);
- server players - 22.0-22.5 sec
- attacking players - 23.0-23.5 sec.

Vertical jump from place:

- server players - 85-80 cm;
- attacking players - 90-85 cm.

Running jumps:

- server players - 345-340 cm;
- attacking players - 355-350 cm.

Technical and tactical preparation:

- scoring - 45-50%;
- delivery of the first ball to the passer - 75-80%;
- attack: - successful - 50%;
- unsuccessful - 10%;
- efficiency - 40-42%.

Blocking:

- useful barrier - 50%;
- successful - 15%;
- unsuccessful - 5%

Classes are usually held twice a day.

Most of the morning trainings are dedicated to improving game techniques, tactics and tactical combinations, as well as mastering a new technical-tactical model. The training sessions held in the second half of the day are aimed at mastering different game models at a high intensity, and organizing game training based on priority tactical models. Trainings of highly skilled volleyball players focus on improving performance, restoring it after intense loads, and applying measures to strengthen this ability. In theoretical training, the game models of future rival teams are studied on the basis of video materials, and these models are tested and formed in practical trainings. The dynamics of formation of types of training (physical, technical-tactical) in volleyball players of this category are regularly controlled by using special standard test exercises. Based on the obtained results, purposeful changes are made to the content, volume, intensity, duration and direction of training. In order to determine the effectiveness of training and to prepare for official competitions, it is necessary to hold control games, simulated games and friendly matches every week.

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Rezyume: Ushbu maqolada voleybol sportida o'tkaziladigan mashg'ulotlar turi, texnikasi va bugungi kundagi taraqqiyoti haqida ilmiy fikrlar tadqiq etiladi.

Резюме: В данной статье рассматриваются научные мнения о видах тренировок, методиках и современных разработках в волейболе.

Kalit so'zlar: Voleybol, mashg'ulot, raqobat, sport, musobaqa, texnika, taraqqiyot, o'yin, malaka, kombinatsiya, tezlik, maydon.

Ключевые слова: Волейбол, тренировка, соревнование, спорт, соревнование, техника, развитие, игра, мастерство, комбинация, скорость, поле.

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THE PROTECTION OF CHOREOGRAPHIC WORKS UNDER COPYRIGHT LAW

Shamshetov Sh.S.

Karakalpak State University named after Berdakh

Summary: *In the article some aspects of the choreographic works protection are analyzed in the context of Copyright Law. The author also analyses some issues of Copyright Law, where can be added: the problem of legal protection of choreographic works; legal status of choreographic works. The results of this scientific work can be applied in educational, scientific, practical and other activities.*

Key words: *intellectual property, author, copyright, Copyright Law, literary and artistic works, choreographic work, using a creation, originality, novelty.*

For many years, man and art have been inseparable. People admired and were inspired by creative works, expressed their emotions through body language, expressed their thoughts through art, and left a great spiritual legacy to their ancestors.

Over time, the need for legal protection of created creative works arose, and therefore the first legal acts regulating this area began to appear. Intellectual property legislation continues to evolve to this day, which will ultimately play an important role in copyright protection. Copyright protection for a choreographic work is no exception.

In the modern world, choreographic art occupies a special place among other types of creativity. Choreographic works are a unique combination of music, movement and emotions that are transmitted to the audience through the performance of the dancers. However, like any other creative work, choreographic compositions are object to copyright protection.

The first mention of a choreographic work, in the prism of copyright, is contained in the provisions of the Berne Convention for the Protection of Literary and Artistic Works of 1886. According to the Convention, choreographic works are classified as literary and artistic works. However, at that time only written or graphic records of the choreographer were subject to legal protection. In 1967, when amendments were made to the Berne Convention, the requirement for a written record was abolished. From this moment on, the term “literary and artistic works” covers all works of creativity, regardless of the method and form of their expression. Thanks to this provision, it was the dance that became the object of protection, and not the choreographer’s instructions on paper regarding the staging of movements and poses. [3].

Similar norms are contained in the civil legislation of the Republic of Uzbekistan. So, according to Part 1 of Art. 1042 of the Civil Code of the Republic of Uzbekistan [1] and Article 6 of the Law of the Republic of Uzbekistan “On Copyright and Related Rights” dated July 27, 2006 [2], choreographic works are object to copyright.

A choreographic work is a work that consists of a set of movements and poses arranged in a certain sequence to create a single image, within a single concept, with or without the use of musical accompaniment. Like any other creative work, choreography can have an original style. The concept of a choreographic work in this definition includes any styles and directions of dance, ballet, choreography in sports numbers, pantomime.

A single complex choreographic work can also be part of another creative object – for example, a dance number as part of a theater production or a movie episode, etc. And as part of a single choreographic number there may be elements that have the characteristics of a work and are protected as separate objects in a complex composition.

Which parts of the dance can be protected by Copyright Law? The legislation does not provide a clear answer to this question. It seems that these are separate movements, a choreographic sequence, a choreographic phrase, a fragment, etc. However, these elements must be completed to a certain

extent, which gives them the opportunity to be used separately from the work as a whole without additions. For example, a solo part as part of a dance with many participants. Following this logic, we can come to the conclusion that poses and static elements of dance, which serve to place emphasis and to realize the author's intention, are not separate protected objects, but are not dynamic. In other words, they do not have the characteristics of a work.

The complexity of legal regulation in the field of choreography is also due to the fact that there are no uniform criteria for evaluating a work. The choreographer will have to consider whether he is using elements that are copyrighted by others or protected in the public domain. It is not clear how, in the case of dance works, to evaluate changes in the sequence of elements or movements, as well as the addition of new elements to an existing dance. Does this result in the birth of a new work or modification of an existing one, or does piracy even occur? Will changing the style and genre of dance be considered a reworking of the work? All these questions are mostly evaluative; they are not regulated by independent rules of law in relation to choreography. In each specific case, if it comes to a legal dispute, it may be necessary to involve specialist experts.

In modern realities, a choreographic work can be expressed in any form. There are no requirements in the legislation for methods of fixing it. There are also no special rules on mandatory registration of dance works; therefore, the choreographer's copyright arises at the moment of creation of the dance, i.e. at the moment of giving the work an objective form [9, p. 107-109].

It seems that in order to fully consider a choreographic work as an object of Copyright Law, it is necessary to move away from the figure of the performer and consider exclusively the choreography.

In the minds of most people, choreographic performance is associated with the fact that a person performs a set of movements in a certain sequence to a musical composition. However, obviously, the dance can be performed not only by people, but also by fictional characters. At the same time, the figure of the performer often overshadows the figure of the choreographer, who is the author of the choreographic work. It is necessary to identify what will be the object of Copyright Law in relation to a choreographic work and who, in this case, will be the copyright holder. It seems obvious that the object of Copyright Law in relation to a choreographic work will be precisely the author's idea, which is embodied in certain movements and dance patterns, and the copyright holder will be the choreographer who is the author of this idea.

In order to confirm this, let us turn to the Civil Code of the Republic of Uzbekistan, which establishes what characteristics objects of Copyright Law must have. Thus, according to Article 1041 of the Civil Code of the Republic of Uzbekistan, works that are the object of Copyright Law must be the result of creative activity and be in some objective form. Therefore, in order to conclude what is the object of Copyright Law in relation to a choreographic work, it is necessary to identify where the creative principle lies and what the objective form of expression may be.

As the Supreme Court of the Republic of Uzbekistan points out, the object of Copyright Law can only be the result that is created by creative work [4]. The mere lack of novelty, uniqueness or originality of a result of intellectual activity cannot indicate that such a result was not created by creative work. That is, the criterion that determines the protectability of an object will not be novelty, uniqueness or originality, but the fact that the object is the result of creative activity. "Originality" refers to the final product, and creative work refers to the labor process itself, and not to the result, which is subject to evaluation [7, p. 25]. D. A. Bandurina believes that in this case, "creativity is reflected in the intellectual activity of the choreographer, since in the process of thinking certain images, dance drawings, specific movements are formed, which are then reproduced in the dance production" [5, p.59]. E. P. Gavrilov defines creative activity as "the activity of the human brain, which is capable of creating only ideal images, and not objects of the material world" [6, p. 44]. From this position, it seems that the creative principle lies precisely in the choreographer's idea. Also, a criterion for evaluating works of art is the obviousness of a certain image created by the author, which evokes an emotional response in the viewer and is capable of making changes in his inner world [8, p. 16].

The creation and reproduction of such an image can also be considered the result of the creative work of the author of the choreographic work, who thought through all the images that will be presented in the production. Thus, creative work reflects the result of the choreographer's intellectual activity and is realized in the plot, dance patterns, and individual movements. Creativity can also be expressed in individual dance elements. For example, Michael Jackson's moonwalk can be considered as an independent object, since it is the result of the creative activity of its creator and, without a doubt, meets the criteria of originality.

In some cases, creativity can be expressed in the mass character of a choreographic work. In order to involve a large number of people in the production, the choreographer also needs to think through in detail the role and image of each of them. Thus, only the result of the choreographer's intellectual activity, his idea reflected in the dance production, can be recognized as creative work.

An objective form of expression is a form accessible to human perception of a work. Until the choreographer's idea is expressed in an objective form, it cannot be the object of Copyright Law. In Civil Law there has not been a single idea of the objective form in relation to these objects. Choreographic works are embodied in an objective form, in particular, through their public performance [9, p. 109]. However, public performance without any additional fixation is designed for one-time perception. Consequently, there is a need to otherwise record the performance of a choreographic production, for example, by video recording. Such recording can also be performed by the choreographer recording a detailed description of the plot, images, set of movements, dance patterns, or by labanotation – a system of recording human movements. Using this technique, you can reveal the ideological content of a dance production, which will reflect the creative process of creating an idea by the choreographer. Now there are special computer programs that record the entire vocabulary of dance movements, which makes it possible to reproduce a choreographic work in a computer version [5, p.59-60].

Discussing about the civil law protection of copyright and related rights to a choreographic work, first of all, it should be noted that currently creativity knows no boundaries and is rapidly developing along with human needs. At the same time, along with the development of intellectual property, the number of offenses in this area increases and the need for effective protection of rights arises.

Today, one of the main problems of copyright protection for choreographic works is the problem of protecting this work on the Internet. Today, the World Wide Web contains an incredible amount of video footage of public and home performances that can be viewed for free. Those who have experience in choreographic activities, after watching the video of the dance number, can easily repeat it. As a result, they have the opportunity to use someone else's choreographic work and pass it off as their own, thereby receiving financial compensation for it. Such actions give rise to disputes regarding copyright of a choreographic work. Although the law provides sufficient measures to protect and enforce copyrights, lawsuits are not always resolved in favor of the actual author of the work.

Thus, we can conclude that the object of Copyright Law in relation to a choreographic work will be the idea of the choreographer, embodied in certain movements and dance patterns, since it is precisely this idea that corresponds to the characteristics of the object of Copyright Law. That is, it reflects creativity and is expressed in an objective form.

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Rezyume: Maqolada xoreografik asarlarni muhofaza qilishning ayrim jihatlari mualliflik huquqi to'g'risidagi qonunchiligi kontekstida tahlil qilinadi. Shuningdek, muallif mualliflik huquqining ayrim masalalarini tahlil qiladi, masalan: xoreografik asarlarni huquqiy himoya qilish muammolari; xoreografik asarlarning huquqiy holati. Ushbu ilmiy ish natijalari o'quv, ilmiy, amaliy va boshqa faoliyatda qo'llanilishi mumkin.

Резюме: В статье анализируются некоторые аспекты охраны хореографических произведений в контексте законодательства об авторском праве. Автор также анализирует некоторые вопросы авторского права, к которым можно добавить: проблему правовой охраны хореографических произведений; правовой статус хореографических произведений. Результаты данной научной работы могут быть применены в учебной, научной, практической и другой деятельности.

Kalit so'zlar: intellektual mulk, muallif, muallif huquqlari, mualliflik huquqi, adabiy va badiiy asarlar, xoreografik asar, asardan foydalanish, o'ziga xoslik, yangilik.

Ключевые слова: интеллектуальная собственность, автор, права автора, авторское право, литературно-художественные произведения, хореографическое произведение, использование произведения, оригинальность, новизна.

**THE THEORETICAL AND METHODOLOGICAL FOUNDATIONS FOR IMPROVING
SERVICE QUALITY IN THE CONTEXT OF DIGITAL ECONOMY DEVELOPMENT**

Beglenov N.D.

Karakalpak State University named after Berdakh

Summary: *The article discusses the theoretical analysis of scientific approaches describing the peculiarities of the development of the service sector in the digital economy the author's definition of the socio-economic content of the categories «quality of service» and «digital service».*

Key words: *service, marketing, strategy, marketing strategy, services, service area, digital service, quality of service.*

The development of the digital economy and the widespread adoption of information and communication technologies in the service sector have a significant impact on the evolution of modern services, including electronic services. This creates conditions for improving service quality and enhancing their competitiveness. The share of electronic services in the total volume of services worldwide was 8.6% in 2016, and this figure rose to 13.0% in 2022. In the same vein, in the United States and China, this share was 8.2% and 12.6% respectively in 2016, reaching 9.0% and 27.5% by 2021. Globally, there is an increasing focus on improving the quality enhancement system in the service sector based on the development of the digital economy.

In the context of the rapid development of the digital economy and expanding integration processes, numerous scientific studies are being conducted on improving service quality. The mutual integration of the digital economy and the service sector, transformational processes during the transition to digital services, the development of methodological foundations for assessing factors and indicators of electronic service development, identifying modern models for enhancing quality in the service sector, and improving the institutional framework for quality enhancement in this field demonstrate priority areas for scientific research in this direction.

Today, in the context of the development of the digital economy in our republic, the issues of ensuring stable economic growth in the service sector, increasing the efficiency of resource use in the industry, ensuring the quality and competitiveness of the services provided, and fully satisfying consumer demand for services have become particularly relevant. Alongside this, among the priority tasks of our country's economic life are improving the positions of service sector enterprises in international markets and expanding the export of services.

Currently, despite the fact that theoretical approaches in the field of service quality management are well understood, the complexity and intricacy of describing the service sector in the context of the digital economy necessitate the interpretation of socio-economic categories such as "service quality" and "digital services" from a scientific and theoretical perspective, as well as the formulation of their specific definitions.

According to the author's approach, service quality is an attribute that exists outside of the service itself and is an idea formed in the consumer's mind based on a comparison of expectations and actual perceptions of the service during and after its purchase and consumption.

A digital service is an automated or targeted mass or customized service performed with minimal human intervention, provided on a paid basis in a simple and secure manner via the Internet in real-time through economic activities based on digital data using direct information and communication technologies.

The quality of service provision as an independent concept has been developing since the mid-1970s during the transition to a service economy on an international level. Since the development of this concept is still ongoing, there are several dozen definitions of the category "service quality" found in scientific discourse, which complicates its practical application. In the scientific literature, six main approaches to defining the category "service quality" can be identified. On one hand, the evolutionary

nature of the interpretation of this category is noted; on the other hand, established approaches do not replace each other but continue to evolve and enrich one another. Concurrently, concepts related to service quality, such as customer satisfaction, customer expectations, customer service quality, and value, are being studied.

According to which scientific approaches are systematized by individual directions based on the comparison of consumer expectations with the actual indicators of service providers, assessment of absolute quality, determination of the influence of interpersonal relationships on service quality, critical analysis of consumer attitudes toward service quality, and evaluation of compliance of service quality with international standards.

In our country, from 2018 to 2022, the volume of provided communication and information services increased by 2.4 times, including a 2.7-fold increase in publishing services, a 3.3-fold increase in services for the production of television and video programs, sound recording, and musical works, a 2.2-fold increase in broadcasting and programming services, a 174.8% increase in communication services, a 7-fold increase in computer programming, consulting services, and other auxiliary services, and a 10.4-fold increase in information services

(see Table 2).

Digital services include the following characteristics: intangible (in most cases); delivery via the Internet; easy access; automated delivery or minimal human intervention; rights of personal and common property; control of service provision by the customer; storage of information in digital form; primarily aimed at meeting customer needs; inexhaustibility of the service (i.e., regardless of the volume of the corresponding service, its quantitative characteristics do not change); asynchronicity of service provision and receipt.

In the course of the research, the author developed a model for the use of digital services based on the execution of digital transactions, the organization of virtual firms, access to electronic markets, the formation of digital competence, and the grouping of integrated, additional, and purely digital services into separate categories. At the same time, the development of both electronic and digital services is aimed at increasing the level of digitalization both in the country and worldwide. Accordingly, electronic services can be appropriately considered an integral part of digital services. The classification of digital services includes their types, as shown in Figure 2.

The large number of digital services offered by digital service providers may complicate the analysis and organization of data for this research; therefore, it is important to consider the types of digital services. In our opinion, digital services can be classified into the following types:

1. Integrated Digital Services: Integrated digital services are an integral part of the produced goods and are provided free of charge. However, their cost can be included in the overall price. These services possess additional properties and are necessary for the main functionality of the product in a tangible form (for example, regular software updates that occur after purchasing a phone; the update is provided by the manufacturer for free via the Internet).

2. Additional Digital Services: Additional digital services are provided as an extension of the digital services of the produced goods and are paid for separately. These services are optional and perform functions that are not essential to the tangible product (for example, a construction company sells bricks but also offers an application to help customers calculate the correct angle for laying bricks; the company charges a fee for the application, which uses augmented reality technology. The application itself requires an Internet connection).

3. Pure Digital Services: They provide results that are independent of a tangible product (for example, a company produces diagnostic devices for cars. Modern automotive manufacturing also offers internet services due to connectivity, reading data from the vehicle through a network connection and analyzing it online. The service is provided by subscription. In this case, there is no need for a physical device).

Digital services primarily serve as mechanisms for social mobility, facilitating social and financial inclusion of the population, and improving the convenience and quality of services in crucial areas such as healthcare, education, government services, culture, and science. Secondly, digital

services create comfortable and safe living conditions for society. Thirdly, in the modern world, companies urgently need qualified personnel with digital literacy—talented individuals who take their choice of living and working environment seriously. Creating comfortable living conditions becomes a mandatory requirement for attracting high-class specialists and large employers, especially in high-tech industries. Today, a good quality of life is directly linked to an improved business environment and economic growth. Fourthly, digital services help enhance the business and investment climate by increasing the accessibility and efficiency of government services.

It is advisable to determine the prospects for the development of the main factors influencing the growth of service sector entities through correlation-regression methods and the creation of regression models. To establish this methodological approach, one begins by identifying all factors affecting the activities of entities within the production network and highlighting the most significant among them using correlation-regression methods. For the purpose of creating an econometric model for the development of digital service entities in the Republic of Uzbekistan, which is the subject of this research, key factors influencing this development have been selected.

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Rezyume: *Maqolada raqamli iqtisodiyotda xizmat ko'rsatish sohasini rivojlantirish xususiyatlarini tavsiflovchi ilmiy yondashuvlarning nazariy tahlili va muallif tomonidan "xizmat ko'rsatish sifati" va "raqamli xizmat" toifalarining ijtimoiy-iqtisodiy mazmuni ta'rif ko'rib chiqiladi. ishlab chiqilgan.*

Резюме: *В статье рассматриваются теоретического анализа научных подходов, описывающих особенности развития сфера услуг в условиях цифровой экономики разработано авторское определение социально-экономического содержания категорий «качество услуги» и «цифровая услуга».*

Kalit so'zlar: *xizmat, marketing, strategiya, marketing strategiyasi, xizmatlar, xizmat ko'rsatish sektori, raqamli xizmat, xizmat sifati*

Ключевые слова: *сервис, маркетинг, стратегия, маркетинговая стратегия, услуг, сфера услуг, цифровая услуга, качество услуги*

**CLASSIFICATION, COMPOSITION AND STRUCTURE OF COMMERCIAL BANK
HEDGING**

Utegenova S., Rozumova D.

Karakalpak State University named after Berdakh

Summary: *The article describes the role of the Bank Accounting and it's implementation of the Republic of Uzbekistan. The paper reports on a study aimed at developing a methodology for converting balance sheets to international standards in commercial banks. Proposals and recommendations for harmonizing the concept of accounting policies in commercial banks with the requirements of IFRS were accepted for use in the development of accounting policies in banks.*

Key words: *commercial banks, profit, revenue, credit resources, and contingent liability, identification, buyer, investor, issuing loans, storage of foreign currency.*

There are many definitions of the concept of hedging. Most experts debate whether transactions without the use of derivative financial instruments can be considered hedging. International Financial Reporting Standard (IFRS) 9 Financial Instruments defines hedging as “a risk management activity involving the use of financial instruments to manage positions in specified risks that could affect profit or loss.” In this case, the hedging instrument can be either a derivative instrument measured at fair value through profit or loss, or a non-derivative financial asset or non-derivative financial liability. Taking into account the recognition of international financial reporting standards by both the global and Russian communities, as well as directly by the Ministry of Finance of the Russian Federation, in this article, hedging operations include operations using both derivatives and non-derivative financial instruments. At the same time, it is necessary to note the opinion of many economists that hedging involves the use of derivative contracts. For example, V. A. Galanov defines hedging as “insurance of the risk of changes in the price of an asset, interest rate or exchange rate using derivative instruments.” There is also no consensus regarding the definition of hedging objectives. Thus, according to A. N. Burenin, hedging operations can be used to minimize risk, maximize expected profitability, or maximize expected utility. However, this definition does not allow one to unambiguously distinguish hedging operations from the general list of banking operations, because all operations of a commercial organization are in one way or another aimed at maximizing expected utility. Most scientists still agree that the essence of hedging comes down to opening a position on the market that is opposite to an existing one, in order to minimize the risk associated with having an open position. For example, for an enterprise with a significant debt burden in foreign currency, it makes sense to enter into transactions that bring it profit if the currency of the debt increases. Thus, the company will compensate for additional costs associated with the increase in the cost of payments on borrowed funds due to the increase in the debt currency exchange rate. If the company does not use hedging instruments, the currency risk is uninsured and can lead to significant losses that are not offset by profits from other transactions. Having determined the essence of hedging, as well as outlining its boundaries, the following hedging instruments can be distinguished:

- attraction/placement of borrowed funds and funds in a certain currency for a certain period at a fixed or floating interest rate (the terms of the loan are determined taking into account the current position of the hedger);
- opening a long/short position on a specific security or a specific group of securities;
- concluding spot contracts, including for the purchase or sale of foreign currency;
- conclusion of derivatives contracts, including forwards, swaps, options¹, agreements on future interest rates;
- concluding direct and reverse repo transactions;
- securitization of existing assets or liabilities and sale of related securities;

- concluding contracts that directly provide for the transfer of risks on a particular financial instrument, including credit default swaps.

All of these instruments are financial instruments and thus may qualify as a hedging instrument under IFRS 9 if they are used “to manage positions in specified risks that could affect profit or loss.” One of the features of the banking business is “a high level of risk. “Management errors often lead to loss of liquidity and solvency of banks, and sometimes to bankruptcy.” The effectiveness of measures aimed at minimizing risks is a key factor in credit institutions achieving their goals. The list of operations carried out by the bank may vary depending on the specific organization, but it is customary to distinguish the following typical types of activities for credit organizations:

1. Lending to legal entities and individuals.
2. Maintenance and servicing of current and special accounts of legal entities and individuals.
3. Attracting time deposits from legal entities and individuals.
4. Providing bank guarantees and guarantees to legal entities.
5. Operations in the interbank lending market.
6. Transactions on the securities market.
7. Operations on the derivatives market.
8. Operations on the foreign exchange market.

Some credit institutions also carry out other types of operations (for example, leasing real estate for financial or operating lease), but these types of activities are not typical for banks and, therefore, are not included in the list presented above. The diversity and complexity of the activities of a commercial bank determines the presence of a whole list of risks that are different from each other in nature.

Most often, the following types of banking risks are distinguished:

1. Credit risk.
2. Liquidity risk.
3. Interest rate risk.
4. Price risk.
5. Currency risk.
6. Inflation risk.
7. Operational risk.
8. Prudential risk.

Credit risk generally refers to the uncertainty associated with the borrower's ability to service its debts and meet its financial obligations. Credit risk includes both the risk of counterparty default and the risk of an increase in the probability of counterparty default (primarily due to a deterioration in its financial position). If in the first case, the bank's losses are due to the complete or partial impossibility of obtaining the expected cash flows on the loan, then in the second - the level of the interest rate, which no longer corresponds to the level of credit risk inherent in a particular borrower. Credit risk can be both individual, i.e., inherent in an individual borrower or a separate group of borrowers, and collective, i.e., expressed in the deterioration of the quality of the loan portfolio as a whole. Counterparties include not only persons to whom loans were issued by the bank, but also issuers of debt securities in the bank's portfolio, as well as enterprises acting as principals on guarantees issued by the bank. Some authors identify the risk of a bank's off-balance sheet operations as a separate banking risk. Country risk is often separately identified, i.e. the bank's exposure to credit risk from non-resident counterparties. Country risk applies both to the bank's claims to non-resident borrowers (including legal entities, individuals, as well as state and municipal bodies of foreign states), and to claims to resident borrowers, if a significant part of their fixed capital is located abroad and cash flows, at the expense of which the obligations will be repaid will also be generated abroad. Liquidity risk is “the uncertainty associated with a bank's ability to timely and fully meet its obligations.” Liquidity risk means not only the possibility of bank bankruptcy, but also the presence of factors that negatively affect the bank's liquidity and, accordingly, the perception of the bank as

an investment object by its current and potential creditors, which negatively affects the bank's ability to raise funds at market prices. As a rule, "liquidity risk in a bank is determined by a schedule of the ratio of assets and liabilities by maturity." Interest rate risk refers to the uncertainty of the impact of changes in interest rates on the financial position of the bank. Interest rate risk affects the income and expenses of a credit institution, the value of its assets, liabilities and off-balance sheet instruments. On the one hand, placing and attracting funds at fixed rates creates the possibility of lost profits when market conditions change. For example, if interest rates in the economy rise, long-term loans previously issued at fixed rates become less profitable financial instruments: if they were issued after corresponding changes in market conditions, the interest rates on them would be higher. On the other hand, the use of floating rates when placing and raising funds creates uncertainty in future cash flows. Thus, a sharp increase in average market interest rates leads to an increase in interest expenses on funds raised with a floating interest rate.

Interest rate risk becomes particularly important when one of the following conditions is present:

1. Interest-bearing assets and liabilities have significant differences in structure in terms of the share of floating rate instruments.

2. Interest-bearing assets and fixed rate liabilities have significant differences in structure in terms of terms to maturity.

3. Different interest rates are used as benchmarks for floating rate instruments.

Price risk is the uncertainty of changes in the value of the bank's assets and liabilities due to changes in market conditions. "Price risk exists at any given time. Any decrease in value will result in a loss equal to the difference between the cost of the portfolio and its market value at the time of sale. The holding period of an asset does not affect the determination of price risk, since at any point in time a decision can be made to liquidate the portfolio and hedge future changes in the value of the portfolio. The risk is that the market value may change during the minimum period required to liquidate the portfolio, so price risk is limited to the liquidation period." Currency risk is the uncertainty of changes in the bank's future cash flows due to changes in exchange rates. An indicator of currency risk is the size of an open currency position in a particular currency. The currency position is understood as "the difference between the requirements and obligations of the bank acquired as a result of transactions for the purchase and sale of foreign currency, the conversion of one type of currency into another, as well as other operations that result in changes in the requirements or obligations of the bank expressed in foreign currency". In other words, the currency position is the ratio of claims and liabilities in foreign currency. The risk of devaluation of an individual currency can be identified as a subtype of currency risk. Separately, it is worth highlighting inflation risk - uncertainty regarding the amount of losses from possible inflationary depreciation of money.

The sum of all bank income in a given reporting period is called gross income.

The following groups are distinguished as part of gross income:

- 1) operating income:

- interest income;

- commission income;

- income from operations in financial markets;

- other operating income;

- 2) income from side activities of the bank;

- 3) other income. The largest share in the structure of income of a commercial bank is occupied by income from core activities, i.e. operating income. Operating income includes interest and non-interest income.

The predominant part of the bank's income relates to interest

income, namely income from paid placement of the bank's own funds and borrowed funds. This is income from providing loans to customers or placing temporarily free funds in central and commercial banks, interest income from investments in debt obligations, income from various accounting transactions.

All types of listed interest income are generated by providing funds for temporary use and generate income in the form of interest on the invested amount. In recent years, interest income for the majority of Russian banks accounts for about 80% of total income. The figure shows the classification of income.

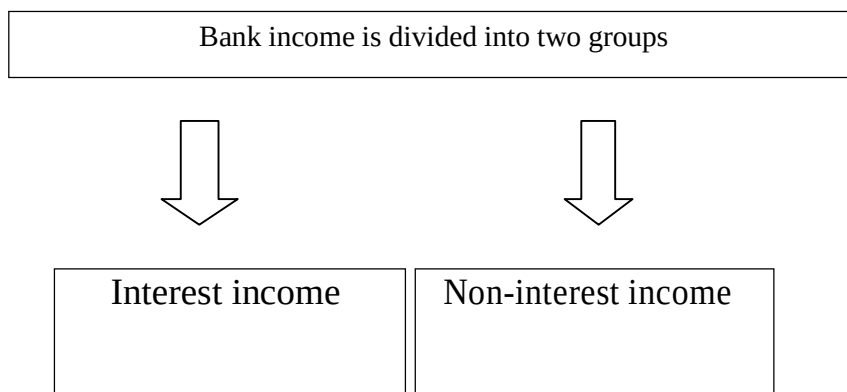


Figure 1 – Types of bank income

Interest income on loans belongs to the group of stable sources of income for the bank. Stable income is income that is constant for the bank over a relatively long period of time (1 - 2 years) and, in this regard, can be planned for the future. Stable income in bank practice usually includes income from core activities. Unstable income includes income from foreign exchange transactions and securities transactions in financial markets. In the practice of functioning of commercial banks, a prerequisite for their successful operation is a predominant increase in income from stable sources with a small share of income from unstable sources.

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Rezyume: Maqolada bank hisobining o‘rni va uning O‘zbekiston Respublikasida joriy etilishi yoritilgan. Maqolada tijorat banklarida balanslarni xalqaro standartlarga konvertatsiya qilish metodologiyasini ishlab chiqishga qaratilgan tadqiqot haqida ma’lumot berilgan. Tijorat banklarida hisob siyosati konsepsiyasini UFRS talablariga muvofiqlashtirish bo‘yicha taklif va tavsiyalar banklarda hisob siyosatini ishlab chiqishda foydalanish uchun qabul qilindi.

Резюме: В статье описывается роль банковского учета и его внедрение в Республике Узбекистан. В статье сообщается об исследовании, направленном на разработку методологии перевода балансов на международные стандарты в коммерческих банках. Предложения и рекомендации по гармонизации концепции учетной политики в коммерческих банках с требованиями МСФО были приняты для использования при разработке учетной политики в банках.

Kalit so'zlar: tijorat banklari, foyda, daromad, kredit resurslari va shartli majburiyat, identifikatsiya, xaridor, investor, kredit beruvchi, chet el valyutasini saqlash.

Ключевые слова: коммерческие банки, прибыль, выручка, кредитные ресурсы и условные обязательства, идентификация, покупатель, инвестор, выдача кредитов, хранение иностранной валюты.

THE IMPORTANCE OF LEGAL DOCUMENTS IN THE DEVELOPMENT OF AIR TRANSPORT

Kitaybekov A.

Karakalpak State University named after Berdakh

Summary: This article covers the history of the adoption of laws, legal documents and the introduction of a new system in this field in the development of air transport in Uzbekistan.

Key words: Uzbekistan airways, Air Code, airplane, aviation, airline, department.

Car, water and air transport are among the types of transport that lighten the burden of people and bring them closer. Therefore, the type of transport that makes it possible to fly over long distances, over mountains and oceans is air transport.

With the help of air transport, it is possible to reach hard-to-reach places, roadless, desert and mountainous areas in a short time. One of the main goals of every developed country is to improve the way of life of people and create convenience for them. Codes, laws, decrees, decisions, legal documents and other documents will help in this matter.

Many laws have been adopted in Uzbekistan in order to improve the quality of air transport of passengers and cargo. The most important of these laws is the Air Code of the Republic of Uzbekistan. On the basis of this document adopted on June 26, 1993, air transport in Uzbekistan is regulated. Article 1 of this document states that "The Republic of Uzbekistan has complete and exclusive ownership of the territory of the Republic over land and water bodies. The celestial territory of the Republic of Uzbekistan is an integral part of the territory of the state of Uzbekistan."²

Relations in the field of use of the airspace of the Republic of Uzbekistan and the activities of all its users, including aviation activity on the territory of the Republic of Uzbekistan, are regulated by this Code, the regulation on the use of airspace of the Republic of Uzbekistan, the basic Rules for aviation flights in the airspace of the Republic of Uzbekistan, approved by the Cabinet of Ministers of the Republic of Uzbekistan, as well as the Rules of flights of civil and experimental aviation in the airspace of the Republic of Uzbekistan and the Rules of flight of state aviation in the airspace of the Republic of Uzbekistan, approved respectively by the Aviation Administration of the Republic of Uzbekistan and the Ministry of Defense of the Republic of Uzbekistan, and other legislative acts. If an international treaty of the Republic of Uzbekistan establishes other rules than those stipulated by the legislation of the Republic of Uzbekistan on the use of airspace and aviation activity, then the rules of the international treaty shall apply, - It is defined as in text 2.³

The order of the head of the State Inspection of Flight Safety Control of the Republic of Uzbekistan dated December 6, 2013 No. 36-N "Approving the rules of air transport" was adopted. It defines the procedure for air transportation of cargo in accordance with the requirements of the international agreements of the Republic of Uzbekistan, as well as the standards and recommendations of the International Civil Aviation Organization (ICAO). In this:

aviation security - adapted, human and material resources, as well as comprehensive measures to protect civil aviation from illegal actions;

airport - a complex of facilities intended for the reception and departure of aircraft, air transportation, and for these purposes, an airfield, an air terminal, other facilities, as well as the necessary equipment;

outer packaging - a container designed to combine one or more cargo spaces;

cargo - any property transported or accepted for transportation on an aircraft (except for mail and other property transported under the terms of international postal agreements, luggage or property of the carrier), as well as baggage transported under a waybill;

² <https://www.uzairways.com/uz>

³ <https://lex.uz/docs/-55594>

transfer cargo - cargo delivered to an intermediate destination in the transportation direction and transported after this destination by another route of the same carrier or another carrier;

carrier - the operator of an aircraft with an operator's certificate;

agent of the carrier - a person authorized to act on behalf of the carrier;

perishable cargo - cargo that requires compliance with special conditions and rules for transportation;

cargo packing slip - a slip used for transportation of a special category, including exhibits, works of art, and other cargo;

forwarder - a person who acts as an intermediary between the shipper and the carrier and provides services to the shipper or the carrier;

unaccompanied baggage - personal belongings of the passenger transported on the basis of the waybill;

valuable cargo - cargo for which a fee of 1,000 US dollars (or its equivalent) or more per kilogram is charged for transportation and requires special measures for storage and security (silver, gold, platinum, precious stones, pearls and articles thereof, currency notes, traveler's checks, insurance policies, stocks, stamps and ready-to-use bank and/or credit cards);

embargo - a certain (or any) type and form of cargo for a certain period of time in a certain (or any) direction or a certain (or any) area or contiguous area of the route refusal to accept carriage at addresses.⁴

O'zbekiston Respublikasi Prezidentining "Transport sohasida davlat boshqaruvi tizimini tubdan takomillashtirish chora-tadbirlari to'g'risida" 2019-yil 1-fevraldagi PF-5647-son Farmoni va "O'zbekiston Respublikasi Transport vazirligi faoliyatini tashkil etish to'g'risida" 2019-yil 1-fevraldagi PQ-4143-son qaroriga muvofiq, O'zbekiston Respublikasi Vazirlar Mahkamasining 2019-yil 19-aprelda "About the approval of the regulation on the Ministry of Transport of the Republic of Uzbekistan" qabul qilindi. Bunda vazirlikning vazifalari va funksiyalari quyidagilar bo'lib hisoblanadi:

In the field of supervision in the field of transport, organization and implementation of investigations into accidents and accidents in civil aviation and experimental aircraft, as well as accidents and accidents in railway and river transport:

Compliance with passenger, baggage and cargo transportation rules, safety of passengers and cargo transportation, ensuring the necessary level of passenger service culture, uniform movement of vehicles on passenger routes, established traffic schedule and organizes systematic control of compliance with intervals;

in accordance with the law:

urban, suburban, intercity and international passenger and cargo transportation by road transport;

issues licenses (license forms) entitling passengers and cargo transportation in domestic and international railway transport;

supervises compliance with the terms and conditions of permit documents and license requirements, takes measures to suspend, terminate and cancel the validity period of licenses and permit documents issued in the prescribed manner;

carries out inspections during the registration (re-registration) of ships, construction, use, re-equipment and repair of ships;

issues ship certificates and tickets, category certificates, seaworthiness certificates and other documents stipulated by the rules of shipping regulations to ships;

certifies compliance with the qualification requirements for employees of legal entities engaged in passenger and cargo transportation in road transport, as well as newly appointed managers and responsible management personnel in railway transport organizations, centers and enterprises;

⁴ <https://lex.uz/docs/-2316398?ONDATE=28.07.2021>

organizes and carries out technical investigation and investigation of aviation incidents and accidents and collisions in civil aviation and experimental aircraft, as well as accidents and accidents in railway and river transport in the territory of the Republic of Uzbekistan;⁵

Develops proposals for the prevention of accidents and accidents in civil aviation and experimental aircraft of the Republic of Uzbekistan, as well as accidents and accidents in railway and river transport;

first of all, the State System of Emergency Situations (hereinafter referred to as FVDX), provides rescue structures, forces and means of military units and transportation of goods for the elimination of emergency situations and the implementation of evacuation measures;

FVDX directs the activity of functional sub-systems of motor transport service and highway services;

Participates in the determination of the shortest distance procedure for the transportation of dangerous and special goods transiting by road and rail transport to the Republic of Uzbekistan and across the territory of the Republic of Uzbekistan;

Rights, obligations and responsibilities of air transport passengers:

The passenger shall:

use of air transport on preferential terms;

carry free baggage within the specified amount;

has the right to hand over baggage for transportation within the specified amount free of charge, and for exceeding the amount - by paying a fee according to the specified tariff.⁶

In accordance with the decree of the president of the Republic of Uzbekistan after the declaration of independence of the Republic of Uzbekistan, on January 28, 1992, on the basis of the Department of Civil Aviation of Uzbekistan, which is under the jurisdiction of the Ministry of Civil Aviation of the former Union, the national airline "Uzbekistan Airways" was established.⁷

The Council of Ministers of the Republic of Karakalpakstan together with the Ministry of Finance, considering the letter of Nukus Airport dated 26.09.1997 № I-20-657 "On Allocation of Funds for Reconstruction and Improvement of Nukus Airport", Nukus Airport for these purposes, 3 (three) million soms were allocated from the financial fund of the Council of Ministers by order № 269-B of 20.10.1997.⁸

To sum up, the adoption of laws by the state on the air transport system creates the basis for the rapid development of this sector.

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Rezyume: Ushbu maqolada O'zbekistonda havo transportining rivojlanishida qonunlar, huquqiy hujjatlarning qabul qilinishi, ushbu sohaga yangicha tizimning kirib kelish tarixi yoritilgan.

Резюме: В данной статье освещена история принятия законов, правовых документов и внедрения новой системы в этой области развития воздушного транспорта в Узбекистане.

Kalit so'zlar: O'zbekiston havo yo'llari, Havo kodeksi, samolyot, aviatsiya, avialiniya, zveno.

Ключевые слова: Узбекистан ҳаво йўллари, Воздушный кодекс, самолёт, авиация, авиалиния, звено.

⁵<https://www.norma.uz/oz/>

⁶ <https://advice.uz/oz/document/1153>

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GUARANTEES OF RELIABLE PROTECTION OF INDIVIDUAL RIGHTS AND FREEDOMS IN OPERATIONAL INVESTIGATIVE AND INVESTIGATIVE ACTIVITIES

Baynazarova G.J.

Judge of the Nukus Interdistrict Administrative Court of the Republic of Karakalpakstan

Summary: *This article highlights the powers and procedure for the reliable protection of individual rights and freedoms in operational investigative and investigative activities.*

Key words: *investigating judge, human rights, court, investigation, crime, sanction, detention, house arrest, petition, legislation, justice, civil peace, personal rights.*

Large-scale work is underway in our country aimed at raising the human rights protection system to a new level on the principle of "for human dignity", strengthening guarantees for the protection of individual rights and freedoms in the activities of judicial and law enforcement agencies, as well as strengthening public confidence in the law enforcement system.

At the same time, judicial and investigative practice indicates that effective mechanisms for ensuring guarantees of protection of human rights and freedoms have not been fully implemented, as well as the need to strengthen measures to ensure through the court reliable assurance of the constitutional rights of a person accused of committing a crime to freedom and privacy.

Proceeding from the priority directions outlined in the strategy "Uzbekistan — 2030", in order to increase the efficiency of the courts, practically ensure the principle of equality and consent of the parties in the pre-trial conduct of cases, as well as effective protection of individual rights and freedoms in operational investigative and investigative activities:

1. Since January 1, 2025, proposals of the Supreme Court, the Prosecutor General's Office, the Ministry of Internal Affairs, the State Security Service and the Ministry of Justice are being accepted, providing for:

introduction of the procedure for considering the issue of authorizing procedural decisions during pre—trial proceedings in criminal cases by individual judges - investigative judges in district and city criminal courts;

introduction of the position of an investigative judge in district and city criminal courts;

the establishment of the procedure for the sole review of sanctions imposed by the investigating judge on procedural decisions during pre-trial proceedings in criminal cases, the court of the Republic of Karakalpakstan, regional and Tashkent city courts, the military court of the Republic of Uzbekistan only in the appellate instance;

granting investigative judges the authority to consider cases of administrative offenses;

maintaining the current procedure for reviewing cases of administrative offenses in higher instances considered by investigative judges.

2. To authorize the investigating judge to consider the application of the following criminal materials, including sanctions and coercive measures:

Sanctions against:

application for the application of a precautionary measure in the form of detention or house arrest;

in connection with issues of detention or extension of house arrest, the petition;

application for suspension of passport (travel document) ;

application for exhumation of a corpse;

petition for commemoration of postal and telegraphic items;

request for a search;

Eavesdropping on conversations transmitted by telephones and other telecommunication devices, requesting information transmitted through them;

petition for the revocation of property;

Coercive measures against:

petition for the removal of the accused from office;
application for placement of a person in a medical facility;
the petition of the accused to extend the period of stay in a medical institution;
application for an extension of the period of detention to forty-eight hours;

The prosecutor's petition for the preliminary confirmation of the testimony of the witness and the victim (civil plaintiff).

3. The main areas of activity of the investigating judge are determined by:
fair and impartial performance of duties assigned to the investigating judge in accordance with the procedure established by law;

ensuring the rule of law, social justice, peace and harmony of citizens;

effective judicial protection of the rights and legitimate interests of citizens and legal entities.

At the same time, the investigating judge, carrying out his activities independently, obeys only the law and does not allow the imposition of any duties on the investigating judge that are not related to the administration of justice. The appointment and dismissal of investigative judges, as well as the formation of the judicial corps, are carried out in accordance with the procedure established by law. The organizational activities of the investigating judge are managed by the chairmen of the Court of the Republic of Karakalpakstan, regional and Tashkent city courts, and the military court of the Republic of Uzbekistan, respectively.

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Rezyume: Ushbu maqolada tezkor-qidiruv hamda tergov faoliyatida shaxsning huquq va erkinliklarini ishonchli himoya qilishdagi vakolatlari va tartibi yoritilgan.

Резюме: В данной статье освещаются полномочия и порядок надежной защиты прав и свобод личности в оперативно-розыскной и следственной деятельности.

Kalit so'zlar: tergov sudyasi, inson huquqlari, sud, tergov, jinoyat, sanktsiya, hibsga olish, uy qamog'i, iltimosnoma, Qonunchilik, adolat, fuqarolik tinchligi, shaxs huquqlari.

Ключевые слова: следственный судья, права человека, суд, расследование, преступление, санкция, задержание, домашний арест, ходатайство, законодательство, правосудие, гражданский мир, права личности.

ANALYSIS OF BANKING RISK HEDGING OPERATIONS

Utegenova S., Rozumova D.

Karakalpak State University named after Berdakh

Summary: *The article describes the role of the International Standards of Accounting and its implementation of the Republic of Uzbekistan. The paper reports on a study aimed at developing a methodology for converting balance sheets to international standards in commercial banks. Proposals and recommendations for harmonizing the concept of accounting policies in commercial banks with the requirements of IFRS were accepted for use in the development of accounting policies in banks.*

Key words: *commercial banks, profit, revenue, credit resources, and contingent liability, identification, buyer, investor, issuing loans, storage of foreign currency.*

Commercial banks play a huge role in the functioning of the credit system. They accumulate the bulk of credit resources, provide clients with a full range of financial services, including issuing loans, accepting deposits, settlements, purchase and sale and storage of securities, foreign currency, and so on. The essence of a commercial bank is manifested in its functions, the implementation of which has a huge impact on the country's economy. The leading role of banks in the development of the economy of Uzbekistan is undeniable. By lending to various areas of activity, banks contribute to the radical transformation of the republic's infrastructure, the development of small and medium-sized businesses, as well as the employment of the population. Thus, in 2023, with the assistance of banks, over 1,500 thousand university graduates were employed. Commercial banks provided them with preferential loans to organize their own business in the amount of about 1,280 billion soums, which is 1.3 times more than in 2021.

Interest income is the main source of income for most commercial banks. They are generated from transactions with assets that generate income in the form of interest. Simply put, interest income is the income a bank receives from lending and investing in securities. The difference between the interest earned on these assets and the interest paid on deposits and loans forms the bank's interest income.

Main sources of interest income:

Loans: This is the most significant source of interest income for most banks. The bank provides the borrower with a sum of money, and the borrower agrees to return the money with interest. Different types of loans include mortgages, personal loans, auto loans, credit cards and commercial loans.

Investment in Securities: Banks invest in various securities, including government and corporate bonds, to earn interest income. Let's analyze the annual report of interest income [Compiled by the author based on the annual financial statements of the Karakalpak Republican Nukus branch of JSCB "Microcreditbank"]

Table – 1

Interest income analysis Karakalpak Republican Nukus branch of JSCB
"Microcreditbank" for 2022-2023 (sum, tiyin)

№	Name indicator	code	2022 year	2023 year	Growth, in %
1	Interest income on loans receivable	80	35 883 161 986	44 710 725 656	20,5
2	Interest income on loans under litigation	90	923 116	135 730 922	14 706
3	Interest income on investments in debt	100	-	-	

	securities held to maturity				
4	Other interest income	110	45 540 427	2 189 190 309	208
5	Interest income on transactions with securities	120	-	-	
6	Interest income - Leasing	130	-	-	
7	Total interest income	140	35 929 625 529	47 035 646 886	24,7

Let's analyze the interest income of the Karakalpak Republican branch of JSCB "Microcreditbank" for 2022-2023 in table 1. The table shows that interest income on loans receivable increased by 20.5% compared to last year, and other interest income increased by 208%. But during the reporting period, interest income performed poorly, which is in legal proceedings, showing an increase of 147 times. But overall, interest income showed an increase of 24%.

The bank's profit or loss reflects the results of all its active and passive operations in concentrated form. The amount of profit largely depends on the amount of income and expenses that were incurred. Hedging of commercial banks is risk management, here it is necessary to know all banking operations associated with management risks.

Revenues represent amounts of money received from production and non-production activities. The Bank receives income from banking operations, provision of services to customers and from additional activities related to its main functions.

Expenses represent the use of funds for production or non-production activities. In the case of a bank, expenses may relate to both banking and non-banking activities.

Book or gross profit is the difference between the amount of gross income and the amount of expenses. If this difference is positive, then we talk about gross profit, and if it is negative, then we talk about a loss.

A bank's profit is usually divided into several types, including operating profit, profit from incidental activities and other types of profit. Operating profit is usually the most significant part of profit, and an important part of it is interest income received from core banking activities.

The final result of the financial activities of a commercial bank is net profit, which is the remainder of the bank's income after deducting all expenses, including unforeseen expenses, the formation of reserves and the payment of taxes from profits.

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Rezyume: Maqolada buxgalteriya hisobi xalqaro standartlarining o'rni va O'zbekiston Respublikasida joriy etilishi yoritilgan. Maqolada tijorat banklarida balanslarni xalqaro standartlarga konvertatsiya qilish metodologiyasini ishlab chiqishga qaratilgan tadqiqot haqida ma'lumot berilgan. Tijorat banklarida hisob siyosati konsepsiyasini UFRS talablariga muvofiqlashtirish bo'yicha taklif va tavsiyalar banklarda hisob siyosatini ishlab chiqishda foydalanish uchun qabul qilindi.

Резюме: В статье описывается роль Международных стандартов бухгалтерского учета и их внедрение в Республике Узбекистан. В статье сообщается об исследовании, направленном на разработку методологии перевода балансов на международные стандарты

в коммерческих банках. Предложения и рекомендации по гармонизации концепции учетной политики в коммерческих банках с требованиями МСФО были приняты для использования при разработке учетной политики в банках.

Kalit so'zlar: tijorat banklari, foyda, daromad, kredit resurslari va shartli javobgarlik, identifikatsiya, xaridor, investor, kredit beruvchi, chet el valyutasini saqlash.

Ключевые слова: коммерческие банки, прибыль, выручка, кредитные ресурсы и условные обязательства, идентификация, покупатель, инвестор, выдача кредитов, хранение иностранной валюты.

THOUGHTS ABOUT FRENCH MUSIC

Dadaev A.Sh.

The Uzbekistan State Institute of Arts and Culture

Summary: *It is not for nothing that France is recognized as the cultural center of the world. The origin or development of many areas of art and culture is associated with the French state. This article talks about the French art of music, its development over the centuries, achievements, leading specialists in this field and about the further work carried out to improve it.*

Key words: *art, culture, music, musical genres, music theory, musical instruments, composer, polyphony, international competitions, festivals.*

Introduction. French music is one of the most interesting and influential musical arts in Europe, and its origins go back to the folklore of the Celtic and Germanic tribes that lived in the territory of present-day France. With the emergence of France in the Middle Ages, French music brought together folk music traditions from many regions of the country. French music developed in contact with other European nations, especially Italian and German music. Since the second half of the 20th century, French music has been enriched with the musical traditions of African nations. It did not stay out of world music art, it incorporated new musical trends and gave a unique French touch to jazz, rock, hip- hop and electronic music.

Literature review. A lot of research has been done on the art of French music. O.A.Vinogradova's encyclopedia “Французская музыка”, [1] T.F. Gnativ's “Музыкальная культура Франции рубежа XIX-XX веков” [2] educational manuals are important as sources. In many studies, for example, E.Weber's “Histoire de la musique française de 1500 à 1650, Regards sur l’histoire”, [5] F.Porsil's “La belle époque de la musique française 1871-1940”, [6] D.Egard's “Les relations franco-allemandes et la musique à programme” [7] sources describe the path, characteristics and rich heritage of French music.

Research Methodology. French music is rich and diverse, embodying the richness of the country's cultural heritage and traditions. French music has evolved from its ancient roots in the Middle Ages to the modern trends of the 21st century, reflected in the diversity of composers and musical movements. French musical art was formed in the rich layer of folk songs. Although the oldest song records that have survived to this day date back to the 15th century, literary and artistic materials show that music and singing played an important role in the daily lives of the people from the time of the Roman Empire.

Analysis and results. The main French folk instruments are the violin, the cello, the lyre, and the pipes. Volynka is very luxuriously decorated. Structurally, the volynkas available in France are divided into several types. For example, in the Berry and Bourbon regions, the double-barreled French wine; in the Auvergne, the unbarreled cabaret; and among the Occitans, the single-barreled wine called bodega. In addition, the flute-galube, which plays under the rhythm of the drum and drum, which was common in the Middle Ages in the Occitans, has been preserved. T.F. Gnativ notes that instruments accompany with the farandole. [2]

In the middle of the 19th century, the accordion entered French folk music, and in the 1880s, the genre of ball-musette music appeared. This is the name of the dance halls, where folk dances such as burre were first performed, then waltz, polka, gavotte, mazurka, and similar dances. [3, 4] As a result, this name was transferred to the music performed in such salons. In the 1920s and 1950s, the ball-musette reached its peak of popularity. In those years, new types of dances—foxtrot, pasodoble, swing, tango—were introduced, and skilled accordionists also appeared. [4] At the end of the 20th century, the ball-musette was mixed with the jazz style, jazz-manush, which appeared under the influence of the folk music of the French gipsies, and the accordion began to be accompanied by the guitar.[5]

The Celtic-speaking Bretons have their own musical traditions. The Breton *volline*, *binyu-coz* or *binyu*, has a very small, short melody pipe. In 1932, the *bineu-brase* was created based on the improved *bineu-coz* and the Scottish *volline*, which was also included in Breton music. Another Breton musical instrument is the *bombard*, which often accompanies the *binue*. *Bombard* was first recorded among the Bretons in the 16th century. *Bombard* has a diatonic scale, which allows you to play in only one tone. It is very difficult to perform on the *bombard*; it requires a sharp breath from the musician. [7] *Vocheri* occupies a special place in Corsican folk music, which was traditionally performed by women over the corpse of a man killed. Musical instruments include *horn-pifana*, *sistra*, *volinka*, and *chyaoambella* played on the tongue. In the 18th and 19th centuries, they were replaced by the accordion, violin, mandolin, and guitar.

The development of church music dates back to the Middle Ages. *Jumiej* Catholic abbeys have become centres of church music and cells of professional spiritual and secular music culture. Special singing schools are established in many abbeys to teach students to sing. There, they taught not only Gregorian chant but also how to play musical instruments. Notation appeared in the middle of the 9th century, and its development led to the formation of modern musical notation many centuries later.

Secular music developed in the lives of the people, in the palaces of the kings, in the castles of the feudal lords. The bearers of the folk music traditions of the Middle Ages were mainly the popular folk musicians—jugglers. They sang moral, comic, and satirical songs and danced to the accompaniment of various musical instruments, including *tambourines*, drums, flutes, and lutes. Jugglers performed in villages, in the palaces of feudal lords and even at festivals in monasteries. They were persecuted by the church as representatives of secular culture. In the 12th and 13th centuries, social stratification took place among jugglers. Some of them settled in the castles of the knights and became completely dependent on them; others stayed in the cities. As a result, jugglers lost their creative freedom. However, this process contributed to the penetration of folk creativity into castles and cities and became the basis of music and poetic art of chivalry and burghers.

At the end of the Middle Ages, with the general rise of French culture, the art of music began to develop. The secular art of *troubadours* and *trouvres*, based on folk music, flourished in feudal castles.

As a result of the rise of cities such as Arras, Limoges, Montpellier, Toulouse in the 12th-13th centuries, urban music art developed, the creators of which were poets-singers from the urban class. They introduced their own aspects to the art of *troubadour* and *trouver*, moved away from the musical and poetic images characteristic of chivalry, adopted folk themes and created their own style and genres.

The most prominent master of the city music culture in the 13th century was the poet and composer Adam de la Alle. He created a new interpretation of the traditional solo musical and poetic genres of the *troubadours*, using polyphony.

The strengthening of the economic and cultural role of cities, the establishment of universities where music was included as a compulsory subject, contributed to the rise of music to the level of art. In the 12th century, the city of Paris became one of the centers of musical culture, and the Notre-Dame cathedral, which united singer-composers and scientists, became a singing school. This school is associated with the flourishing of cult polyphony, the emergence of new musical genres, and discoveries in the field of music theory in the XII-XIII centuries.

Polyphony gave rise to new genres of church and secular music, including the conductor and the motet. Conduct was first performed on church holidays, but later became a completely secular genre. At the end of the 12th century, the most important genre of polyphonic music—the motet was formed on the basis of the conductor. The motet gave freedom to the combination of liturgical and secular melodies and texts. The motet genre was significantly updated in the 14th century under the *ars nova* movement, whose author was Philippe de Vitry.

Ars nova and, in particular, the ideas of the rhythmic motet found their development in the work of Guillaume de Machaut, who combined the artistic achievements of musical and poetic art with solo songs and polyphonic urban music culture

In the 15th century, representatives of the Franco-Flemish school occupied a leading position in French musical culture. Gradually, the role of music in social life increased. French kings created chapels in their palaces, organized musical festivals, and the royal palace became a center of professional art. In 1581, Henry III approved the position of “intendant”, the chief manager of music in the kingdom. This position was first occupied by the violinist Baltazarini de Belgiozo.

During the Renaissance, the role of music increased significantly. Viola, lute, guitar, violins were widely used. Instrumental genres penetrated both everyday and professional music, and partly into church music. Among polyphonic works of the 16th century, lute dances were distinguished by their rhythmic plasticity, homophonic composition and transparency. Organ music also acquired an independent meaning. The appearance of the organ school in France is connected with the work of the organist J.Titluz.

In 1570, “Academy of Poetry and Music” was founded by Jean-Antoine de Baïf. The participants of this academy sought to restore the ancient poetic and musical dimension and defended the principle of integral connection between music and poetry.

In the 17th century, the French music was strongly influenced by the rationalist aesthetics of classicism, which promoted the requirements of taste, beauty and truth balance, clarity of design, and harmony of composition. Under the influence of the absolute monarchy, court art gained great importance and determined the direction of development of important genres of music: opera and ballet. In the 17th century, various schools of musical instruments - lute, harpsichord, viola - developed in France. The combination of double dances, which began to be used in music since the 16th century, was widely used, which led to the creation of an instrumental suite in the 17th century.

The Great French Revolution brought great changes to all areas of musical art, helped to form popular genres-songs, anthems, marches, etc. The “Opera of Salvation” has reached an important stage of development, raising the themes of the fight against tyranny and glorifying loyalty. Military instrumental music became more significant and the National Guard Band was established. The system of music education has undergone radical changes. In 1792, the National Guard Music School was opened to train military musicians, and in 1793, the National Music Institute (from 1795 the Paris Conservatoire) opened.

During the Second Empire (1852-70), many light theaters appeared, where vaudevilles and farces were staged. French operetta developed. Starting from the 1870s, under the conditions of the Third Republic, operetta lost its satire and parody relevance, historical-domestic and lyrical-romantic plots prevailed, and lyricism rose to the first place in music.

The impressionism appeared in 1880-1890. Musical impressionism revived certain national traditions - the desire for concreteness, programmability, elegance of style, transparency of texture. Impressionism found its fullest expression in the music of K.Debyussy and influenced the works of M.Ravel and P.Ducal. Impressionism also introduced innovations in the field of musical genres.

After the World War I, the creative association "French Six" was formed under the leadership of composer E.Satie and critic J.Cocteau, whose members were against not only Wagnerism, but also impressionist "uncertainty".

In 1935, a new creative association of composers - "Young France" was established in France, which included composers such as O.Messian, A.Jolivet, who attached great importance to the restoration of national traditions and humanitarian ideas. They focused their efforts on updating the means of musical expression. France also played an important role in the development of electronic music, where it appeared in the late 1940s.

The city of Paris remained the center of music. The “Paris State Opera” operates in Paris, among the leading musical groups there are the National Orchestras of France, the Philharmonic Orchestra, the Radio France, the Paris Orchestra, the Colonia Orchestra.

Specialized music educational institutions: Paris Conservatory, Skola Cantorum, Ecole Normale - located in Paris. The most important musical research center is the Institute of Musicology at the University of Paris. Books and archival materials are stored in the National Library (the music department was established in 1935), the museum of musical instruments at the library and conservatory.

In France, M. Long and J. Thibaut international competition of pianists and violinists, guitarist competition, Toulouse International Vocal Competition (1954), Besançon International Competition of Young Conductors (1951). Paris International Harp Competition, as well as many festivals, including the Paris Autumn Festival, the 20th Century Paris Music Festival (1952), the Epinal Piano Competition (1970), the Grand Prix de Chartres Organ Competition (1971), and the Rwanda Classical Music Festival.

The French made a huge contribution to electronic music. In the 1990s, electronic genres such as trip-hop, new age, and industrial developed in France. Rock music appeared in the late 1950s. In the 1970s, progressive rock developed well, especially in the Northwest, where A. Stivell, Malicorn, T. Yann grew up, and Celtic rock flourished. The French hip-hop style is also of particular importance. This "street" style was very popular among non-natives, Arab and African immigrants. Some performers from immigrant families have achieved great fame.

Conclusion. It seems that French music has a long history and a rich heritage. Among the peoples of the world, the French, who are distinguished by their knowledge of art, created their own school in music, as well as in other types of art. In France, the international competition of pianists and violinists, the competition of guitarists, the international vocal competition, the international competition of young conductors, the international harp competition, as well as much classical music and rock music festivals are held on a regular basis.

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Rezyume: Dunyo miqyosida Fransiyaning madaniyat markazi sifatida tan olinishi ham bejiz emas. Ko'plab san'at va madaniyat sohalarining kelib chiqishi yoki rivojlanishi Fransiya davlati bilan bog'liqdir. Mazkur maqolada fransuz musiqa san'ati borasida, uning asrlar davomida rivojlanishi, sohada erishilgan yutuqlar, sohaning yetuk mutaxassislari va uni yanada yuksaltirish borasida amalga oshirilayotgan ishlar borasida fikr yuritiladi.

Резюме: Не зря Франция признана культурным центром мира. Зарождение или развитие многих областей искусства и культуры связано с этим государством. В этой статье речь ведется о французском музыкальном искусстве, его развитии на протяжении веков, о достижениях, о ведущих специалистах в этой области и о работе, проводимой для его дальнейшего совершенствования.

Kalit so'zlar: san'at, madaniyat, musiqa, musiqa janrlari, musiqa nazariyasi, cholg'u asboblari, bastakor, polifoniya, xalqaro tanlovlar, festivallar.

Ключевые слова: искусство, культура, музыка, музыкальные жанры, теория музыки, музыкальные инструменты, композитор, полифония, международные конкурсы, фестивали.

MODERN MECHANISMS FOR DEVELOPING THE INTERCONNECTION BETWEEN REPRESENTATIVE AUTHORITY AND CIVIL SOCIETY INSTITUTIONS

Bayriyeva A.Q.

Karakalpak State University named after Berdakh

Summary: *This article analyzes issues related to the development of interaction between representative authority and civil society institutions at the current stages of development.*

Keywords: *Cooperation, representation, authority, civil society, mechanism, model.*

Throughout history, humanity has achieved great results through cooperation, solidarity, and mutual assistance. It is difficult to imagine human life without cooperation and mutual aid. This natural instinct, which urged humans to live together, work in harmony, and, in general, to live, initially served to protect them from natural disasters and predatory animals in the early periods of human existence. In the current stage of social development, this instinct is applied in all areas, and it is precisely on this basis that humanity has reached the level of prosperous life it enjoys today.

The great thinker Abu Nasr Al-Farabi expressed the significant role of mutual cooperation in achieving human happiness with the following thoughts: "A city that unites people who assist each other to achieve true happiness is a virtuous city, and a community that unites people to achieve happiness is a virtuous community" [1].

In this context, it is important to pay attention to the scientific aspects of the relationship between representative authority and civil society institutions. There are various views in scientific research regarding the relationship between representative authority and civil society. However, it can be said that "representation" refers to the representative activities within state authority, while "civil society" is the arena for citizens' participation and involvement in state and societal affairs.

The activities of representative bodies of power and the necessity of cooperation with civil society institutions require attention to certain analyses. Three main aspects of the concept of representation are highlighted:

- Representation as an authorized representative;
- Ordinary representation, having the average characteristics of certain groups;
- Symbolic representation [2].

Deputies are representatives authorized by citizens for a certain period. The parliament itself is a symbol of these people's representatives and, at the same time, the unity of society. The activities of parliament as an institution also imply three meanings. Voting means carrying out one of them. Debates are the most important aspect of parliamentary activity, and it should always be a platform for continuous negotiations.

Based on various characteristics inherent in the essence of representative authority, we can highlight the following main features implemented through representative authority:

- Elections and the expression of people's interests;
- Decision-making through consultation or in a collective manner;
- The unique characteristics of the interconnection between people's representatives and voters.

Only when these qualities are observed as a whole does the representative function of the relevant institutions come into play. Accordingly, it allows the description of representative authority itself as national representative bodies.

In our opinion, the organization of representation refers to the special procedure for forming bodies of representative authority that embody various interests of citizens. This can be organized in different ways, but it is mainly achieved through general, equal, and direct elections by secret ballot. Through elections, national representative bodies manifest their most defining quality - representing the people. The legal basis of state authority in the form of a people's representative body is the

representative mandate, i.e., authority "given" by voters or other participants in the electoral process to trusted representatives.

Political theories also include several normative models developed at various stages of the development of the Western system of representation.

The Trustee Model. Often associated with the name of E. Burke, the proxy model represents representation as a moral obligation: voters choose individuals whom they trust to possess certain abilities and competencies, and it is assumed that representatives act on their behalf. This model includes a purely elitist campaign, forming a specific elite within the structure of representative authority that distributes power resources; it actually compares a person's level of knowledge with a sense of social responsibility, which is why it is criticized. Representation achieved through this model is associated with high moral and intellectual methods.

The Delegate Model of a trustee, on the other hand, views the representative as a means to express the opinions of the voters; in this model, delegates are advised not to adhere to their own opinions and desires. Like the previous one, this model is theoretically constructed and is not applied in political practice.

However, in some principles of designing representative institutions, its essence changes. For example, regular elections, short-term mandates, the right to recall a deputy, the use of referendums in addition to the usual legislative process, and others uniquely transform it. In this case, the meaning of representation lies in the voters' ability to clearly express their interests.

Unlike the initial two models, the mandate model reflects the ongoing practical activity of representation within a party: by winning the election, the party receives a mandate that gives it the right to implement policies in accordance with its pre-election promises. However, this model is also not very precise, as it assumes that voters vote for the party's political program and expect it to be reasonably fulfilled. Thus, representation is linked to the party's success, effectiveness, and its ability to conduct elections at a high level.

There are also other models of representation. For example, some radical theorists propose viewing the representative body as a miniature version of society, a microcosm. From this model's perspective, the extent to which a representative is relevant to representation is connected to the social group that elected them and their experience and knowledge.

This model, which is very vulnerable to criticism, has been tested in some electoral practices (e.g., in the form of quotas). Without considering this collection of models as complete, it can be used as a means of distinguishing the influence of political elite members and mass groups on representative relations.

Civil society is a dynamic and multi-level system capable of developing optimal decisions on socially significant issues, reflecting the democratic interests of the majority of citizens, and expressing and satisfying the needs of people and society through interactions with public associations that reflect self-management.

Based on the above, it can be said that in representative authority, people are recognized as the main source of power. By electing their representatives to state bodies and local state authorities, citizens directly participate in governance. In short, this is a system of relations arising from the expression of the interests of individual citizens, communities, and associations engaged in legitimate activities.

The activities of civil society institutions are based on the necessity to perform the following functions:

- Increasing the level of civic activity among the population;
- Developing the legal culture of citizens;
- Improving democracy;
- Actively involving leaders and influencers from the population in governance;
- Developing vertical and horizontal public relations and strengthening the interactions

between the population and political power.

In conclusion, it can be said that in recent decades, the concept of representation in modern democratic theory has significantly expanded, encompassing not only traditional institutional forms (political parties, pressure groups, and other civil society institutions) but also other non-institutional forms of political participation (social movements, informal civic groups, active citizens, etc.). In the context of the crisis of the traditional political representation institution – the political party – these new social groups and citizens have emerged as bright representatives and defenders of their interests. Therefore, in modern democratic theory, democratic representation is defined as a mechanism for citizens to influence the political decision-making process (through political representation and other non-institutional forms of political participation). At the same time, there is notable growth in "non-institutional participation" in almost all Western countries [3]. According to many prominent European scholars [4], this trend reflects the direct influence of citizens on political decision-making [5]. This, in turn, highlights certain questions about the necessity and effectiveness of reforming the institution of representation.

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Rezyume: *Ушбу мақолада тараққийётнинг бугунги босқичларида вакиллик ҳокимияти ва фуқаролик жамияти институтлари ўртасидаги ўзаро алоқадорликни ривожлантиришига оид масалалар tahlil qilinadi.*

Резюме: *В этой статье анализируются вопросы, связанные с развитием взаимодействия представительной власти и институтов гражданского общества на современных этапах развития.*

Kalit so‘zlar: *Ҳамкорлик, вакиллик, ҳокимият, фуқаролик жамияти, механизм, модел.*

Ключевые слова: *сотрудничество, представительство, управление, гражданское общество, механизм, модель.*

THE PRINCIPLE OF ANTHROPOCENTRISM OF PEDAGOGICAL CULTURE IN THE DEVELOPMENT OF COGNITIVE ABILITIES OF CHILD EDUCATORS

Bazarbayeva A.K.

Nukus State Pedagogical Institute named after Ajiniyaz

Summary: *In the article the principle of anthropocentrism of pedagogical culture in the development of cognitive abilities of future educators is highlighted. It helps to form a person capable of self-knowledge and self-improvement. The principle of anthropocentrism of pedagogical culture in the development of cognitive abilities of future educators the main indicator is the level of mastery of all possible types of children's activities, they serve as the main driving force and source of the child's development, and all their achievements are most clearly manifested in them.*

Keywords: *cognitive development, anthropocentrism, technology, method, creativity, brainstorming, educator's phoneme, hardworking, lazy, love for the country.*

Within the framework of the new education strategy of the President of the Republic of Uzbekistan for 2022-2026, raising the quality of education in the preschool education system to a new level, introducing an advanced system of improving the professional skills and abilities of students, improving the specialization of more than 160 thousand teaching staff in 2022-2026, improving preschool education processes the task of directly directing education to the students who are scientific was determined.

Research is being conducted in our country to study advanced foreign experiences, modernize the content of modern education, create opportunities for students, and train teachers in the modern education system. In the research conducted by the world's most prestigious educational institutions and scientific staff on the preparation of internationally qualified books, the introduction of modern educational practices, special attention was paid to the comprehensiveness of the requirements of international educational standards, the criteria of pedagogical qualification of qualified pedagogues, the creation of an innovative educational center. Scientific research aimed at expanding modern information and pedagogical technologies on indicators of successful abilities in the educational process of motivation, cognitive, operational, reflexive and communicating with oneself is important in the development of teachers' cognitive abilities.

Pedagogical information, included in the educational section of the pedagogical information collection as a result of the scientific research of a number of pedagogical researchers, is a structural division of pedagogical information, which includes the order of direct deepening of the knowledge of pedagogical theory, stylistically describes the ability to use the identified information. Pedagogical information in the development of the cognitive abilities of child educators is the student's learning abilities, which in cooperation with them ensures the successful implementation of education. He studied, analyzed and applied the principle of anthropocentrism as a pedagogical aid in the development of the cognitive abilities of child educators, and today he created the phenomenon of a modern educator.

Misconceptions about anthropocentrism date back to the Renaissance. However, according to many researchers, the ideas that include anthropocentrism originated from simple ideas. The complete knowledge and philosophy of the Renaissance is the manifestation of a healthy body in a person's personality, his right to free movement and abilities. The term anthropocentrism belongs to the science of philosophy. problems "Who is a person?" As a result of the fact that speech includes the leading role of the individual in the process of creative reception, philologists joined the idea of?? Anthropocentrism, and thus the individual factor related to language took the first place?. Anthropocentrism? the word Anthropolos-man comes from the Greek and Latin for Center [2] additional Anthropocentric theory is the object of study becoming the subject, that is, the language is analyzed in the individual, and the individual is analyzed in the language. According to scientists,

language exists only in the mind, soul, and heart of one person, and this person dries up the whole language.

According to the above analysis, the principle of anthropocentrism in the development of cognitive abilities of coaches in modern education allows to learn new aspects of pedagogical information. While most scientists have studied pedagogical information from the point of view of pedagogy in a scientific-theoretical and methodological way, in the latest pedagogical studies, the pedagogical information of students is studied, teaching, teaching, teaching, teaching and teaching, teaching and teaching, pedagogical information on teaching and teaching, teaching and teaching, teacher's pedagogical information on teaching, teaching and teaching and learning. It should be noted that, although pedagogy itself developed early, education and educational concepts also appeared in those times. For educational institutions where a teacher must lead a person who must clearly understand his professional goals, be educated, have the ability to think broadly and prepare to implement innovations in education. necessary training is organized.

President Sh. Mirziyoyev's report on the fundamental improvement of the preschool education system on October 19, 2019 states: "In any case, we cannot achieve any change without the training of modern personnel. Here the personnel is trained, the healthy gene pool of the nation is based on the education system from first grade to high school. In order to increase the pedagogical knowledge of preschool students, a number of applications were included among the requirements for the education department. Requirements for the development of self-monitoring and cognitive abilities. applying the methodology of pedagogical information development in development based on the principle of anthropocentrism. Teachers' own positive qualities are directly manifested in the pedagogical process. In the educational system, which plays a major role in the education of children, the responsibility for developing preschool education and their pedagogical knowledge lies with pedagogues in the educational system. This is a change in the process of pedagogical trust that helps the teacher to identify his interests. The most important means of communication for a child educator is language. Pedagogically, their speech should be an example for children and help improve their speaking ability. Grammatical correctness of speech, its lexical richness, well-presented, study of speech technique will allow the coach to solve any qualitative issues. Educator's dress style, appearance, behavior and pedagogic thoroughness are evaluated.

The analysis of scientific literature carried out in order to determine the content of pedagogical information made it possible to determine its following characteristics: firstly, the teacher can explain the requirements of pedagogical information in the pedagogical information itself, and secondly, pedagogical information also studies the creative abilities of a person in the rating of the subject of pedagogical cooperation and partnership. The scientific and practical requirements of preschool education were taught by adopting the modern methods involved in the process of training child educators for the practical purposes of developing pedagogical information in the development of cognitive abilities of child educators. acquires systematic knowledge related to worldview; - enables students who learn humanities to analyze current issues of state policy, social issues and processes without leaving them in perspective; - who knows the history of his homeland, has an active life vision based on ideas against national hatred; - learning processes that encourage students to think about their field, forces students to think about their field; - forces the students who learn humanities to use the central symbols of national culture; - forces students to use their own cultural experience; There is no doubt that, taking into account the main features of anthropocentrism in the above-mentioned educational process, it is necessary to define each stage, criteria, form, style and means of this process and use them effectively. One of the important factors in the development of pedagogical information in the development of the cognitive abilities of children's educators is the use of practical measures, the level of knowledge of students, and their interests in the search for educational paths of professors and teachers, in determining their goals, in determining pedagogical studies, and at the same time, must adapt to hands-on learning in the selection and training of the most important objectives, basic knowledge to achieve the specified goals

In general, the goal of research based on the principle of anthropocentrism, based on the perspective of modern education, is the theoretical knowledge of a person and how to teach him to overcome the gap in his specific environment. Therefore, the modern educational process, rather than providing students with knowledge that is difficult to apply in practice, in order to ensure that students themselves objectively solve these problems during the educational process, this knowledge is used to solve actual professional and pedagogical issues. is to send to do. In order to fully study all the possibilities of pedagogical information in the development of the cognitive abilities of child educators based on the principle of anthropocentrism, it is necessary to pay attention to the following factors: - to introduce a special educational system necessary to overcome high-level pedagogical, communicative and psychological obstacles in the development of pedagogical information in the development of cognitive abilities of child educators; - clearly defining the theoretical impact of pedagogical information in order to fully study all the possibilities of pedagogical information in the development of cognitive abilities of child educators; - to take concrete measures in the process of pedagogical education to develop the cognitive abilities of child educators; At the same time, we must not forget that having pedagogical knowledge is one of the most important things, which is very important for those who have experience in the teaching profession.

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Rezume: Maqolada bo'lajak tarbiyachilarining kognitiv qobiliyatlarini rivojlantirishda pedagogik madaniyatning antroposentrizm tamoyili yoritib berilgan. Bu o'z-o'zini bilish va o'zini takomillashtirishga qodir shaxsni shakllantirishga yordam beradi. Bo'lajak tarbiyachilarining kognitiv qobiliyatlarini rivojlantirishda pedagogik madaniyatning antroposentrizm tamoyilining asosiy ko'rsatkichi-bu bolalar faoliyatining barcha mumkin bo'lgan turlarini o'zlashtirish darajasi, ular bolaning rivojlanishining asosiy harakatlantiruvchi kuchi va manbai bo'lib xizmat qiladi, shuningdek ularning barcha yutuqlari ularda eng aniq namoyon bo'ladi.

Резюме: В статье обозначен принцип антропоцентризма в педагогической культуре в развитии познавательных способностей будущих педагогов. Это помогает сформировать личность, способную к самопознанию и самосовершенствованию. Основным показателем принципа антропоцентризма педагогической культуры в развитии познавательных способностей будущих воспитателей является уровень развития всех возможных видов деятельности ребенка, которые являются развитием ребенка

Kalit so'zlar: kognitiv rivojlanish, antroposentrizm, texnologiya, metod, ijodkorlik, aqliy hujum, tarbiyachining fonomeni, mexnatsevarlik, dangasa, vatanga muhabat.

Ключевые слова: когнитивное развитие, антропоцентризм, технология, методика, творчество, психические расстройства, фономика педагога, доброта, лень, патриотическая любовь.

UDK: 316.346.2-045

**IDENTIFICATION, DIAGNOSIS AND REHABILITATION OF CHILD VIOLENCE
SIGNS: SOCIOLOGICAL ANALYSIS**

Ziyaeva Kh.

Independent researcher of the Academy of Public Administration under the President of the Republic of Uzbekistan

Summary: *The article examines international norms and definitions of the socio-legal status of children in national legislation, theoretically substantiates the fact that children are a generation that ensures the continuity of social life as part of the population. It also scientifically analyzes the fact that violence against children occurs as a social phenomenon in society, factors and conditions that cause violence. In addition, the essence of "Mobbing", "Bullying", "Cybermobbing" and "Cyberbullying" as traditional forms of violence against children is revealed, and the author's approaches to preventing violence against children are highlighted.*

Keywords: *children, violence, sexual, psychological, physical and emotional violence, bullying, mobbing, hazing, cybermobbing, cyberbullying, child neglect.*

Introduction

In determining and diagnosing the type, form, methods and manifestations of violence against a person, some aspects of violence against children and youth are distinguished. By person, we mean a person who has successfully passed the stage of socialization, has a special status, position, role and place in social groups and social classes, and has individual characteristics. Since children and young people have not fully passed these socialization processes, they cannot be called full-fledged individuals. The reason is that children and young people cannot fully express themselves as individuals in the society, using their limited social position in the society.

President Shavkat Mirziyoev says in this regard: "A child is a deposit in the hands of parents," say our great scholars. Today's life proves in every way that our children, their fate and future are really a great investment. If we do not give our children a proper upbringing, if we do not keep an eye on their behavior and mood every day, if we do not teach them science and technology, if we do not find a decent job, then we will lose this [1.480] .

Results and Discussion

Implementation of the requirements of the Convention "On the Rights of the Child" to a full life, guaranteeing the rights of children provided for in the Constitution of the Republic of Uzbekistan, the Family Code and other laws, ensuring that they grow into a physically, intellectually, mentally and spiritually mature generation, as well as for the years 2022-2026 One of the main tasks in the field is to effectively ensure the implementation of the tasks defined in the Development Strategy of New Uzbekistan.

By the decision of the President of the Republic of Uzbekistan dated April 22, in 2019 year №PQ4296 "On additional measures to further strengthen the guarantees of children's rights". It was determined that changes and additions should be introduced and according to the law, the types of oppression and violence used against the child were also about its prevention [2].

By child abuse we mean cruelty to children, physical and emotional abuse, sexual abuse, neglect, indifference to them, trafficking in children, use of child labor, their health, survival, development or dignity. actions such as preventing them from happening can be cited. According to the World Health Organization, child abuse is a global problem with serious lifelong consequences [3].

The procedure for determining the status of a child in international legal documents was first established in the "Geneva Declaration of the Rights of the Child" dated November 26, in 1924 year. » is identified [4.14].

Article 1 of the Convention on the Rights of the Child, adopted by the United Nations on November 20, in 1989 year, states that "every person under the age of 18 years is considered a child if, according to the law applicable to the child, he or she has not reached the age of majority earlier [5].

In our national legislation, on January 7, in 2008 year, Article 3 of the Law of the Republic of Uzbekistan "On Guarantees of Children's Rights" states that "Child (children) is a person (persons) who have reached eighteen years of age (adulthood) [6].

In Uzbekistan, the initial work on the protection of children and ensuring the guarantees of children's rights began with the 757-XII accession to this convention on December 9, in 1992 year, with the decision of the Supreme Council of the Republic of Uzbekistan "Joining the Convention on the Rights of the Child" on December 9, in 1992 year [7].

As for the issue of youth, Article 4 of the Law of the Republic of Uzbekistan "On State Policy Regarding Youth" dated November 20, in 1991 year defines youth as citizens between the ages of 14 and 30. This law was amended on September 14, in 2016 year, in which, although there were no changes in the age limit of young people, the concepts of young family, young professional youth entrepreneurship were included in this law [8].

In articles 3, 10 and 16 №-139 of the Law of the Republic of Uzbekistan on January 07, in 2008 year "On Guarantees of Children's Rights", it is possible to see the articles on the protection of children from various forms of violence. In particular, Article 3 of this law includes abused children in the group of children in need of social protection. Article 10 states that "The state ensures the privacy of the child's identity, home, and correspondence, and protects the child from all forms of exploitation and abuse, including physical, mental, and sexual abuse, torture, or other forms of cruel, harsh, or degrading treatment." implements protection from abuse, sexual harassment, involvement in committing crimes and antisocial acts" and Article 16 "From pornography, mass media that show cruelty and violence, insult human dignity, have a harmful effect on children and cause crimes to be committed use, distribution of literature and screening of films are prohibited" [9].

This law was adopted seventeen years after independence. However, it should also be noted that until now, the issue of violence against children has only been dealt with in the articles of the Criminal Code, Criminal Procedure Code and Code of Administrative Responsibility. This may restore the violated rights of the abused child. However, due to the lack of norms for the protection of children from such violence, in 2008 year, the Law of the Republic of Uzbekistan "On Guarantees of Children's Rights" was adopted, and a separate law aimed at protecting children from various forms of violence and guaranteeing their rights was adopted in our country.

Due to the fact that the forms of violence against children have changed over time, this in 2008 year Law of the Republic of Uzbekistan "On Guarantees of Children's Rights" was adopted in a new version on March 11, in 2020 year, with additions and amendments. With the adoption of the new version of this law, no changes or additions were made to the text of the articles that list the types of violence against children.

Reviewing the social history of violence against children in the family and society allows for a clearer understanding of the causes of this phenomenon and the essence of the problem, sociological analysis and synthesis of interpretations and views on violence against children. Is a part of population, the phenomenon of violence against children is one of the social evils in the society that has been going on for a very long time.

In our opinion, the initial view of studying the historical and sociological aspects of the problem of child abuse is to look at infant mortality from the initial stage of child abuse. It is known from the history of mankind that facts such as the deliberate killing of newborns in primitive societies or the execution of male infants as sacrifices to gods and goddesses, and the killing of children during food shortages indicate that the history of violence against children is very ancient.

In ancient Sparta, a special authority examined all newborns to determine their health and usefulness to society. As a result of such an examination, boys were found "unfit" to live, and children born with physical defects and disabilities were sentenced to death. Also, in ancient Roman law, this

condition strictly prohibited the raising of children with physical defects or disabilities in the family. It is a remarkable fact that even enlightened people such as Hippocrates and Soran of Ephesus, the founder of gynecology, discussed the question of which newborns deserve to be educated and educated [10. 447].

In ancient Roman law, children were considered the property of their parents, and until the child reached adulthood, it was considered an inferior being, the result of sexual relations, it was literally the property of the parents, mainly the father. This rule adopted from Roman law was called (patria potestas - strict parental authority), and the child was completely at the mercy of his parents. A father has the right to use his child as an employee, property, and use force and punishment at will.

In our opinion, the opposite of child cruelty in the West can be seen in the East. In particular, it is envisaged that the child should be given all the love of his parents so that he will be the successor of the generation and the owner of tomorrow. In Eastern countries, especially in Movarounnahr, China, Khorasan, Egypt, it is not important how a child is born, regardless of whether he is born healthy or with a physical defect, his status as a child has not changed and the child is not considered the property of the parents. A child is considered to be an object of socialization and a person in the future, as well as a being born with the right to live. We can find such situation in Avesta, Confucian views, Indian Vedas, Bible, Holy Quran and Hadith. In some Arab countries, violence against girls born in the period of pre-Islamic ignorance, such as burying alive and sacrificing boys to idols and idols, was completely eliminated with the introduction of Islam.

While some modern forms of child abuse and harassment are referred to as bullying, mobbing, hazing, cyberbullying and cybermobbing, these terms are generally used as synonyms for child abuse. Interpretation of these concepts from the point of view of sociology allows to distinguish their different aspects.

We considered it necessary to quote the following rule as an author's interpretation of the concept of violence against children. Child abuse is cruel treatment of a child, neglect of a child, lack of love in the relationship between a child and a parent, actions that harm the physical and mental health of the child, his development and peace of mind, as well as limit his rights or freedom, or It is inactivity caused by neglecting to provide housing and food necessary for development, health and growth, education, and living .

Child abuse also includes the concept of "Persecution", which is psychological or physical violence aimed at forcing children to submit to or leave the dominant group (leader) and its in-group laws. Such cases are mostly found in preschool educational institutions, schools, orphanages, family children's homes (Foster care), educational colonies, sports schools, hospitals, camps and also in various institutions where children stay. There are forms of harassment such as gossiping, slandering, scaring, isolating, insulting, humiliating, and coveting [11.147].

The English term child molestation is used as a universal term in sociology and social work as "Mobbing", "Bullying", "Hazing", "Cybermobbing" and "Cyberbullying". Bullying means belligerent, hooligan, bully, bully, bully, violent, and it is a repeated situation of violence and persecution by one person against a weak person who cannot defend himself [12.150].

Therefore, bullying is always aimed at harming the child, instilling fear in him, depressing him, humiliating him, subjugating him to himself. In educational institutions, bullying is a common phenomenon among peers, bullying is often perpetrated by older students against younger students. This type of bullying can also be used by teachers, staff or management of educational institutions. Bullying can also occur in the family between older and younger children, between adopted and foster children, and between children of the father or mother.

Mobbing (eng. mobbing - crowd) is a form of psychological violence in the form of mass persecution of a child by a large group of children in a community. In mobbing, those who cause harm are called mobbers, and those who are harmed are called "victims". The manifestation of mobbing among young people and adults is different from that of children, and it is described as a kind of "Psychological terror" that involves regularly repeated hostile and unethical behavior of one person directed against another person. The forms of mobbing among young people and adults are

manifested in the form of laughing at physical defects, isolation, denial, touching, pushing, making fun of clothes, not talking and who cannot defend himself. Bullying is distinguished from mobbing by the performance of a specific student or group of students who have the authority, rather than the whole class, in the role of the bully [12.151].

Hazing (eng. hazing) is the application of a series of tests by the leaders of the group hierarchy as conditions for the acceptance of a child into this group in order to become a member of a particular group. In hazing, probation conditions are considered child abuse. In this case, the child has to commit a crime, steal, do something against his will, run away from home or perform some phenomenal task. Such manifestations of hazing occur among neglected children, gangs of bullies, correctional institutions and children's organizations. The most negative aspect of hazing is that almost 70% of children who are victims of hazing violence die due to inexperience.

There are forms of cruel and violent treatment of children, such as physical, sexual, psychological violence and neglect of the child's needs, exploitation. Child abuse can be classified according to a number of parameters depending on the occurrence:

- overt or covert violence;
- violence related to the behavior of the abuser;
- current or past violence;
- violence lasting once or several times over many years [13.17].

Physical violence against children means harming the child's health by parents or their substitutes, guardians, sponsors, educators, teachers, coaches, nannies, caregivers, social worker assistants, group leaders or persons whose work activities are related to children. Its development is causing various injuries and injuries to the body that destroy physical and mental health. These actions include hitting, torturing, shaking, suffocating, putting in water, pulling hair, hitting with an object, slapping the face, burning with hot objects, pressing on smoked tobacco, sticking a needle, biting, giving psychotropic substances, drinking alcohol, eating it is manifested in the form of not giving, leaving naked, punishing the child for defecating, taking him outside on cold days, doing things the child cannot do, lifting heavy loads. It can also be done by scaring the child with various objects as a tool of humiliation [14.212].

Child sexual abuse is a form of cruel treatment of a minor child by an adult or another child by tricking or coercing them into sexual activities in order to satisfy their sexual needs or for financial gain. Child sexual abuse, sometimes referred to as "Pedophilia", is the attempt or coercion of a minor or sexually immature child to engage in sexual activity [15.195].

Psychological violence against children is constant or occasional verbal abuse, cursing, name-calling, forcing the child to act like an animal or human, forcing him to change his voice, making propaganda that confuses the child about his gender, threatening with various pictures and objects, not sleeping, sleeping a lot, humiliating, humiliating, stigmatizing, dressing contrary to gender, completely isolating the child from the outside world, forcing the child to realize himself as an animal rather than a human [16.101].

Emotional abuse of children is the neglect of the basic needs of the child by parents or their substitutes, and the lack of care for the child results in a disturbance of the child's emotional state and a danger to his health or development. This form of violence can also be described as moral cruelty.

Neglect of children (neglect) is a form of psychological abuse in which a person systematically ignores the vital needs of a dependent victim (child). Child neglect manifests itself in the following forms:

neglect of food - depriving the child of food or malnutrition;
carelessness in providing the child with clothes - dressing the child in clothes and shoes that do not correspond to the season or neglecting to dress the child at all;

neglect of hygiene - non-observance of general norms of personal hygiene, violation of the sanitary conditions of the residence that threaten the life or health of the child;

Negligence in medical care - lack or refusal of necessary medical care to protect the child's life, health and physical integrity, failure to vaccinate against various diseases on time, negligence to

various disorders in the functioning of the child's internal and external organs, negligence to the fact that the child's body part has stopped developing and changes, rapid not to contact medical personnel in cases;

neglect of education - carelessness in sending the child to kindergarten and school for education and training, carelessness in the child's efforts to acquire school education;

emotional neglect - denial of the child's psychological and emotional problems by parents or their substitutes;

negligent supervision - negligence in unsupervised conditions or situations that could lead to illness, injury, disability or death of a child;

child exploitation is any form of forced labor that endangers a child's health, safety, morals, mental and physical development, including hinders his education. This is mainly manifested in the involvement of children in field work in agriculture, carrying goods, hiring a cart, feeding livestock, begging, cleaning, trading, and digging in mines [16.121].

Conclusions

In conclusion, the types and scope of violence against children are quite wide, and new methods of violence are emerging today. Although the types of child abuse are similar, the difference is that child abuse is committed only by adults. If there is violence between children, then children commit violence without consciously understanding the consequences. Violence against children, if committed by adults, is used for the purpose of getting rid of the child, making the child completely dependent on him, easily controlling the child, intimidating the child, using the child.

We believe that it is possible to prevent and eliminate all forms of violence against children in society. In order to prevent and eliminate violence, communicate with children and young people in a timely manner, strictly establish discipline in the educational masses, effectively organize the cooperative work of the neighborhood group, prevent the spread of alcohol, narcotic drugs, and psychotropic drugs among young people. , can be achieved by preventing the carrying of firearms and cold weapons by young people, protecting them from cyber threats and risks by constantly checking the phones, computers and tablets of children and young people, reducing poverty and ending poverty.

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Rezyume: Maqolada bolalarning ijtimoiy va huquqiy maqomlariga berilgan xalqaro normalar va milliy qonunchilikdagi ta'riflar sharhlar keltirilib bolalar aholining bir qismi sifatida ijtimoiy hayotning davomiyligini ta'minlovchi avlod ekanligi nazariy asoslantiriladi. Shuningdek, bolalarga nisbatan qo'llanilgan zo'ravonlik jamiyatda ijtimoiy hodisa sifatida ro'y berish=0s i, zo'ravonlikni keltirib chiqaruvchi omillar va sharoitlar ilmiy tahlil qilinadi. Bundan tashqari bolalarga nisbatan qo'llanilgan zo'ravonlik an'anaviy ko'rinishlari sifatida «Mobbing», «Bulling», «Kibermobbing» va «Kiberbulling» ko'rinishlarining mohiyati ochib beriladi va bolalarga nisbatan zo'ravonlikni oldini olish borasida mualliflik yondashuvlar yoritilgan.

Резюме: В статье рассматриваются международные нормы и определения социально-правового положения детей в национальном законодательстве, теоретически обосновывается тот факт, что дети являются поколением, обеспечивающим непрерывность социальной жизни как часть населения. Также научно анализируется тот факт, что насилие в отношении детей происходит как социальное явление в обществе, факторы и условия, вызывающие насилие. Кроме того, раскрывается сущность «Моббинга», «Буллинга», «Кибермоббинга» и «Кибербуллинга» как традиционных форм насилия в отношении детей, а также освещаются авторские подходы к предотвращению насилия в отношении детей.

Kalit so'zlar: bolalar, zo'ravonlik, jinsiy, psixologik, jismoniy va iqisodiy zo'ravonlik, bullying, mobbing, heyzing, kibermobbing, kiberbulling, bolaga beparvo munosabat.

Ключевые слова: дети, насилие, сексуальное, психологическое, физическое и эмоциональное насилие, буллинг, моббинг, дедовщина, кибермоббинг, кибербуллинг, безнадзорность детей.

THE IMPORTANCE OF PROPER BREATHING IN SINGING

Allanbaev R.O.

Nukus branch of the State Conservatory of Uzbekistan

Summary: *This article discusses the various types of breathing techniques used in choir vocal performances. It highlights the importance of proper breathing, the different methods of breathing, the challenges associated with breathing in a choir, and the overall significance of mastering proper breathing techniques in choral performances. This article aims to provide detailed information about proper breathing and its various types, emphasizing their crucial role in the art of choral performance.*

Key words: *Singer, tune, song, breath, pronunciation, speech, vocal.*

In recent years, there has been further development of national culture in the Republic of Uzbekistan, along with the creation of a new history for the country. Efforts have been made to preserve and promote the country's cultural heritage, including both material and intangible masterpieces. Additionally, there has been a focus on popularizing folk art and amateur art, as well as integrating Uzbekistan into the global cultural space. Various measures aimed at the innovative development of the culture and art sphere have been implemented. Given the processes of globalization, it's challenging for any nation to stay unaffected. Literature, art, national theaters, concert ensembles, literature translation, painting and visual arts exhibitions, and other forms of artistic activities, as well as amateur art groups such as "Ashula and Dance Ensemble," play a role in shaping the history and development of the nation. Our government has paid particular attention to national music and the development of artistic amateurism, emphasizing their importance in nurturing the spirit of high spirituality and devotion to the ideals of national independence. Since gaining independence, efforts have been made to ensure that our children grow up to become well-rounded individuals. The art of singing, like other forms of art, has been developing among the Uzbek people for centuries.

Through this article, we aim to inform young people involved in the art of singing, as well as amateur singers, about the importance of proper breathing techniques while singing.

The development of singing breathing as the foundation of singing takes place through the process of working on the sound. It is gradually and systematically developed to help coordinate all the systems involved in producing sound. Organized, calm breathing associated with singing creates the conditions for a "rested" sound, which sounds full and beautiful. Before making a sound, it is important to inhale. The phase of inhaling can be controlled, which is crucial for teaching. While singing, breathing fills the lungs with air and prepares the vocal apparatus to produce sound. A singer's breath should be taken quietly, rather deeply, with a half-yawning sensation. Taking in too much air while breathing is not ideal, as it can make the process of creating a sound difficult. During singing, inhalation and exhalation are separated by briefly holding the breath, followed by exhalation.

Holding the breath for a moment before producing the sound is known as the "breathing position" - the moment of fixing the breathing position. Proper exhalation should gently and efficiently release air to create pressure in the subglottal cavity, which is necessary for the normal functioning of the vocal tissues. Mastering singing breath involves using the breath until the end to create a sound. In vocal pedagogy, diaphragmatic, or mixed breathing, which involves the active movement of the chest and diaphragm during breathing, is considered the most convenient. The interaction of breath and vocal tissues determines the foundation of sound. Singing support is the result of coordinated work of all parts of the vocal apparatus (larynx, respiratory organs, and upper tube). The quality of the reproduced sound is the main criterion for singing support. This is characterized by a round, rich timbre that is clearly audible. Therefore, correctly organized breathing and sound attack are considered crucial in training, as they determine the choir's tone in many ways. The initial moment of the cooperation of vocal tissues and breath is known as sound attack. Sound

attack determines the consistent sound and organizes the work of the vocal tissues. Soft and hard attack are used in vocal pedagogy as a means of expression in singing.

Singing is a form of musical art that involves the organization of music with words. The organs of speech, including the oral cavity, tongue, soft palate, lower jaw, and larynx, are involved in creating musical speech. The coordination of these organs in the production of speech sounds (vowels and consonants) is known as articulation or pronunciation. As the most mobile and voluntary part of the vocal apparatus, the organs of pronunciation play a crucial role in singing. Movements of the lower jaw, lips, and soft palate, as well as the position of the throat, are essential in singing. The sluggishness or tension of these speech organs can significantly affect the vocal apparatus. Proper tuning of the soft palate and throat is essential in singing, as they influence the stability of the throat. The elevation of the soft palate is particularly important for producing high tones, especially in male voices. Teaching proper yawning from the beginning of vocal training is important, as it is considered a fundamental aspect of breathing position. The vocal cords of the articulating organs differ in the formation of singing vowels from those of speech vowels in terms of acoustics and format. Singing consonants are also an important method in vocal training and are widely used in vocal pedagogy. The intensity and coordination of the articulatory organs determine the quality of speech sounds and the accuracy of words. It is important to ensure that rapid and intense movements, especially those of the tongue, do not interfere with the vocal structure of the throat. Furthermore, teaching to pronounce sounds without stimulating the larynx is crucial.

The following types of breathing are distinguished:

1. Chest breathing: In this case, the chest organs are active. External breathing movements consist of active movements of the chest walls. The diaphragm is less mobile, and the abdomen is pulled in during breathing. This type of breathing is shallow, involving the chest, upper joint, shoulder, and neck muscles. The neck muscles are tense, and larynx movements are limited, making it difficult to produce sound.
2. Mixed, chest-abdomen breathing: Both chest and abdominal muscles, along with the diaphragm, are active in this type of breathing.
3. Abdominal or diaphragmatic breathing: In this case, the diaphragm and abdominal cavity muscles, including the muscles of the visible abdominal wall, actively contract, while the chest walls move relatively less. There are some differences in breathing patterns between men and women. "Low" breathing, close to abdominal breathing, is typical for men, while women typically breathe much "higher," closer to chest support.

In conclusion, teaching proper breathing is essential when working with choir singers. Simultaneous breathing in a chorus is important for long melodic phrases and maintaining continuous choral parts. Connecting breaths are used, and singers take turns breathing, requiring careful and imperceptible coordination to maintain ensemble unity.

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Rezyume: Bu maqolada vokal-xor ijrochiligida nafas olish va uning turlariga tavsif beriladi. Xorda nafas olish turlari, nafas olish usullari, qiyinchiliklari, xorda to'g'ri nafas olishning ahamiyati

to'g'risida kengroq so'z yuritilgan. Xor ijrochiligi san'atida to'g'ri nafas olish va uning turlarining ahamiyati katta hisoblanadi. Bu haqida ushbu maqolada ma'lumotlar keltirilgan.

Резюме: *В данной статье описывается дыхание и его виды в вокально-хоровом исполнении. Подробно освещены виды хорового дыхания, техника дыхания, трудности и важность правильного хорового дыхания. Правильное дыхание и его виды имеют большое значение в хоровом исполнении. Информация об этом приведена в этой статье.*

Kalit so'zlar: *Xonanda, kuy, qo'shiq, nafas, talaffuz, nutq, vokal.*

Ключевые слова: *Певец, мелодия, песня, дыхание, произношение, речь, вокал.*

DESCRIPTION OF THE POWERS OF LOCAL COUNCILS

Reymova Z.A., Mambetnazarov G.Dj.

Karakalpak State University named after Berdakh

Summary: *In this scientific article, the competences of local councils are classified and analyzed in detail based on the opinions of scientists and experts who have conducted research within this topic.*

Key words: *Council, authority, function, competence, representation, local, state, activity.*

Within the framework of ensuring the implementation of legislative acts in the implementation of the tasks of socio-economic development, communication between the state authorities and governing bodies and the self-governing bodies of citizens, the involvement of the population in the management of the city, district, local councils carry out the relevant powers along with the governors.

The two branches of local state government (executive and Representative), together with their continuous interaction, carry out the tasks assigned to them using various methods and methods. Issues related to the performance activities of local state authorities are discussed at the session of local councils of people's deputies [1].

The directions of the activities of local councils and the institutional foundations of their powers have been analyzed in various ways by researchers and scientists.

J.Ermashev noted that the task of representative bodies in the field of socio-economic and cultural development is to determine, coordinate and control the general direction, and the task of executive management bodies is to direct them using their structural units [2].

In our opinion, we can partially agree with J.Ermashev's opinion about the role of representative bodies in the field of economic, social and cultural development of regions. According to the legislation, the tasks of local representative bodies are to ensure the implementation of social and economic development tasks that are common in the region, to ensure the implementation of legislative documents in the localities, to ensure the communication between the state authorities and self-government bodies of citizens, to involve the population in the management of the district and city.

According to A.Tolaganov, the functions of representative bodies of state power mean their socio-historical support, the main aspects of the activities aimed at the implementation of state power belonging to the people [3].

Also, A.Tolaganov stated that representative bodies of state power use the following tools in the implementation of their functions: adoption of regulatory legal documents in accordance with the Constitution of the Republic of Uzbekistan. Giving orders is a directing and coordinating activity. Councils of People's Deputies form bodies subordinate to them, direct the activities of enterprises, organizations and institutions located in their territories and subordinate to them, coordinate the activities of enterprises, organizations and institutions located in their territories but subordinate to the higher councils.

Local Councils supervise the activities of the bodies reporting to them. Also, the Councils of People's Deputies supervise the provision of legality, law and order and security in their territories.

Theodore Metaxas emphasized that the role of local authorities in the state system and its main features, their powers and jurisdiction, as well as the autonomy of management at the central local level are considered [4].

A.Makhmudov said that local representative bodies should carry out control activities: firstly, to determine the factors and conditions affecting the effectiveness of the law; secondly, to achieve the implementation of each legal norm; thirdly, to identify legal norms, shortcomings in their application and to develop proposals for their elimination; fourthly, it provides for the high responsibility of officials in law enforcement and legal culture of citizens [5].

Legal scholars M.Najimov and M.The utemuratovs classified the powers of local councils and divided them into two types. The first is "the absolute powers of the councils of people's deputies, which are decided only on the side of the councils. The second type includes other powers, that is, they can be performed by governors at the time between sessions, but it must necessarily be approved in the session of the issue [6].

At the beginning of the analysis of the powers of the representative bodies of local state authorities, that is, local councils, it is advisable to dwell on the content of the concept of "authority".

Explanatory dictionaries define the concept of "authority" ("vakolat" from Arabic – representation; entitlement) – that is, the right given to act on behalf of a person, institution, organization, state, right of representation [7].

Researchers and scientists connect the concept of authority with competence and analyze it as a set of rights and obligations, as well as tasks and functions, belonging to a specific subject.

Competence is defined as a set of tasks, functions, rights and obligations (authorities) of state bodies, officials, public organizations, commercial and non-commercial organizations defined in regulatory legal documents [8].

At the same time, within the concept of "authority" in relevant sources, it is appropriate to understand not only the rights of subjects, but also the set of rights and obligations granted by legislation. Powers are the rights and obligations of a state body, a local government body, an official, other participants in public relations defined in the regulatory legal document [9].

It is appropriate to include rights and obligations within the concept of authority, and corresponding duties and functions in the concept of competence.

Authority represents the right (at the same time, the obligation) of the relevant subject to act in a specific situation in accordance with the law or other legal document.

Yu.A.Tikhomirov stated that authority is an inseparable unity of rights and obligations and a type of legal obligation implemented in the public interest, which creates responsibility in case of refusal to exercise authority or ineffective implementation [10].

One cannot agree with some aspects of Yu.A. Tikhomirov's opinions on the concept of "authority", for example, this scientist has shown authority as an inseparable unit of rights and obligations. However, the authority only defines the scope of the implementation of certain functions within the framework of rights.

It is appropriate to classify the powers of local councils according to their field and content as follows:

1) **Economic and financial powers** (approving regional development programs and budgets; determining the rates of taxes and compulsory payments for the region; approving the internal structure of the administration, staff units and monthly salary fund.

2) **Powers related to the creation of norms** (making normative decisions; approving the decisions of the governor and canceling the decisions that do not comply with the law; preparing and adopting the regulations of the local expansions, the commissions, which are considered as working bodies).

3) **Organizational powers** (appointment and dismissal of officials; organization of working bodies of the council; giving consent to the prosecution of deputies and premature termination of their powers.

4) **Powers related to control** (request of party groups and deputies; listening to reports (information) of responsible persons; study of implementation of norms of legislative documents by state bodies).

Based on the above, it can be concluded that the local representative bodies should systematically and effectively implement their powers in solving and developing social and economic issues of local type, ensuring effective parliamentary control.

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Rezyume: *Mazkur ilmiy maqolada mahalliy Kengashlarning vakolatlari tasniflangan hamda ushbu mavzu doirasida tadqiqotlar olib borgan olimlar, mutaxassislar fikr-mulohazalari asosida atroflicha tahlil qilingan.*

Резюме: *В данной научной статье компетенция местных советов классифицируется и подробно анализируется на основе мнений ученых и экспертов, проводивших исследования в рамках данной темы.*

Kalit so'zlar: *kengash, vakolat, funktsiya, kompetentsiya, vakillik, mahalliy, davlat, faoliyat.*

Ключевые слова: *Кенгаш, власть, функция, компетенция, представительство, местное, государство, деятельность.*

THE HISTORY OF THE DEVELOPMENT OF VOLLEYBALL IN UZBEKISTAN

Kazakov B.A.

Karakalpak State University named after Berdakh

Summary. *The article discusses the history of the development of volleyball in Uzbekistan before and after the Independence. Various stages, each of which is distinguished by the improvement of certain capabilities in the technique and tactics of the game are noted in the article.*

Key words: *volleyball, volleyball players, the development of volleyball, a team sport, championship, Physical Education, competition.*

With the entry into the era of development of the Republic of Uzbekistan, with the acquisition of independence, ample opportunities arose to develop, achieve certain results in such popular sports in the world as football, tennis, basketball, including volleyball. It is known that the sport game of volleyball originated at the end of the 19th century (1895) in the USA, and its author is William Morgan, who invented this game for people with poor health. And only more than twenty years later, the game penetrated Europe and Asia, and ten years later - in the twenties of the twentieth century - it finally established itself and became widespread, which made it possible to hold competitions according to the unified international rules of the game.

It was then that, since 1925, volleyball began to develop in Uzbekistan, and already in the summer of 1927, a draw for the city championship was held in Tashkent. And besides, the team took part in an international meeting with a team from Kazakhstan. To involve children in systematic and organized classes, a network of special institutions is expanding - sports schools, boarding schools, classes are organized at the place of residence, etc. Quite a lot of attention is paid to the recommendation of sports facilities, as well as the construction of new sports bases and complexes that meet modern requirements. It is well known that big sport is a professional occupation in which colossal work and the complete subordination of all vital interests to one single goal lead to the highest achievements. However, next to this phenomenon of the 20th century, which is not wearable for most people, attracting the masses only as spectators, empathizers, fans, there is a public sport aimed at maximum results, and above all, at a health effect. Since its "invention" at the end of the 19th century, the game of volleyball has experienced rapid development. Outwardly, this is expressed by the number of volleyball players - more than 150 million representing about 141 countries - members of the International Volleyball Federation. In terms of its prevalence, this game, along with basketball and football, occupies a leading position in the world sports arena [1].

In many countries (Japan, China, Cuba, Brazil, Italy, Holland), volleyball is classified as an absolutely leading sport in terms of the registration number of active supporters. This purely external side is met by no less rapid development of volleyball from a game for recreation to an Olympic sport with high athletic, technical and tactical requirements. At the same time, the game has become a means of organizing leisure, maintaining health and restoring working capacity [2].

In the course of the development of volleyball, various stages can be noted, each of which is distinguished by the improvement of certain opportunities in the technique and tactics of the game and the corresponding points of view on the essence of training. The word "volleyball" is of English origin: in English it means - a flying ball. Volleyball is a team sport. The game is played between two teams of 6 people each, on a court 18 m long and 9 m wide. The court is divided along the length into two equal halves by a net 1 m wide and set at a height of 2 to 2.43 m (depending on gender). and age). 10 men's and 4 women's teams have already taken part in the championship of Tashkent in 1928. The winners turned out to be teams of educators. At the same time, school teams began to compete. Volleyball was developed not only in Tashkent, but also in other cities of the republic, where many teams were created, which made it possible in 1929 to hold the first draw of the championship of Uzbekistan. the program included volleyball. Volleyball players of Uzbekistan were the strongest. The championships of the USSR have been held annually since 1933. Uzbek volleyball players began

to take part in them since 1934 (in Moscow). Since 1935, volleyball has been cultivated everywhere in schools, technical schools and universities of the republic. In March 1935, in Samarkand, to improve the skills of volleyball players, the city committee of physical education opened a sports school with a contingent consisting of 60% of local nationalities.

The essence of the game lies in the fact that the players of one team seek to knock the ball to the side of the opponent so that the ball touches the ground within its area. The opposing team tries to kick the ball up without it touching the ground, and in turn kicks the ball to the opponent's side. At the same time, each team can hit the ball in no more than three hits, preventing it from falling to the floor. The same player is not allowed touch the ball twice in a row [4].

In April 1935 at the stadium. Ikramov in Tashkent, the opening of the 1st Tashkent University Spartakiad took place, in which 49 teams took part. Among women, volleyball players of the planned (now economic university) became the first, and among men - Industrial Institute (now the Polytechnic University). And in the autumn of the same 1935, 34 teams already took part in the championship of Tashkent. From the best players, national teams of the republic were formed to participate in the third championship of the USSR in Baku. The result of the performance of the women's team was successful: having defeated the teams of Rostov, Kyiv, Minsk, Gorky and Sverdlovsk, she took 7th place, and the men were on 11th place, having achieved only one win against the team of Gorky.

On October 24 and 25, 1935, an important event took place in Tashkent at the Dynamo stadium (later it was called Pishchevik, and now the Mitrofanov swimming pool is located on this site): for the first time in the history of the USSR and Uzbekistan, international friendly volleyball matches were held between men's teams of Uzbekistan and Afghanistan. On the first day, in the presence of numerous spectators and the Afghan Consul, a meeting was held, held according to the Afghan rules, the distinguishing feature of which was that the teams consisted not of 6 people, but of 9 people, the transitions of players from zone to zone were prohibited, and the score in each of 2 games were fought up to 22 points. The game ended with an easy victory for the Tashkent team.

The second meeting was held according to our rules and also ended in victory for the Tashkent team. In 1936, the match of 4 capitals of the republics of Central Asia and Kazakhstan was held for the first time: Tashkent, Ashgabat, Frunze, Alma-Ata. In this sequence, the teams are located in the standings.

In October 1938, teams from all regions of the republic took part in the 5th Republican Collective Farm Spartakiad. Volleyball players from Tashkent region became the winners among men, and representatives of Karakalpakstan became champions among women's teams.

In 1939, the men's and women's teams of the Moscow Lokomotiv, the then strongest club in the USSR, arrived in Tashkent to hold friendly and demonstration matches. They met with volleyball players of the clubs "Teacher", "Science", "Builder", "Motor". More experienced Muscovites won in all meetings. But the volleyball players of Tashkent, having united in national teams, managed to give the guests a fight, and the girls even defeated the Muscovites with a score of 2:1.

1940 brought a double victory in the championship of Uzbekistan to the men's and women's teams "Teacher" (Tashkent). Grigory Keshishev, a graduate of the Leningrad Institute of Physical Education, coached these teams and played in them, who subsequently led the Nauka team (the strongest in the republic and repeatedly won the championship title) and the national teams of Uzbekistan at all-Union competitions for a long time. During the Second World War, most of the volleyball players known at that time were at the front. But volleyball life in the republic did not stop. In July 1943, a volleyball tournament was held at the Pishchevik stadium in honor of the day of the athlete, and in September 1944, the sports contest of the republics of Central Asia and Kazakhstan was held, in which volleyball players from Uzbekistan became the first. Volleyball courts in the cities and villages of our republic are beginning to come to life. In 1946, after the regional competitions, the championship of the republic was held between the combined teams of the cities, which ended with a double victory for the city of Tashkent (men - ODO, women - "Science"). The men's army team, speaking in 1947 in the USSR championship in group II in Grozny, managed to defeat all its

rivals and, having taken first place, received the right to play among the strongest teams of the USSR the following year. This was the first major success of the volleyball players of our republic in the all-Union arena. Here is the composition of that team: Gennady Bukin, Alexei Rumyantsev, Vadim Traitel, Mikhail Fedorov, Georgy Boyarkin, Viktor Timofeev, Valentin Shnurov. At the regularly held sports contests of the Republics of Central Asia and Kazakhstan, starting from 1948, volleyball players of our republic constantly proved their superiority over their rivals and took first place in 1948, 1951, 1952 and 1954, losing it only once - in 1957. Our young men also successfully performed during these years at the matches of the capitals of the Republics of Central Asia and Kazakhstan, invariably being winners in 1945, 1955 and 1956. (girls won only once - in 1954). In the period from 1947 to 1954. The dispute for the title of the strongest in the republic was constantly fought by the women's teams Lokomotiv and Nauka, and the men's teams - ODO, Lokomotiv and Nauka. Many players of these clubs were part of the national teams of the republic. These are: Ekaterina Shashkina, Lidia Shodlovskaya, Raisa Motorova, Lilia Ustimenko, Lyudmila Guseva, Evgeny Sviridov, Oleg Rusanov, Evgeny Saraykin, Evgeny Belov, Georgy Boyarkin (all Lokomotiv), Leonid Kremmentsov, Yuri Silakov, Alexei Bicherov, Vladimir Sidorov, Evgeny Romanika, Vladimir Shveduks, Nadezhda Pavlova, Elena Sokolovskaya, Larisa Olikhova, Zinaida Gutchenko, Klara Kalandarova, Valentina Maksimova, Energia Shumakova (all Nauka), Elizaveta Cherepanova, Viktor Timofeev, Serafim Utkin, Vladimir Beregovsky, Willy Bekmukhamedov, Yuri Nikitin (all ODOs). As in all sports games, volleyball tactics have a certain tendency towards specialization. According to the tactical function and the various tactical and physical prerequisites that follow from this, three types of players are distinguished - the point guard, the main attacker and the universal player. One of the significant advantages of volleyball is that the rules prohibit a fixed distribution of playing areas, and thus the possibility of long-term specialization in the role of attacker and defender is excluded [5].

At the first (1956) and second (1959) Spartakiads of the Peoples of the USSR, volleyball players from Uzbekistan performed very modestly: they were in the second ten. But the time has come, and they played on equal terms with the strongest teams. At the IV Spartakiad in 1967, men took an honorable sixth place, and women in 1975 were fifth. Here are their names: Gennady Khudyakov, Vladimir Ananich, Yuri Simonov, Sergei Knyazev, Dinar Zhuravlev, Yuri Golaev, Rustam Khusainov, Mikhail Korchagin, Vladimir Grishenkov, Lyudmila Kholomkina, Svetlana Katasonova, Lyudmila Sobitova, Tamara Sklyarova, Elena Rakhmankulova, Vera Duyunova, Lyudmila Ishmaeva, Elena Shafenkova, Lyudmila Velichko, Claudia Lysenko, Natalya Rogulina, Olga Krashkova, Nadezhda Makushkina, Galina Kolyusheva, Lyubov Lepilina. All these players became the first masters of sports of the USSR, and their skills allowed the Avtomobilist women's team (Tashkent), starting from 1971, to constantly compete in the major leagues, and in 1978 to win the coveted USSR Cup.

The men's team "Dinamo" (Tashkent) for a long period was among the strongest in the first league and stubbornly fought for the top. She achieved this in 1980.

The names of Uzbek volleyball players began to appear regularly in the national teams of the USSR.

Vera Duyunova, Honored Master of Sports of the USSR, Olympic champion in 1968 and 1972, world champion in 1970, champion of the World Universiade in 1973 and winner of the World Cup in 1973, achieved the greatest success in games for the USSR national team. They achieved high results playing for the national teams of the USSR Lyubov Veretelkina (Lepilina) and Klavdia Avdeeva (Lysenko), who became European champions among youth teams in 1973 and 1975 and became masters of sports of international class. The same success was achieved in 1977 by Elena Petrunina and Olga Belova. And the master of sports of international class Larisa Pavlova (Lunina) added the title of Olympic champion in 1980 to the title of champion of the World Universiade (1977).

The women's volleyball team "Avtomobilist" in Tashkent (actually the national team of Uzbekistan) successfully performed at the Spartakiads of the peoples of the former USSR, as can be seen from the tables in this book, and achieved an outstanding result. So, in 1978 in Semfiropol

(Ukraine), our volleyball players without two Olympic champions Duyunova Vera and Lunina Larisa won the USSR Cup.

The team played in the following line-up: Elena Petrunina, Marina Roman, Lyubov Shulga, Lyudmila Suleykina, Svetlana Slepakova, Olga Dubyaga, Elena Shafenkova, Lyubov Lipilina, Natalya Koldobenko, Zoya Panara (head coach Adadiy Natanovich Izrailov, coach Lazar Gurfinkel). It should be noted that the team was greatly assisted by the manager of the auto trust of Uzbekistan, the chairman of the Uzbekistan Volleyball Federation, Mikhail Samuilovich Levin.

In addition, masters of sports Lyudmila Ishmaeva, Olga Dubyaga, Lyudmila Suleikina, Svetlana Slepakova, Elena Rakhmankulova, Svetlana Isupova, Sergey Bannov, Mikhail Gusev were the champions of Europe among youth and winners of the tournaments of the Druzhba teams of the socialist countries in different years. In the lists of the strongest players in the USSR, according to the results of 1981, there were three masters from Uzbekistan: Elena Shafenkova, Svetlana Slepakova, Sergey Myachin.

The performance of our volleyball players at the All-Union Spartakiads of schoolchildren was successful. The girls' team achieved success three times, receiving medals of various standards: gold (1972, Kyiv), silver (1976, Lvov), bronze (1974, Alma-ata). The success of schoolboys was more modest: they were sixth in 1972 in Yerevan, fourth in 1978 in Tashkent, and won bronze awards in 1981 in Kaunas.

In 1978, in Simferopol, the women's team Avtomobilist (Tashkent) for the first time in the history of volleyball in Uzbekistan won the USSR Volleyball Cup. The team was played by: Elena Petrunina, Marina Roman, Lyubov Shulga, Lyudmila Suleykina, Svetlana Slepakova, Olga Dubyaga, Elena Shafenkova, Lyubov Lipilina, Natalya Koldobenko, Zoya Panara. (senior coach Izrailov A.N., coach Gurfinkel L.)

The Dynamo men's team competed in the USSR championships among the teams of the first league, and in 1980, having won first place, they received the right to play in the USSR championships among the teams of the major league in 1981. In 1980, the Dynamo Tashkent team in Leningrad (now St. Petersburg) won the USSR championship among the teams of Ts.S. Dynamo, the team of Uzbekistan played in the same composition as in the USSR championship, with the exception of Alexander Safonov.

Twice - in 1977 and 1979. - the team of girls from Tashkent became the champion of the USSR, and the combined youth men's team became the sixth in 1972 in Zhdanov, Gorky (1973) and Daugavpils (1983). The strategy in the development of scientific knowledge in the field of sports games is to develop directions, ensuring the upbringing of a healthy, physically perfect young generation, capable of completing the task of building a democratic society, raising the level of health, creative performance. Increasing life expectancy, increasing the role of physical culture and sports in managing the deep processes of the human body. These areas are of global importance, they define the general research agenda, and make it necessary to expand the developed and put forward new problems.

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Rezyume: *Maqolada O'zbekistonda voleybolning mustaqillikka erishguncha va undan keyingi rivojlanish tarixi haqida so'z yuritiladi. Shuningdek, maqolada turli bosqichlar qayd etilgan bo'lib, ularning har biri o'yin texnikasi va ma'lum qobiliyatlarni rivojlantirishi bilan ajralib turishi ochib berilgan.*

Резюме: *В статье рассматривается история развития волейбола в Узбекистана до и после независимости. В статье отмечаются различные этапы, каждый из которых отличается совершенствованием определенных возможностей в технике и тактике игры.*

Kalit so'zlar: *voleybol, voleybolchilar, voleybolni rivojlantirish, jamoaviy sport, chempionat, jismoniy tarbiya, musobaqa.*

Ключевые слова: *волейбол, волейболистки, развитие волейбола, командный вид спорта, чемпионат, физкультура, соревнования.*

IRON PRODUCTS IN MEDIEVAL MONUMENTS OF USTYURT

Qdirniyazov O.-Sh., Qidirniyazov Z., Abdullaeva A.

Karakalpak State University named after Berdakh

Summary: *The article presents a study of blacksmith products in the medieval monuments of Ustyurt, comparing them with other cultures, focusing on identifying similarities and features. Based on archaeological research carried out in the medieval monuments of Ustyurt, finds of the local population in crafts, agriculture, everyday life and economy, horse hunting and military weapons widely used by the population are cited as a source.*

Key words: *Ustyurt, Middle Ages, Puljoy, Shemakha Castle, Caravan Palace, glassmaking, metalworking, Khorezm.*

Findings of medieval archaeological sites of Ustyurt, in addition to pottery and glass products, finds of metal products serve as the main source for classifying handicraft products by types and forms. For example:

1- Agricultural tools. Spatula, hoe, plow tooth, scythe, garden knives (Puljoy, Shemakha kala and hack.).

2- Craft tools. Axes, saws, rands and others (Puljoy, Shemakha Castle, caravan palaces: Bulok, Uchkuduk...).

3- Household goods. Knife, scissors, lock, nails (Puljoy, Shemakha Castle, caravan palaces...).

4- Military weapons. Arrowheads, spearheads, swords, daggers, cold iron plates (made by V.N. Yagodin, 1991).

5- Hunting equipment. *Sovlik, toka, taka, uzangi* (Puljoy, built by medieval peasants).

In addition to them, copper products can be distinguished.

1- Household items. Bronze pot, copper tray, fragments of metal plates, spoon, bronze stones, bronze and copper chains (Puljoy, Shemakha Castle: Kdirniyazov, 2015).

2- Cosmetics and decorative items. It can be attributed to bronze mirrors, bronze bells, zoomorphic objects (Puljoy, settlers: Yagodin, 1991, Kdirniyazov 2015).

Medieval braids discovered in the monuments of Ustyurt were larger and more perfect in size compared to the braids of archaic and ancient monuments.

Shemakha castle in 9th-11th of Khorezm at the beginning of 7th-8th centuries [1.181], Braids of various sizes were found in the Puljoy sites.

Holes were discovered in the Khorezm quarters of Tok-Kala of the early 8th century, Ajigeldi of the Urta century, the caravan palace of Koshbulok, the quarters of Janpikkala and Mizdakhan.

They are located perpendicular to the handle of the trapezoidal blade. It is found in the medieval caravan palaces of Ajigeldi and Koshbulak, as well as in the Mizdakhan quarters. [5.115-116]

Universal - household knives. Single-edged knives, the blade is triangular in shape, the handle is made of wood or bone. It is used in household work. The upper shoulder part of the knives is made a little thicker (Kdirniyazov, 2015).

Such knives are the fortifications of Tok-kala, Kuyuk-kala, Burgut-kala oasis at the beginning of the 8th century [7.94], Yakka-Parson, Qavat castle, Guldursin castle, rural areas of the beginning of 11th-13th centuries [8.110-111], Jampiq castle [2.70], Mizdakhon neighborhoods [3.149], Shemakha castle, Shekhrlik, Kokhna-Urganch, Puljoy [3.150], Talaykhan-Ota, Ajigeldi, Koshbulok caravan palaces [5.115] and other monuments of the 13th-14th centuries.

Scissors. In addition to the monuments of Ustyurt, scissors can be found in the medieval quarters of Mizdakhan, Bulak, Talaihan-Ota, and the caravan palaces of Khorezm. According to their intended use and design, scissors are divided into two types: spring-loaded.

Horse hunting tools are found in the buildings of military monuments in Ustyurt.

Hunting equipment. Bridles, stirrups, horseshoes, and horse harnesses were discovered in the medieval monuments of Ustyurt and Khorezm. Reservoirs in monuments are divided into two types based on their structure.

Handles of the cross-shaped or perpendicular type are connected to each other by means of rings on the head. Such cisterns were discovered by V.N. Yagodin in 2 mound graves of the Jarinkuduk-14 group of "Bow-shaped structures" on the Ustyurt Plain [13.139-155].

G.A. Divided into classification forms by Fedorov-Davydov. Amphitheaters in the border monuments of Ustyurt are included in the IV form of the B group (Ustyurt form I) and D group G II-III forms (II Ustyurt form) of the form compiled by the scientist [12.17].

Similar water bodies can be found in Panjikent (7th-8th centuries), South Urals (12th-14th centuries), monuments of Eastern European settlers (13th-14th centuries) and Siberia (9th-10th centuries) in large areas and cultural layers of a large chronological period [10.135].

Uzangi. In the border monuments of Ustyurt to Khorezm, it is found mainly in the graves of settlers. Several types of Uzangi were found in Jarinquduq-14, Qazgan-2, Qazgan-4 burial mounds of the "bow shaped building" complex in the Ustyurt plain [13.155]. The long ones were made by V.N. Yagodin divides the structure into five forms.

Among the settlers, who lived in the Ustyurt mountains, and the inhabitants of the Khorezm oasis, developed as a component of the craft from ancient times. In addition to written sources, there is information about the military art and weapons of the peoples of the Khorezm oasis, as well as in images on handicraft monuments. The statue with a spear is depicted on the ancient hill of the Screaming Fortress monument.

Valuable information is given in written sources about the military art of the Khorezms. A written source from the 10th century says that "the Khorezm are not only skilled traders and travelers, but also fearless and brave warriors, waging a peaceful war with the neighboring Oguz tribes." According to Istakri (10th century), "They fight bravely with the Oguzs and do not obey them." Maqdisi complements this data and emphasizes the following: "They are hospitable, brave and skillful warriors," the author of Hudud al-Alam describes the capital of Mamuni as "the inhabitants of the city of Kat as faithful warriors in fighting."

Based on natural and geographical conditions, the military science and weapons of the Khorezms developed in close contact with the nomadic peoples. Settlers often organized raids and forays into the oases established by the sedentary agricultural culture in Central Asia. Invasion efforts intensified, especially during the Middle Ages.

Researcher of Khorezm civilization S.P. Tolstov noted that "the war with the Oguzs became a tradition, even a program, for the Khorezmians from the 10th century [11.244].

According to Abu Rayhan Beruni, the Khorezmians "On the Fagburiya holiday in the cool autumn, the king leaves his residence and prepares for a winter campaign against the traditional Oguzes and expels them from the border territories." In addition, Khorezm sometimes carried out attacks on neighboring countries. These factors created the opportunity to improve the military field and weapons in Khorezm in the Middle Ages.

We will fill in the unknown pages about the military sphere and weapons of Khorezm in written sources on the basis of archaeological finds in monuments and a comparative analysis of similar types in the monuments of neighboring nomadic peoples. According to the purpose of use, finds in monuments are divided into ranged weapons (bows, arrowheads), melee weapons (swords, spears, daggers) and defensive weapons (shields, helmets).

A Bow. A weapon used for hunting and long-range weapon.

A compound bow made of bone from the medieval Single-Parson of Khorezm (8th century) [9.28], Kuyik-kala (8th century) [4.33], Found in Kat (13th-14th centuries) and Jarinquduq-14 fortress graves in Ustyurt [13.154]. The monuments' supports are severely deformed. According to researchers, in the steppes of Eastern Europe, Central Asia and Eurasia, starting from the Melody of the 1st century, bone carriers of complex bows of the gunn type were widespread and were used until the Mongol invasion.

Ammunition. As in other regions of Eurasia, bow arrows were carried in Khorezm ammunition. In Central Asia, bullets were made mainly of leather. Turko-Mongol archers used birch bark arrows. The bullet is reinforced using belts or special tape belts. A birch bark bullet was found in the grave of group III 4 of the Kazgan II archaeological complex in the border region of Ustyurt [13.155]. The bullet is truncated-conical, length 65 cm, width at the base 17-18 cm, height 11-12 cm. Similar arrowheads are found in the burials of the Kipchak tribes of the Southern Urals in the 12th-14th centuries.

Al-Maqdisy from the Arabian coast of the 10th century gives information about the import of birch bark from Bulgaria to Khorezm. Under the influence of trade and economic relations, Khorezm archers may also have used arrows from such birch bark in the Middle Ages.

A sword with a total length of 110 cm, a handle of 11 cm, a blade length of 99 cm and a blade width of 3.5 cm was found from the nomadic monuments of the Ustyurt Plain in the Kalalika-2 area. The sword is double-edged, long, with a cross-shaped handle. The blade cut is double-edged, pointed, biconvex. The sword is forged from iron. Many broken swords were found in mound No. 2 of the "bow arrowhead" group of buildings in the Jarynkuduk-14 section of the Ustyurt Plain. Some archaeological literature provides information about the breaking of a sword during a special ritual during the burial of the deceased, and they are often associated with the religious beliefs of nomads.

Similar types of swords discovered in the border monuments of Khorezm are found in Western Kazakhstan, the Southern Urals, in the burial mounds of Eastern European nomads and on Siberian monuments.

Iron plates of warriors were found in the mounds Berniyaz-3, Kazgan-4 on the medieval plains of Shahrlik and Ustyurt in Khorezm.. From the Shahrlik monument of the 13th-14th centuries 30 iron armor plates were identified. Iron plates 3.5 x 3 cm; 4.5 x 3.5 cm and other sizes, very rusty. The iron plates in the Bernios mound are 7.5-7.6 cm long and 2.0-2.2 cm wide. One side is round. Each plate has 13 small holes measuring 2-3 mm. The iron plate has 3 holes on each rectangular side, 2 holes on the top, 2 holes in the middle of the circle and 1 hole in the center. In such cooling plates, the holes can be located in different ways.

Material finds of Settlers discovered in the mounds of Ustyurt: mound-grave-1, iron cooling plates-2, uzangi, bone parts of alms-bow-3 (Yagodin V.N., 1992).

Al-Maqdisy (10th century) writes that "bow arrowheads, daggers, swords" were brought from Bulgaria along the Volga to Khorezm [6.202]. In our opinion, in Khorezm in the Middle Ages, swords should have been made by local artisans.

In the Khorezm oasis, coppersmithing is one of the oldest crafts. In the Middle Ages, coppersmithing was one of the most developed branches of craft. During this period, coppersmiths made household, household and decorative items from various non-ferrous metals. Scientific analysis of copper objects in archaeological sites enriches historical information about the economic life, diversity and cultural connections of the peoples of the oasis in the Middle Ages.

Among the finds of material culture from the medieval archaeological sites of Ustyurt one can find metalworking products. They can be divided into types and forms. For example: working tools used in agriculture (belt, hoe, plow, scythe, garden knives), craft tools (axe, saw, rand, ax and others), household and household items (knife, scissors, lock, nails)) , military weapons (bow arrowheads, spearheads, swords, daggers, iron cold plates), riding equipment (buckles, horseshoes, stirrups). In addition to them, copper products can be distinguished.

Medieval braids discovered in the monuments of Ustyurt were larger and more perfect in size compared to the braids of archaic and ancient monuments. Braids of various sizes were found in the monuments of the Shemakha Castle and Puljoy of the 7th-8th centuries, the 9th-11th works of Khorezm (Kdirniyazov, 1989). Holes were discovered in Ajigeldi of the 3rd century, the caravan palace and oasis of Koshbulak, the Janpikkala and Mizdakhon quarters in Ustyurt. They are located perpendicular to the handle of the trapezoidal blade.

In addition to them, single-edged knives from universal household knives were found in Shemakha Castle, Shahrlik, Puljoy, Ajigeldi, caravan palaces of Koshbulak and other monuments.

Their blade is triangular or cone-shaped, and the handle is made of wood or bone. It is used in household. The upper shoulder part of the knives is made a little thicker.

In the monuments of Ustyurt, scissors from the medieval quarters of Mizdakhan oasis, Bulak, Talaihan-Ota, and the caravan palaces of Ajigeldi were discovered. According to their intended use and design, scissors can be divided into two types: spring-loaded.

Among the excavated monuments of Ustyurt, riding equipment can be found in buildings. Bridles, stirrups, horseshoes, and horse harnesses were discovered in the medieval monuments of Ustyurt and Khorezm. Reservoirs in monuments are divided into two types based on their structure. Handles of the cross-shaped or perpendicular type are connected to each other by means of rings on the head. Such cisterns were discovered by V.N. Yagodin in two burial mounds of Dzharinkuduk-14 of the "bow-axle design" group on the Ustyurt Plain (Yagodin, 1992).

G.A. Divided into classification forms by Fedorov-Davydov (Fedorov-Davydov, 1966). Similar amphibians are found in vast territories of Eurasia and in cultural layers of a large chronological period: Penjikent (7th-8th centuries), Southern Urals (12th-14th centuries), Eastern European settlers (13th-14th centuries) and Siberia (9th-14th centuries). 10th century monuments (Steppes of Eurasia..., 1982). Horse stirrups are found mainly in the graves of settlers at the border monuments of Ustyurt and Khorezm. Several types of Uzangi were discovered in the Jarinkuduk-14, Kazgan-2 and Kazgan-4 mounds of the "bow-shaped construction" complex on the Ustyurt Plain. The long ones were made by V.N. Yagodin divides the structure into five forms.

Thus, among the Settlers, who lived in the Ustyurt mountains, and the inhabitants along with tools and household items, weapons-making developed from ancient times as a component of the craft, which was reflected in the finds of the cities in border areas.

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Rezyume: *Maqolada Ustyurtning o`rta asr yodgorliklaridagi temirchilik maxsulotlarini o`rganilishi keltirilib, boshqa madaniyatlar bilan solishtirilib o`xshashlik, o`zgacha tomonlarini ochib berishga e`tibor qaratilgan. Ustyurtning o`rta asr yodgorliklaridagi olib borilgan arxeologik tadqiqot ishlari asosida mahalliy axolining hunarmandchilikda, dehqonchilikda, uy-ruzg`or va xujalikda, ot-ulovda va harbiy qurol-aslohalarning topilishi, aholi tomonidan keng foydalanganligi manba sifatida keltiriladi.*

Резюме: *В статье представлено исследование кузнечных изделий в средневековых памятниках Устюрта, сравнение их с другими культурами, акцентирование внимания на выявлении сходства и особенностей. На основе археологических исследований, проведенных в средневековых памятниках Устюрта, в качестве источника приводятся находки местного населения в ремеслах, земледелии, быту и хозяйстве, конной охоте и военном оружии, широко используемом населением.*

Kalit so'zlar: Ustyurt, o`rta asr, Puljoy, Shemaxa qala, Karvon saroy, shishaso`zlik, metalso`zlik, Xorazm.

Ключевые слова: Устюрт, Средневековье, Пулджой, Шемахакала, Караван-сарай, стеклоделие, металлообработка, Хорезм.

**A CREATIVE APPROACH TO THE CREATION OF DIDACTIC SUPPORT IN MUSIC
EDUCATION CLASSES OF HIGHER EDUCATIONAL INSTITUTIONS**

Dadabayev Kh.M.

Andijan State University, Faculty of Sports and Art, Department of Music, Associate Professor

Summary: *In the article, the author revealed the principles of creating educational programs and educational resources based on a creative approach and creative approach to the preparation of educational materials and their effective preparation.*

Key words: *educational programs, educational resources, educational materials, principles, principles of effective preparation of educational materials, didactic developments, requirements for preparation.*

Creating curriculum and learning resources based on a creative approach. At first glance, the organization of the educational process based on creative ideas gives the impression of deviating from the requirements set in the curriculum. However, creativity, a creative approach, adapts the learning activities to the existing DTS. In addition, methods, methods and tools that serve to ensure a creative, creative approach to the teaching process from teachers ensure that training is carried out methodically effectively and correctly. From the pedagogical point of view, the formation of educational content is carried out in the following three stages:

1. General theoretical stage;
2. Educational stage;
3. The stage of mastering the educational material.

At the stage of mastering the educational material, regulatory documents such as State educational standards, curriculum and curriculum, as well as educational resources (textbook, educational and methodical manual, instructions, recommendations, etc.) will be reflected in.[3]

The content of education is reflected in the content of the state educational standard and curricula.

State educational standards are normative documents that determine requirements for the content and quality of general secondary, secondary special, vocational and higher education.

Curriculum is a normative document, which reveals the content of each educational subject and shows the amount of knowledge, skills and abilities that need to be mastered during the academic year.

The educational content is covered in more detail in the curricula.

Curriculum is a normative document that describes the content of knowledge, skills and qualifications in a specific subject, the distribution of total time for the study of important knowledge, the determination of the sequence of topics and the level of their study.

Full mastery of the knowledge, skills and abilities specified in the program by the students is considered the criteria determining the success and efficiency of the educational process.

The full expression of creative qualities of pedagogues is evident in working with educational programs. Among the educational programs, the author's educational programs are educational programs that can fully express the content of the pedagogue's creativity, creative approach to organizing professional activities, and the professional-creative activities he organizes in order to improve the quality and efficiency of education.[6]

Authorship training programs:

- 1) a training program aimed at in-depth study of a specific topic (problem) or finding a solution to a specific problem within the educational module (subject), taking into account the needs, interests, and wishes of students;
- 2) a type of educational programs.

These types of programs also differ from other educational programs by having a special form of construction of the subject, taking into account the requirements of the state educational standards,

reflecting the author's point of view on the studied phenomena and processes. Programs of this type must have external reviews by pedagogues, psychologists, and methodologists working in the relevant field of science and be approved by Pedagogical Councils of educational institutions.[6]

In the development of authorship educational programs, the pedagogue has the opportunity to fully express his creativity in a free and independent manner. Usually, it is effectively used in the organization of free-choice (compulsory or special) courses of the author's educational programs, in the activities of circles, scientific societies, "Science clubs", technical and artistic creativity centers.

In addition, every pedagogue has the opportunity to make changes to the content of the subject, if he has a creative approach of 15%. Consequently, the acquisition of an innovative, creative character of educational programs increases students' interest in education, ensures the activation of their learning and learning activities. Educational content and curricula are designed in educational literature. Such literature includes textbooks and instructional manuals.[2]

Textbooks have a special place among educational literature.

A textbook is a source of scientific information determined in accordance with the educational goal, curriculum and didactic requirements of a specific academic subject, and according to its content and structure, it corresponds to the curriculum created for the subject.

Textbooks created on the basis of educational programs are recommended by the Ministry of Higher and Secondary Special Education for all academic lyceums and vocational colleges, higher education institutions (universities, academies).

It is necessary that a textbook that is ideologically and methodologically perfect can meet all the requirements for educational content, satisfy the needs of students, increase their interest, and enrich their knowledge, skills, and abilities. The educational information presented in the textbook should be clear, understandable and visual, and should correspond to the aesthetic needs of students.[3]

The textbook should have a stable, well-founded structural structure. Essentially, the textbook has a solid foundation due to its stability, and due to its mobility, it shows the ability to quickly introduce new knowledge without breaking into the main structure. Although their requirements are different, they have many common requirements. special attention is paid to the publication of alternative textbooks in leading foreign countries. The reason for this is to create an opportunity for pedagogues and students to choose from among them the most appropriate and practical ones. In our republic, while the activity in creating alternative textbooks is somewhat slow, pedagogues are active in creating alternative auxiliary literature (educational, methodical and educational-methodical manuals).

Educational content is revealed at the level of educational material, as well as in textbooks, in various educational manuals: literature and history chrestomies, reference books, sets of problems in mathematics, physics, chemistry, geography, atlases in biology, sets of language exercises, etc. Study guides extend some aspects of the textbook and have the purpose of solving specific problems (information, practice, examination).[4]

The creation of educational and educational work programs is based on certain principles. At the same time, the principles of creating the following educational programs, based on M. Carne, are followed in the practice of pedagogy:

- The principle of individualization;
- Creating programs and implementing them in the educational process is the principle of strengthening personal responsibility;
- The principle of formation of additional funds for improving the qualifications of pedagogues;
- The principle of ensuring the activity of teachers;
- The principle of improving the skills of pedagogues on the preparation of educational programs at workplaces;
- The principle of evaluating the level of individual and group training of teachers;
- The principle of achieving the placement of different methods from the program.

"Creativity can be analyzed as a learning activity. Therefore, some students prefer to think critically, analytically or creatively, while others prefer to have knowledge based on specific information, while representatives of the third group are naturally inclined to think creatively and critically. Based on this, teachers should be able to set themselves the goal of developing educational programs and forming educational resources based on the interest, ability, inclination of each student, as well as their learning style" (Tomlinson, 1999). In modern conditions, the creativity of the pedagogue is clearly manifested in another case - in the creation of electronic information-educational resources (**EIER**).[5]

EIER is a set of electronic publications created on the basis of systematization, consistency, compatibility and integrity of educational subjects (modules), fully or partially covering educational materials and placed on a special (separate) site in the computer technology or Internet information network.

EIER will have its own content base, like printed teaching-methodical collections. This structural framework covers several elements. The **EIER** consists of the following elements:

- Working curriculum of the training module;
- Educational and teaching-methodical materials;
- Electronic instructional materials;
- Current, intermediate and final control assignments;
- Methodological instructions for studying the educational module;
- Sources providing lexical information;
- Electronic term dictionary or glossary;
- Pedagogical practice documents;
- Educational and bibliographic materials.

EIER creates the following conditions required for effective use of the following opportunities in the educational process:

- formation of educational tasks;
- describing the content of the educational material;
- organization of knowledge acquisition;
- feedback;
- control of students' cognitive activity;
- preparing for the next stage of organizing students' educational activities (directing students to independent education, independent reading of additional educational literature).

Creative approach to the preparation of educational materials and criteria for their effective preparation. Creativity in the educational process includes creating creative questions that increase students' interest in reading, using various pictures, images, tables, diagrams, and symbolic expressions, assigning students tasks such as finding correlations between ideas that are completely unrelated to the educational information presented, in small groups is reflected in actions such as ensuring their performance. What would be the results of encouraging and encouraging students to achieve creative thinking, to create creative products in educational activities? Wouldn't the same situation be what teachers are looking for?.[1] It is known that educational materials aimed at revealing the content of education are divided into several main types.

They are:

- Text printed educational information;
- Visual printed educational information;
- Printed educational information expressed in working papers;
- Electronic educational information with text;
- Visual e-learning information;
- Electronic educational information expressed in worksheets.

Along with enriching the general and professional knowledge of students, educational materials should also serve to enrich their worldview, expand their imagination, and form a positive attitude towards social and natural existence. Therefore, pedagogues should follow the principles of

preparation of certain educational materials along with a creative approach to the preparation of educational materials.

That is:

- The principle of idealism;
- Scientific principle;
- The principle of visuality;
- The principle of systematicity;
- The principle of consistent presentation of educational information;
- The principle of interdependence between educational information;
- The principle of appropriateness of students to their age;
- The principle of practical importance;
- The principle of clear goal orientation;
- The principle of compliance with aesthetic requirements.

Educational materials prepared in accordance with these principles can fully satisfy the needs of all students, regardless of the field of specialization and specialization.

Modern requirements for the preparation of didactic works for educational activities. In order to develop creative thinking skills in a person, first of all, it is necessary to develop critical thinking skills in them. When presenting educational materials to students, the question "If ...?" It ensures that they effectively master both objective and subjective thinking skills in the process of completing tasks. As Ken Robinson (2011) noted, creativity in students "must not only require the promotion of new ideas, but also should be able to form decision-making and analysis skills on educational issues.[3]

The creative process includes developing initial ideas, researching and analyzing them, and rejecting them if necessary. At this point, it is worth mentioning that a creative approach to the educational process is used not for the purpose of working with students who have lost interest in learning and mastering the basics of academic subjects, but to engage in lively, interesting, enthusiastic communication with all students, to encourage them to be active. In addition, creative training is offered not only in the fields of art and culture, but also in any field (business, economy, law, pedagogy, psychology, construction, agriculture, engineering, industry, etc.) it can be organized equally effectively in the process of working with students.

Teachers should also apply a creative approach to the educational process not only to students who achieve high results in mastering academic subjects, who record positive situations in creative thinking, but also to students who require more attention and do not have the ability to think creatively, they need to pay attention.[1]

In the organization of the educational process, it is important to prepare educational materials in accordance with the purpose, with ideological content and quality. Three types of didactic materials are prepared for training sessions organized in higher education institutions:

A set of educational information that illuminates the essence of educational materials (verbally presented and visually presented information);

Didactic materials covering the content of educational tasks (oral and written educational tasks).

Worksheets that ensure quick completion of educational tasks.

When pedagogues work in accordance with the following modern requirements in the preparation of didactic materials for training sessions, they create the necessary conditions for achieving the expected educational result:

- to be focused on a specific goal;
- preparation according to the needs and interests of students;
- validity of educational information;
- having the opportunity to activate students' educational activities;
- creating conditions for active work of students in pairs and small groups;
- development of independent, creative, critical and creative thinking skills in students;

- gaining modern importance;
- to be of aesthetic quality;
- be free of vague concepts and expressions;
- able to guarantee an exact result;
- ability to apply in different situations;
- serve to strengthen the existing knowledge, skills and abilities and b.

When preparing didactic materials for training sessions, pedagogues use educational resources (printed publications such as textbooks, educational, methodological and educational manuals, instructions, recommendations, dictionaries, encyclopedias, atlases, workbooks, chrestomathies, as well as Internet materials, electronic information sources such as EIER they can use the information in a targeted and effective way. The reliability of the information obtained at this point is important. That is why it is necessary for pedagogues to pay attention to the reliability of the didactic information is of special importance in providing.[2]

Conclusion.

Therefore, creative approaches of pedagogues to the creation of educational programs and educational resources are important for the general development and professional formation of students. The success of the educational process also depends on the quality of the educational materials provided by the pedagogue. Therefore, pedagogues are required to have a creative approach to the preparation of educational materials. In this case, in the effective formation of educational materials, they should take into account principles such as ideological, scientific, visual, systematic, consistent presentation of educational information, interdependence between educational information, compatibility with the age characteristics of students, practical relevance, clear goal orientation, and compliance with aesthetic requirements. ensures methodically correct organization. it is necessary to take into account the inclinations. Pedagogues have modern requirements in preparation of didactic developments for training sessions.

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Rezyume: *Maqolada muallif Kreativ yondashuv asosida o'quv dasturlari va o'quv manbalarini yaratish va O'quv materiallarini tayyorlashga kreativ yondashuv va ularni samarali tayyorlash tamoyillarini ochib bergan.*

Резюме: *В статье автор раскрыл принципы создания образовательных программ и образовательных ресурсов, основанные на творческом подходе и творческом подходе к подготовке учебных материалов и их эффективной подготовке.*

Kalit so'zlar: *o'quv dasturlari, o'quv manbalari, o'quv materiallari, tamoyillar, o'quv materiallarini samarali tayyorlash tamoyillari, didaktik ishlanmalar, tayyorlashga qo'yiladigan talablar.*

Ключевые слова: *образовательные программы, образовательные ресурсы, учебные материалы, принципы, принципы эффективной подготовки учебных материалов, дидактические разработки, требования к подготовке.*

WAYS TO DEVELOP CREATIVITY QUALITIES IN PEDAGOGUES OF THE MUSIC EDUCATION DEPARTMENT OF THE HIGHER EDUCATIONAL INSTITUTION.

Nurdinov K.

Andijan State University, Faculty of Sports and Art, Department of Music, Associate Professor

Summary: *In this article, the author highlighted the creative qualities and skills of creative-pedagogical activities characteristic of pedagogues of higher educational institutions, the signs and principles that express the creativity of pedagogues, and the criteria that determine the possibility of creativity of pedagogues and their levels.*

Key words: *quality, qualities of creativity, skills, skills of creative activity, ways of developing creative qualities, signs of creativity of pedagogues, principles of development of personal creativity, signs of creativity of pedagogues, creative possibilities of pedagogues, important levels of creative possibilities of pedagogues, criteria determining the level of creativity of a person.*

Creative quality and creative-pedagogical skills specific to pedagogues. Like any other quality (virtue), creativity is not formed suddenly. Creativity is consistently developed in certain stages. So, when do the characteristics of creativity appear in a person's work?

Although creativity is often visible in children's activities, this situation does not guarantee that children will achieve creative achievements in the future. It only represents the possibility that they need to master this or that creative skill. In the development of creativity in children, it is necessary to pay attention to the following:

- 1) encourage them to ask a lot of questions and support this habit;
- 2) encouraging children's independence and increasing their responsibility;
- 3) creating an opportunity for children to organize independent activities;
- 4) focus on children's interests.

Researcher N. Fayzullaeva believes that in order to have a pedagogical mindset, students should be able to master the following skills and competencies based on a thorough study of pedagogical knowledge:

- to know the main ideas, concepts, laws of pedagogy and laws of development of pedagogical phenomena;
- to know the most important theoretical ideas, main categories and concepts of pedagogy;
- to know the main pedagogical facts;
- acquiring practical knowledge about the general method of education and upbringing.[3]

In psychology, E.P. Torrens developed a test that determines the creativity of a person. According to E.P. Torrens, personal creativity shows the following signs:

- 1) not to ignore questions, shortcomings and conflicting information;
- 2) work to identify problems, try to find their solution based on the assumptions made.

Today, in psychology, the creativity of a person is determined according to two aspects specific to his activity. It uses tests that cover two aspects of the activity. The types of tests that determine the manifestation of personal creative qualities of E.P. Torrens are as follows:

- Tests that determine a person's life experience and personal qualities
- Tests that determine creative thinking and its results (speed, efficiency, productivity, etc.)

Before forming creative thinking skills in students, it is necessary to create a comfortable environment in the classroom. Students learning in a creative environment gradually develop an interest in performing creative tasks and tend to think creatively as a result of observing a creatively minded teacher (Sternberg & Williams, 1996). A creative learning environment leads to the development of critical and creative thinking skills in students, which are of great importance in the educational process (Boykin & Noguera, 2011, 2012; Marks, 2000, as cited in Jensen, 2013).[1]

Students' ability to think creatively in higher education institutions depends on the content of their creative environment. "Creating a creative learning environment relies on careful planning. If teachers want to be more effective in using their creative teaching methods and strategies (i.e. thinking broadly and organizing the creative thinking process), they need to instill this in their students' minds and take it seriously (Higgins, Hall, Baumfield, & Moseley, 2005).)". In addition, "only in a creative environment, students will have the opportunity to understand the relationship between the content of the subject they are studying, the educational information and begin to think about it (Anderson et al., 2000)".

A number of researchers have studied the fact that educational practice cannot acquire a creative character. M: in foreign countries, researchers-pedagogues such as Begetto, Kaufman, Kirschner (2010), Sweller, Clark (2006) explain the reasons for this and the conditions for their elimination as follows: "In many cases, teachers only get acquainted with the content of science, but the thinking process is of great importance and do not provide any information about how attention and demands may evolve. [3]

The effectiveness of the teacher's approach to giving waterfall instructions is lower than the methods and strategies aimed at improving the students' learning activity (Beghetto, Kaufman, 2010; Kirschner, Sweller, Clark, 2006). However, in order to provide clear and understandable instructions on thinking skills in the requirements, the teacher should introduce students to (critical, creative) ways of thinking, ways of effective formation of skills, control and direct the students' educational activities. The clarification of the ideas expressed by the authors with the help of examples will help clarify the ideas of the teacher and students about the organization of the creative thinking process. For example: in the process of studying the "Essence of the Immigration Event" based on the "Brainstorming" strategy, students should first of all have an understanding of what the strategy is and how it should be applied.[2]

It is worth noting that the concepts of "classification" and "periodization" are important in the process of developing personal creativity. So what do these two concepts mean?

Stratification - (lat. "diferentia" - "difference", "grading") division of the whole into different stages or levels.

Periodization - (Greek. "peridos" - "turning in a circle") division of a certain event into time units covering some kind of completed process.

Periods and stages in the life of each person are important in creative development. So:

The period of development of creativity is a certain period of time when the development of certain creative qualities has come to an end.

The stage of development of creativity is the level of development of certain creative qualities

Accordingly, at certain periods and stages, pedagogues also develop creative qualities and skills of creative activity.

Students with creative thinking: express ideas that have not occurred to other students; chooses a unique way of expressing themselves; sometimes asks off-topic or unusual questions; enjoys open-ended tasks; prefers to discuss ideas based on concrete evidence; chooses an unconventional approach to finding a solution to the problem.[5]

The following are the types of personal creativity qualities.

Adjectives:

- Creative orientation - Ability to think logically;
- Erudition - Rich imagination;
- Creative effectiveness and initiative;
- Full demonstration of one's creativity;
- Ability to reflect;
- Emotional wealth;
- Ability to take risks;
- Possession of speed of thought
- Development of inner intuition;

- The ability to promote unique (original) ideas;
- Innovative ability;
- Possession of high artistic values
- Ability to make new decisions based on existing experience and knowledge.

In addition to the qualities of creativity, pedagogues should have the following qualifications, which represent the ability to organize creative activities:

Effective ways to develop creative qualities in a person. As already mentioned, creative qualities do not develop spontaneously for pedagogues, as for all individuals. According to this research, a number of ways to successfully develop creative qualities in a person (including pedagogues) are highlighted. Patti Drepeau has also shown four ways to successfully develop creativity in individuals (including educators).[1]

Main roads:

1. Formation of creative thinking skills;
2. Organization of creative activity processes;
3. Development of practical creative movement skills;
4. Use of creative products (developments).

The essence of these roads will be discussed below.

Way 1: formation of creative thinking skills. In this, the main emphasis is on the formation of creative thinking skills, and students are directed to express the essence of creative actions with the help of verbs. In particular, in order to effectively form the ability of creative thinking, teachers pay attention to the presence of necessary verbs in the questions that encourage students to think. If this situation is explained with examples, the control question asking students to "describe the connection between the heart and blood circulation system" does not form creativity in them. After all, the concept of "describe" in the question is equivalent to saying "tell your existing knowledge one by one".

Using words (verbs) that encourage students to think when asking control questions facilitates their creative thinking. Therefore, according to the first way of forming creative qualities in a person, it is appropriate for pedagogues to use words (verbs) that force different, antique, unconventional and thorough answers. M: The use of words (verbs) such as "find the connection", "create", "predict", "explain the idea logically", "imagine" is considered effective from a practical point of view.

Instead of asking students to "describe the connection between the heart and the circulatory system", the teacher should ask them to "give all types of connections between the heart and the circulatory system". As a result, students will have the opportunity to generalize existing knowledge and to put forward new thoughts and ideas.[5]

It is advisable for pedagogues to apply the first method - to use the "Creativity Map" of young teachers in forming students' creativity skills.

Way 2: development of practical creative thinking skills. Educators use instructional methods and methods to form and develop creative thinking skills in students. In this case, using questions can only help in the short term, but it does not develop interactivity and engagement in students.

In her work, Patti Drapeau presents ways and methods that are effective in developing interactivity and creative thinking skills in a number of students.

In particular:

- Working with websites;
- visualization;
- taking into account all points of view;
- appropriate application of important ideas in different situations (transferring the idea to another situation - transformation); - such ways as symbolization;
- "Brainstorming";
- Methods such as "Case-study".

Way 3: organization of creative activity processes. This path emphasizes creative, creative thinking in the process of solving problems and promoting innovative ideas. Although creative

methods and methods are not actively used in these processes, creative thinking occurs. M: "Finding the connection between the heart and the circulatory system" (Isaksen & Treffinger, 1985). While completing the assignment, students will analyze various problems related to the human circulatory system. As a result, multifaceted thinking and observation takes place in this process.

4th way: use of creative products (developments). In this way, the teacher can give students the task of creating a presentation using Power Point or multimedia on the topic "Human Circulatory System". In the process of preparing the presentation, students actively develop creative thinking skills.

Students can fully express their creative thinking skills in a comfortable environment. If students have a feeling of fear of failure, if they hesitate to express their thoughts incorrectly, if they are criticized, in such a situation, it will not be possible for them to effectively form or develop creative thinking skills. It is possible to successfully form the skill of creative thinking only by turning creativity into a habit in students.[2]

In this process, the methods and tools used by them in assessing the thorough understanding of the content of the subject and creative thinking skills are of great importance.

What do you personally think: in the process of encouraging students to think creatively in higher education institutions, in which order the use of these ways guarantees the expected results. Here's Patti Drapeau's advice: "We take two or more routes to get from one destination to another. This idea also applies to the instructions below. The teacher can use one or more of the ways (mentioned above) in the course of the lesson. When a teacher decides to use verbs that shape creative thinking skills (Path 1), he or she effectively engages students who are directly working on creative problem solving (Path 3) to use creative thinking strategies (Path 2). The lesson ends with the development of a creative product (way 4). The map that illuminates the essence of the creative thinking process helps teachers to determine the level and type of creativity manifested in the course of the lesson".[3]

In many cases, teachers and students themselves are faced with such a question: is it possible to achieve the manifestation of the creative thinking process as a habit? Here's what Patti Drapeau suggests: "Brain research is helping us understand how to develop creative thinking skills and how to make them a habit. Creativity occurs as a result of the coordination of the front (ideas) and peripheral (analysis) areas of the brain and the production of dopamine (a feel good substance). Learning leads to the formation of small folds in the brain, and this process increases as a result of active brain activity. The human brain prefers to receive information rich in image, prediction, feeling, emotion and meaning. "If information is free of any emotional and thought processes, it will not be stored in the brain." However, creative thinking requires the brain to use new methods that are "contrary to the methods of learning and teaching" and to develop unconventional, original ideas. As a result of practicing creative thinking skills, students not only rely on established connections, but also tend to establish new, meaningful connections in the brain, develop new ideas, and think in new ways. As a result of regular practice, new creative thinking becomes habitual and automatic. The human brain is always used to working correctly, that is, there is only one correct answer for the brain. However, this is not creativity. Creativity means that all answers can be correct as students defend their views. Immersion in the atmosphere of creativity is considered. Therefore, in order to make creative thinking a habit, students should be able to look at this process with confidence.[5]

Students can only develop a habit of creative thinking if creativity is encouraged and a friendly environment is created. In a creative environment, teachers and students learn to be honest with others and respect their opinions. Creativity does not become a habit in students who have a fear of making mistakes or failure, focusing on excessive evaluations, being different from others, being despised, and fearing criticism and humiliation. Making creativity a habit, improving students' academic success and self-esteem can only be achieved through the appropriate use of creative thinking and in a healthy environment."

According to foreign pedagogues, especially Patti Drapeau, the creativity of one person, especially the teacher, inspires others (students) to organize the creative process.

"Creativity is contagious; to be creative, one should communicate with more creative people and always be in search. Just as any skill can be developed, so can the ability or skill of creative thinking. This also applies to students, and working on creativity can help students think outside the box. However, it depends on how well the teacher is able to inspire and encourage students to be creative. Research on creativity and the work of creativity theorists serve as a guide in the formation of creativity skills in students. It includes elements of the environment in the classroom, the formation of students' thinking, and the teacher's approach and strategies".[4]

The teacher plays a special role in forming students' creative thinking skills. In this process, "the teacher's role is to create an atmosphere of creativity in the audience. As Pannels and Claxton (2008) noted, the environment (goals and tasks in the case of the auditory) influences the formation of creativity, and according to another researcher Piirto (2004), creativity requires risk-taking. However, the teacher should create an environment in the classroom where students can feel free and share their thoughts and ideas. Students can express their ideas and opinions in a variety of ways in the creativity classroom, and they should appreciate this. In order to further activate the processes taking place in the brain, students should deviate from the established rules and standards and act freely in asking various questions. The teacher supports creativity in students by eliciting unusual ideas and encouraging them verbally and non-verbally. The correct attitude of the teacher to the creative ideas given by the students is important for their understanding of possible and impossible conditions. All of these elements are an important part of the teacher-student relationship and ensure student success (Hattie, 2011)."

Certain factors prevent the development of creative qualities and skills of pedagogues. Therefore, in the pedagogical process, teachers should focus on eliminating these factors.

The following factors hinder the development of creativity in a person:

- avoiding risks;
- allow rudeness in thinking and behavior;
- underestimation of personal fantasy and imagination;
- subordination to others;
- think only of success in any case.

"In a creative environment, the teacher uses something new to attract students' attention. Information that arouses curiosity and suspense engages students and increases their desire to learn (Koutstaal, 1997; Willis, 2006). Brain tests have shown that novelty always activates the brain. When a teacher provides students with new information and resources or uses new strategies, the brain "wakes up" and focuses. For example, dressing up as a literary character or historical figure, using historical or modern objects, playing music, telling anecdotes, changing classroom furniture, playing games (this applies to high school students and university students alike). , change the form of the lesson.

In a creative environment, the teacher allows students to make frequent choices. Choice is important in building creativity (Sprenger, 2010), and it not only inspires students and gives them control over their learning, but also empowers them. The right to choose not only improves the teacher-student relationship, but also creates the basis for the expression of the individuality of both parties (Deci, 1995). The right to choose can be only unilateral, that is, the choice can be made independently by the student and the final result can be presented in two or more forms.

Even in higher education institutions, teachers should be able to create the necessary conditions for forming and developing students' creative thinking skills, for them to work as a team, in small or large groups. After all, in the process of working in large and small groups, there is an opportunity to creatively develop any ideas expressed.

"The teacher, realizing the importance of team spirit in creativity classes, constantly changes the groups and forms the skills of working as a team, the ability to respect and respect others. Although individual work is effective in individual situations, small group work is appropriate for creativity because creativity is a social phenomenon (Farrell, 2001; John-Steiner, 2000; Sawyer,

2003, 2006b); According to Sawyer, creative ideas are formed as a result of teamwork and creative collaboration (Sawyer, 2006a, p. 42).

Conclusion.

A teacher does not become a creator by himself. His creative ability is formed by consistent study and work on himself over a period of time, and it gradually improves and develops. As in the case of any specialist, the foundation for future pedagogues' ability to be creative is laid during their student years and is consistently developed in the organization of professional activity. It is important for the pedagogue to direct himself to creative activity and be able to organize this activity effectively. In the organization of creative activities, a teacher should pay special attention to solving problematic issues, analyzing problematic situations, and also creating creative products of a pedagogical nature.

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Rezyume: Muallif ushbu maqolada Oliy ta'lim muassasalari pedagoglariga xos kreativ sifat va ijodiy-pedagogik faoliyat malakalari, Pedagoglarning kreativligini ifodalovchi belgilar va tamoyillar hamda Pedagoglarning kreativlik imkoniyatini aniqlovchi mezonlar va ularning darajalari yoritib bergan.

Резюме: В данной статье автор выделил творческие качества и умения творчески-педагогической деятельности, характерные для педагогов высших учебных заведений, признаки и принципы, выражающие творческий потенциал педагогов, а также критерии, определяющие творческий потенциал педагогов и его уровень.

Kalit so'zlar: sifat, kreativlik sifatlari, malaka, ijodiy faoliyatni malakalari, kreativ sifatlarni rivojlantirish yo'llari, pedagoglarning kreativligini ifodalovchi belgilar, shaxs kreativligini rivojlantirish tamoyillari, pedagoglarning kreativligini ifodalovchi belgilar, pedagoglarning kreativlik imkoniyatlari, pedagoglarning kreativlik imkoniyatining muhim darajalari, shaxsning kreativligi darajasini aniqlovchi mezonlar.

Ключевые слова: качество, качества творчества, умения, навыки творческой деятельности, способы развития творческих качеств, признаки творчества педагогов, принципы развития личного творчества, признаки творчества педагогов, творческие возможности педагогов, важные уровни творческих возможностей педагогов, критерии, определяющие уровень творческих способностей человека.

**THE IMPORTANCE OF PSYCHOLOGICAL CONSIDERATIONS IN PHYSICAL
EDUCATION OF THE YOUNG GENERATION**

Kurbonova Sh.N.

*Fergana branch of the Institute of retraining and advanced training of specialists in physical
education and sports*

Summary: *This article discusses the importance of psychological views in the physical education of the young generation. In addition, the scientific basis of issues such as the formation of physical culture in the history of the Uzbek people, the incomparable spiritual and spiritual support of physical culture and sports in ancient times was analyzed.*

Key words: *sports, education, physical education, physical qualities, psychological views.*

The peoples living in the territory of Uzbekistan paid special attention to the spiritual, intellectual, moral and physical culture of young people since ancient times. They regularly taught their children physical education such as wrestling, archery, horse riding. The Greek historian Herodotus wrote about the skilled marksmen of the Sac tribe, who lived side by side with the Khorezmians: "The Sacs... among all the archers in the world, were famous for being very skilled marksmen who did not miss an arrow." The women of the Sakas and Khorezms also took part in military campaigns and battles, and were not inferior to male warriors in bravery and tenacity. The Greek historian Diodorus wrote about them: "In general, the women of this tribe are brave and share the dangers of war with men".

The roots of the physical culture of the Uzbek people go back to the distant past. Our people have been striving for goodness throughout their lives. Our brave women, who decided to fight for the realization of their dreams in the path of goodness, are the main heroes of the masterpieces of artistic thinking created by the nation. These images have been passed down from time to time, from generation to generation through works of folk art. Therefore, they began to study the hidden aspects of the spiritual life of people: they looked for common connections about health and illness, ways of communication between the body and the soul. At that time, interest in studying the unknown aspects of the human nervous system and brain functions grew [1, 322].

Special psychological training was conducted before the horse race held in Khorezm and Fergana regions to train the skills of long-distance riding, as well as before wrestling and single combats organized during Navruz and other national holidays. Such psychological activities played an important role in making the wrestler confident in his own strength and in increasing the feeling of love for the Motherland.

In those times, one of the means of entertaining and raising the mood of the warriors was the game of "chavgon". In order to improve the physical and mental qualities of warriors, competitions such as hunting with birds of prey were held. That is why Uzbeks and their ancestors have been known since ancient times as mentally and physically strong, resilient, courageous and tenacious people. How many legends and songs have been woven about folk wrestlers. For example, the Alpomish epic depicts the events of the distant past in the life of the Uzbek people. The hero of the work Alpomish, his friend Karajon, the beautiful Uzbek girl Barchinoy, along with many positive qualities, their strength, mental perfection, wrestling, physical and mental perfection are expressed [2].

In ancient times, our ancestors, who deeply felt that physical culture and sports give a person an incomparable spiritual and spiritual support, held various competitions before big battles and huge constructions. In ancient Greece, before starting to build new cities, various competitions similar to the Olympic Games were organized.

A mature philosopher of the East, a poet, a fearless people-loving person, a spiritually mature murshidi of the sect was Ahmed ibn Umar Khawaqi al-Khorazmi. This breed is known to the world under the name Shaykh Najmuddin Kubro. After all, Najmuddin is the star of religion, Kubra means

the great, the great. The reason why Hazrat Ahmad ibn Umar was called Kubra is that whoever Hazrat had a dispute with about knowledge in his youth, he would definitely win. That's why he got the name Kubro, which means great. Another nickname of the Sheikh is Sheikh Valiytarosh. Whoever catches the eye of that person, he reaches the level of guardianship.

The Kubroviya sect was formed on the basis of the Holy Qur'an and Hadiths. Education of a perfect person was the main task of this sect. The life of Sheikh Najmuddin Kubro is a great lesson, a great school. Due to the upbringing of the pirs of the order, our ancestors had good character and great virtue. The Arab traveler Ibn Batuta, who traveled the world for a short time, reported that he did not see such good-willed and good-natured people as the people of Mowarounnahr and Khorezm, and that although the people of Shiraz and Isfahan look like young men, the brave men of Khorezm and Mowarounnahr are higher than them in respect and hospitality.

As we mentioned above, the Uzbek people created their own culture, including physical culture, in ancient times. [3,124].

Aristotle was the scientist who wrote a special work for the first time, putting the issues related to the problems of psychology into an integrated system. Therefore, he is called the founder of psychology in ancient Greece. Ibn Sina systematized psychological issues in the Middle Ages in the East and wrote special works. That is why we can say that Ibn Sina is the scientist who founded psychology in the East.

The factor that made Ibn Sina interested in explaining psychological issues was, firstly, the fact that he studied the works written by scientists who lived before him in Central Asia, China, Iran and India, and secondly, the influence of scientists and philosophers of the ancient world. . Because Aristotle is Ibn Sina's "First teacher" in philosophy. He was familiar with Aristotle's work "On the Soul". Thirdly, Ibn Sina's research in the field of medicine required comprehensive observation of patients, good study of human anatomy and physiology, as well as the human nervous system. Therefore, in the process of treating various diseases, it became necessary to know the mental characteristics of people through practical experiences. Ibn Sina realized that psychology would greatly help to effectively solve the issues of education and upbringing of the young generation.

Like Aristotle, Ibn Sina asserts that the human body and "spiritual powers" exist inseparable from matter and form. That's why the scientist tried to prove how strong the influence of mental activity and human health is on each other. Ibn Sina did not limit himself to abstract thinking in this area, but based on his observations, he conducted simple but reasonable experiments on animals.

In order to prove that the effect of a person's mental state on the body is related to the physiological basis of any mental process, Ibn Sina took two lambs and tied one of them close to him when he was hungry, and kept the other one in a normal, peaceful environment. He gave the same amount of food to both of them. Soon after, the lamb, which was closely tied to the wolf, became very emaciated from fear of the wolf's attacks, and, despite being well fed, fell ill and died of fright. The lamb kept under normal conditions grew fat and lived healthy.

Ibn Sina proved on the basis of scientific evidence that the three types of attention in plants, animals and humans have their own characteristics. He also emphasized that the psyche is characteristic of animals and humans, and showed that the psyche of animals has an instinctive character.

"Instinct," says Ibn Sina, "is such a force that it arises irrationally in the mind of an animal, and a human being is characterized by conscious, logical thinking." The brain is the thinking organ of a person." That's why Ibn Sina concludes: "The brain perceives or stores perceptible images, merges or divides the images stored in the imagination, and at the same time creates different images similar to the images received through intuition." [4, 622]

These processes, according to Ibn Sina, occur with the help of nerves. His ideas about nerves, that is, that the function of nerves is mainly to mediate the transmission of sensations and movements of the brain to other organs, are scientifically very interesting.

Ibn Sina, while thinking about the structure of the human nervous system, is based on his ideas in the field of medicine. He understands well that the starting point of the nerves is the brain, that the

signal spreads from the brain to all parts of the body, and because of this, a person has the ability to respond to the influence of the outside world.

In the first book of his famous work "The Laws of Medicine", Ibn Sina states that physical training should be carried out in different forms and methods depending on the age, health or illness of a person. The fact that he raised the issue of how a person should treat physical training differently during childhood, adolescence, youth and old age shows that Ibn Sina had a perfect knowledge of human anatomy and physiology, and that he understood on a scientific basis that the human body is constantly progressing. [4,356].

Ibn Sina emphasizes that physical culture is of incomparable importance in the development of a person, and not only describes physical exercise, but also shows its various types and how to use them. He points out that physical training is very useful for the human body, that training includes actions performed by a person in the course of work and special physical training actions [5].

Ibn Sina divides special physical exercises into small or large, very fast or slow, that is, light exercises. Among these, quick exercises include: pulling, punching, walking fast, javelin throwing, fencing, javelin, riding, hanging on something, jumping on one leg, swinging two arms, walking on a rope, standing on tiptoes and stretching arms forward and backward. Exercises that are performed very slowly and easily: flying on horses, walking on boats or ships; and vigorous exercise includes lifting stones, riding a horse or camel, and riding in chariots.

There are other evidences that various physical exercises, especially equestrian races and wrestling, are widespread in the life of the Uzbek people. In his memoirs, Babur also mentions boxing competitions and writes that in one place the Osh "armors" won the first place. The evidence presented in "Boburnoma" confirms that during this period sports had a combat character. For example, according to Babur, among his contemporaries there were people who could knock down a horse with one blow. This is another evidence that shows that modern boxing originated from fist fights in the distant past. [6, 35].

Among the peoples of Central Asia, competitions with the participation of horses are widespread, and since childhood, riding a horse has been considered a natural and usual activity of almost everyone living here. On national holidays such as Nowruz, wrestlers' wrestling, as well as traditional single combats, were held.

The peoples who lived in the territory of present-day Uzbekistan have passed a difficult and difficult path in their historical development. In particular, physical culture and sports, which have taken a strong place in the life of these peoples, were also lost in the storm of bloody events, in the wars and massacres of external enemies that destroyed a lot of material and cultural wealth, in the flames of the struggle of workers against the oppression of foreigners and local officials. . One of the rulers has come and gone. The noble children of the people, like Babur, continued the traditions of the past, created new material and cultural wealth, and cared for the development of military art and physical culture. Our forefathers have always appreciated Babur's multifaceted activities. We will always admire him as a person who looked deeply not only at the spiritual spheres of human culture, but also at the sphere of physical culture. After all, the history of sports such as wrestling, football, horse riding, archery, and field hockey developed in Uzbekistan after independence cannot be studied separately from Babur's personality and his era.

The above examples clearly show that our sport today has its ancient roots. So, the history of physical culture and sports of the peoples who lived in the territory of Uzbekistan, like the history of these peoples, has its own distant, difficult and bright past.

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Rezyume: Mazkur maqolada yosh avlodni jismoniy tarbiyalashda psixologik qarashlarining ahamiyatiga doir masalalar muhokama qilinadi. Shuningdek, o'zbek xalqi tarixida jismoniy madaniyatni shakllanishi, qadimda jismoniy madaniyat va sportning insonga beqiyos darajada ta'naviy, ruhiy madad berishi kabi masalalarning ilmiy asosi tahlil qilingan.

Резюме: В данной статье рассматривается значение психологических взглядов в физическом воспитании подрастающего поколения. Также проанализированы научные основы таких вопросов, как становление физической культуры в истории узбекского народа, ни с чем не сравнимая духовная и духовная поддержка физической культуры и спорта человеку в древние времена.

Kalit so'zlar: sport, tarbiya, jismoniy tarbiya, jismoniy sifatlar, psixologik qarashlar.

Ключевые слова: спорт, воспитание, физическое воспитание, физические качества, психологические взгляды.

**A CREATIVE APPROACH TO THE ORGANIZATION OF PRACTICAL
PEDAGOGICAL ACTIVITIES THROUGH MUSIC LESSONS IN HIGHER EDUCATION**

Dadabayev Kh.M.

Andijan State University, Faculty of Sports and Art, Department of Music, Associate Professor

Summary: *In this article, the author explained the acquisition of a visual feature of the text intended for the lecture session, the preparation of control-test tasks in academic subjects based on the creative approach, the formation of a set of cases and graded tests, and the creative approach to the organization of spiritual and educational events.*

Key words: *text, visuality, visual feature of the text, educational tasks, types of educational tasks, working papers, case, level test, audience equipment.*

Acquisition of a visual feature of the text intended for lecture training. Activities aimed at developing personal creativity should not only consist of tasks, exercises or tasks of an entertaining nature. Perhaps, all tasks, exercises and tasks given to students should correspond to the existing state educational standards, and should create an opportunity for students to fully demonstrate their knowledge, skills and abilities. In the process of training, teachers should be able to become the person who encourages students to learn independently by gradually releasing them from responsibility (Fisher, Frey, 2008).[3]

In developing the creativity of a teacher, it is important for him to have the skills and qualifications of a creative approach to the development of educational tasks for lectures, practicals, seminars and laboratory sessions. For this, pedagogues need to organize systematic, consistent practical actions to develop their creativity. Some of them will be discussed below.

Converting textual information into graphic form. Textual information, especially large textual information, is difficult for students to accept. In modern conditions, it is required to transfer textual information into graphic form. When transferring educational information to a graphic form, it is appropriate to express the information in the form of a model, scheme, table, diagram, image, cluster, mathematical, physical, geometric form. Information presented to students in this way is effectively received by students.

At the same time, in the practical training organized in the direction of "Innovative educational technologies" in the courses of retraining of HEI pedagogues and improving their qualifications, students were armed with the skills and abilities to express the following text information in a cluster:

According to the dictionary meaning, the concept of "taxonomy[7]" means "the law of orderly arrangement". Categorization, systematization, placing objects in a sequence of increasing levels of complexity (hierarchical[6] style) based on their interdependence is called "taxonomy".

It was proposed by Augustine Decandole[8] (1778-1841) and was initially used only in biology. Later, this term began to be applied to the general theory of classification and systematization of complex systems in biology and other fields of knowledge, in linguistics, geography, and geology. Mathematically, a taxonomy is a tree-like structure for classifying a given set of objects. At the top of this structure, a single unifying classification—the root taxon—applies to all entities of this taxonomy. Root taxa are more specific classifications that refer to subsets of the overall set of classified entities. Modern biological classification, for example, is a hierarchical system, at the base of which are individual organisms (individuals), and at the top is a single overarching taxon; there are taxa at different levels of the hierarchy between the base and the top, each subordinate to one and only one higher-level taxon. One of the most fundamental problems of taxonomy is determining what a taxon is.[4]

The terms "taxonomy" and "systematics" are often used interchangeably, but strictly speaking, taxonomy is only one part of taxonomy. Usually in biology, taxonomy is interpreted as a branch of knowledge about the diversity of organisms and their relationships, and taxonomy as a branch of science that studies the principles, methods and rules of classification. The main task of biological

taxonomy is to create a hierarchical system of subordinate levels that serves to build a natural classification of organisms.

Pedagogical taxonomy is a theory of description, arrangement and systematization of the objects of the pedagogical process with a multi-level (hierarchical) structure that are interrelated and characteristic. The ideas of "Pedagogical taxonomy" were published in the USA in 1956 under the leadership of B. Bloom. In the 60s of the 20th century, D. Kratvol and others formulated the next ideas of taxonomy representing pedagogical goals.[2]

Working with special tests. The use of E.P. Torrens's "Unfinished Pictures" test gives effective results in determining the presence of creative abilities and qualities of students in teacher retraining and professional development courses.

During the application of P.Torrens' "Unfinished pictures" test in the courses of retraining and professional development of HE teachers, many suggestions are given by the listeners. The given proposals represent the extent to which the listening-pedagogues have creative qualities and the richness of imagination.

Using interactive methods. Working with interactive methods (strategy, graphic organizer) in classes creates the opportunity for students to acquire educational information systematically and holistically. In addition, with the help of interactive methods, students will be able to learn skills and abilities such as analyzing, synthesizing, systematizing important concepts, clearly expressing the general essence of objects, processes, activities, events, and events in working with educational information.[4]

Below are examples of the use of interactive methods in the teaching of pedagogic subjects and the formation of creative qualities and skills of creative and professional activity in students, students and participants of the courses of retraining of pedagogues of higher education institutions and improving their skills.

Types of learning tasks and defining types of learning tasks for learning activities. The system of planned goals is inextricably linked with the system of actions that ensure the fulfillment of these goals. Educational tasks are the factor that motivates the learner to take active action in mastering educational materials. Educational tasks are a set of educational tasks that serve to determine the level of knowledge, skills and abilities acquired by students on the subject being studied.

For this reason, the correct formation of educational tasks is considered appropriate. Students studying at the Pedagogical Higher Education Institution must have the skills and abilities to correctly formulate educational tasks.

Preparation of worksheets for educational assignments. Completion of educational tasks based on worksheets makes it possible to speed up this process, facilitate students' activities and, most importantly, save time as much as possible. Due to this, in the experience of leading foreign countries, special attention is paid to the formation of working papers for the process of working with educational tasks and their preparation for training.

As a result of the innovative approach to the organization of education in the years of independence in Uzbekistan, the tradition of organizing the practical activities of pupils and students by means of worksheets was formed in almost every lesson and training session at all stages of the continuous education system. At the same time, there is a need to further enrich the experience in this regard. For this reason, it is appropriate to develop the skills and competencies of the pedagogues of higher education institutions in creating working papers. In addition, the preparation of worksheets for tasks performed in training sessions helps to further develop the creativity of pedagogues.[5]

When using interactive methods in the educational process, graphic images of graphic organizers can be used as worksheets.

In the "Appendices" section of the OMM, examples of working papers that have been increasingly used in training sessions in recent years are given.

Based on a creative approach, preparation of control-test assignments in academic subjects, formation of a set of cases and graded tests. In modern education, it is becoming more

and more important not to give ready-made knowledge to students, but to direct them to independent acquisition of knowledge. After all, assimilation of ready-made knowledge helps students to understand existence, the content of social relations, and the essence of personal activity in one form or another. However, the phenomenon, reality, mutual unity between the constituent elements of the process, which represents the current state of existence and social relations, hinders the effective development of the skills of understanding the relationship, analyzing the cause and effect, analyzing the content, direction and, most importantly, the factors guaranteeing the result.[4]

It is methodologically effective to expose students to "problem situations" in order to avoid such a negative situation.

The didactic possibilities of problematic situations make students think about the studied issue (theme, problem), understand the mutual unity and connection between the structural elements that illuminate the essence of the issue, analyze the issue based on the "problem-problem solving process-solution" system, put forward hypotheses about the solution, forces to organize practical actions such as checking the acceptability, stating the solution and defending it. In addition, with the help of problematic situations, students will have the opportunity to independently analyze their knowledge, take a critical approach to educational activities, and put forward creative ideas on the subject (topic, problem) under study. ensures fulfillment. That is, problem-based teaching, the technologies used in the process of teaching it are the necessary pedagogic tasks that ensure the fulfillment of the social order, which is to prepare a well-rounded person and a qualified specialist, set by the republican continuous education system. creates conditions. Therefore, special attention is paid to the use of problem-based education and the effective application of problem-based education technologies in the educational system today. In particular, in recent years, the experience of using the "Case Study" technology, which occupies an important place among the problem-based educational technologies in the teaching of general and specialized subjects, has been forming in higher education institutions.[1]

Creative approach to the organization of spiritual and educational events. A creative approach to equipping the auditorium (place) for training sessions and spiritual-educational events. The activity of a pedagogue is not only teaching. At the same time, it also performs educational functions. The organization of spiritual and educational work is also an important direction of the pedagogue's activity.

Therefore, it is necessary for a pedagogue to have a creative approach to the organization of spiritual and educational work. In doing so, he should pay attention to the following:

- consistent, continuous and systematic organization of spiritual and educational activities in accordance with the purpose;
- development of a carefully based plan of spiritual and educational activities for the academic year;
- achieving the implementation of events in the plan that meet the needs and interests of students and are dedicated to the problems of current topics;
- organization of spiritual and educational events not for the purpose of planning, but to meet the needs of students, to ensure their formation as individuals and specialists;
- spiritual-educational works according to their direction, content, character, scope, etc. achieving organization based on interactivity in various forms according to its characteristics;
- to ensure that each spiritual and educational event is organized on the basis of a specific goal and, of course, can guarantee the expected result;
- to achieve equal active participation of all students of the academic group in the organization and conduct of spiritual and educational activities.

Achieving the equipment of not only a place where spiritual and educational events are organized, but also an auditorium where training sessions are held is evidence of both organizational and creative activity of the pedagogue. In both cases, it is desirable for the pedagogue to be able to decorate the educational auditorium and the place (room) where the event takes place in a unique spirit, based on the nature of the subject to be studied and analyzed.

In the educational sessions, according to the nature of the subject, the audience will see posters, mock-ups, herbariums, maps, fiction, portraits of scientists, artists, writers, generals and statesmen, work equipment, correspondence, literature, artistic works, etc. decorating with it has a positive and emotional effect on students, raising the mood of training and events.[2]

The more creative the pedagogue is, the more he will be able to equip an educational auditorium and a room for spiritual educational events in cooperation with students, relying on their creative abilities and creativity. As a result, the creative activity of students increases, and the effectiveness of the training and event increases.

Conclusion.

Thus, problem-based learning is important in modern teaching. Problem-based educational technologies help to effectively form the skills and abilities of students to think, make decisions, and justify their own opinions. Among such technologies, "Case-study" technology is important. Appropriate, purposeful, consistent use of the case study in the educational process improves the quality of teaching, increases its effectiveness, and at the same time activates the learning and learning activities of students.

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Rezyume: *Ushbu maqolada muallif Ma'ruza mashg'uloti uchun mo'ljallangan matnning vizual xususiyat kasb etishi, Kreativ yondashuv asosida o'quv fanlari bo'yicha nazorat-sinov topshiriqlarini tayyorlash, keys va darajali testlar to'plamini shakllantirish hamda Ma'naviy-ma'rifiy tadbirlarni tashkil etishga kreativ yondashishni yoritib bergan*

Резюме: *В данной статье автор объяснил приобретение визуальной особенности текста, предназначенного для лекционного занятия, составление контрольно-тестовых заданий по учебным предметам на основе творческого подхода, формирование набора кейсов и градационных тестов. и творческий подход к организации духовно-просветительских мероприятий.*

Kalit so'zlar: *matn, vizuallik, matnning vizuallik xususiyati, o'quv topshiriqlari, o'quv topshiriqlarining turlari, ish qog'ozlari, keys, darajali test, auditoriyani jihozlash.*

Ключевые слова: *текст, наглядность, визуальная особенность текста, учебные задачи, виды учебных задач, рабочие документы, кейс, тест уровня, аппаратура аудитории.*

GENERAL DESCRIPTION AND ANALYSIS OF PHYSICAL CHARACTERISTICS

Kuzibayev R.A.

Teacher of the Fergana branch of the Institute of retraining and advanced training of specialists in physical education and sports

Summary: *This article covers information such as the need to pay attention to training the quality of speed of athletes during the training phase, speed-strength exercises performed in conditions adapted to training the quality of speed, wide use of speed, and the need to adapt the speed directly in a smaller volume.*

Key words: *Physical quality, description, theory, rehabilitation, methodology, tool, ability.*

In the process of forming a person's physical culture, participants not only master the movements and related knowledge, but also develop their physical abilities. A general description of physical qualities and their development is also important.

Currently, the terms "physical abilities" and "physical qualities" are used to describe a person's movement capabilities. Although these concepts are similar in a certain sense, they are not the same. Unfortunately, in the literature, one can find some conflicting opinions about the definition and interrelationship of these concepts. For example, in one case, physical abilities are understood as the forms of manifestation of the ability of functional systems that participate in the body's movement activity and determine its effect, while in other sources, human-specific capabilities that are realized in life, especially in movement activity, and are based on physical qualities are considered; in the third, capabilities mean developed innate ability targets based on the mental-physiological and morphological characteristics of the organism.

Physical abilities are a complex of mental, physiological and morphological characteristics that meet the requirements of one or another muscle activity of a person and ensure its effective performance. The term "physical (motor) qualities" has been used for a long time to express special aspects of human movement capabilities. Now, some authors suggest that the concept of "physical qualities" should be removed from scientific treatment due to its simple formalistic content, and only the term "physical abilities" should be used instead. Nevertheless, this term is widely used in everyday speech and scientific-methodical literature. Therefore, perhaps, it is appropriate to identify the similarities and differences between these two concepts, to identify the situations of their use. First of all, it should be noted that the concept of "quality" is always used in relation to something, and it expresses its characteristic feature that distinguishes it from other things, it is said about a product, raw material, food product, qualities of life, the quality of a person, knowledge, etc. . In the field of physical education, this term should be used in the same sense. Therefore, it is possible to check the physical qualities of a person in relation to one or another form in which physical abilities are manifested, such as some characteristics of his movement capabilities, that is, to think about them based on the abilities that have been realized. A person can have different abilities that differ from each other in terms of quality. It is the qualitative uniqueness of these different physical abilities that testifies to his physical qualities [1,69].

Characteristics of the quality of human abilities in life, physical education and sports are reflected in the expressions "strong", "quick", "agile", "flexible". The importance of these qualities in life was considered a criterion for showing them off. In fact, physical qualities are an expression of the degree of achievement of individual physical abilities, their accuracy, uniqueness, and importance. Take human strength abilities for example. They are manifested in strength exercises with a high level of muscle tension and a relatively low rate of contraction. Basically, strength skills describe the qualities of strength, such as "quiet", "compressive strength", "static strength".

Speed-strength skills occur in exercises that require a high contraction rate of the muscles, where severe muscle strain occurs. The development of speed-strength skills is primarily reflected in the so-called "explosive" strength.

The above-mentioned qualities of strength allow to determine and distinguish the strength abilities of a person in a comprehensive way. Similarly, qualitative differences can be expressed in other physical abilities. There is a lot of correlation between physical abilities and qualities. The same ability can manifest different physical qualities, and different abilities describe only one of them. For example, the quality "agile" is based on many abilities: coordination, speed, strength, etc. Speed-strength skills are reflected not only in "strength", but also in "speed". Thus, the physical qualities of a person are inextricably linked with his physical abilities and are determined by the characteristics of their manifestation during various actions. On the one hand, the level of development and manifestation of physical abilities is influenced by environmental factors (social and household conditions of life, climatic and geographical conditions, material provision of training places, methods of their development, etc.). on the other hand, genetic factors related to the specific reaction of the organism to various influences have an effect, anatomical, physiological and mental characteristics of the human body appear as indicators of physical ability. In the process of performing an activity, "motor goals" are improved based on adaptation changes of the organism and turn into corresponding physical abilities. It should be noted that "motor targets" are multifunctional and can develop in one or another direction depending on the conditions of muscle activity and provide the development of physical abilities in one or another form. According to Professor Yu. V. Verkhoshansky, there can be as many such forms as there are types of movement activity, because each of them has its own structure, purposeful direction of movements, and muscle coordination. For this reason, it is useless to look for some special mechanisms responsible for the development of endurance or speed of movement in the body. [2,94].

There are a number of laws specific to the directed development of all physical abilities.

Both innate and environmental factors are of great importance in the formation of abilities. However, in equal conditions, the activity of movement aimed at improving the mental and physiological nature of a person plays a decisive role in the development of physical abilities. That is why the morphological and functional indicators of various organs and systems, as well as movement readiness, are generally higher in those who do physical exercises. Jean Lamarck was the first to demonstrate the importance of activity and exercise as a necessary factor for the functional and morphological improvement of the organism. While creating the "law of exercise", which is his "First Law", he wrote: "The rapid and constant use of any element gradually strengthens, develops, enlarges it and gives it the power that will last the longer it is used and not using it regularly weakens it without realizing it, narrows the abilities and eventually causes it to burn out." In this way, Jean Lamarck expressed one of the general laws of nature. This law was further studied later by P.A. Lesgaft, A.A. Ukhtomsky, I.P. Pavlov, G.F. Folbort, N.N. Yakovlev and others made great contributions [3,128].

Physical abilities develop in the process of activity that requires not only their manifestation, but also a specific mode of their performance. The term "regime" refers to the execution of some physical exercises within the framework of a training or a system of training and rest between them. In establishing the necessary order, the fluctuation of stages in a person's ability to work is important. In the process of performing physical exercises, the level of work capacity decreases due to the consumption of energy and functional reserves of the body. Recovery of working capacity occurs during rest. At this time, the human body has several situations: the stage when the capacity for work has weakened; working capacity goes through a completed stage and, finally, a highly restored stage, i.e. increased working capacity. Each of the listed stages has a certain length depending on the characteristics, intensity and duration of the work performed, among other conditions. Depending on the phase of rest each subsequent exercise is repeated, three main modes of movement activity can be distinguished, which have different effects on the development of physical qualities:

Mode 1: in this, each subsequent exercise in the lesson is repeated with short rest intervals, that is, at the stage when the working capacity is not fully restored. All indicators of working capacity are regularly decreasing. This alternating mode of work and rest is suitable for the development of endurance.

Mode 2: each subsequent exercise is repeated with rest intervals that return a number of functional indicators of the body to the level before the activity, that is, at the stage when the capacity for work is completed. Such a regime is characteristic of classes aimed at developing speed, strength and coordination.

Mode 3: in which each subsequent exercise is repeated with much longer rest intervals, corresponding to the phase of increased work capacity. As the exercise is repeated in this mode, comprehensive changes are observed in a person's movement capabilities - muscle strength and speed increase, endurance decreases. Grading of the development of physical abilities. In the dynamics of the development of physical abilities - when performing the same loads for a long time, many times - three relatively independent stages can be conditionally distinguished:

The first is to increase the level of development of abilities;

The second is to achieve maximum indicators in the development of abilities;

The third is a decrease in the indicators of the development of physical abilities;

In the first stage, as a result of the application of the load, adaptive changes occur in the body, which cause the growth of physical abilities related to the characteristics of movement activity and the gradual expansion of functional capabilities.

In the second stage, as the adaptive changes increase, the standard load causes less and less functional shifts in the organism. This is a sign indicating that adaptive processes have passed to the stage of stable adaptation. On the basis of the manifestation of the corresponding abilities, the possibilities of the underlying organ systems will seriously expand. Efficiency and coordination will increase in their activities. All this creates conditions for maximum manifestation of abilities.

In the third stage, this load does not cause adaptive shifts due to the expansion of functional capabilities in the organism, that is, its developmental effect either decreases or disappears altogether. In order for the development of abilities to continue again, it is necessary to change the characteristics and content of the applied loads (choose other exercises, increase the intensity of work, change its duration or the conditions of performing exercises), thus setting new, higher requirements for physical abilities. [4,71].

In order to successfully implement the work of training young athletes, it is necessary to carefully consider the age characteristics of development, the level of training, the characteristics of the chosen sport, the specific aspects of the development of physical qualities, the formation of movement skills and competencies. The trainer's knowledge of age zones allows for better systematization of the long-term training process. However, age is not the only factor that needs to be taken into account when building a rational training system. It is necessary to thoroughly study the specific physical abilities of athletes, the most favorable periods for training physical qualities, as well as the tendency to acquire quality technical-tactical activities [5,130].

As a conclusion, it can be said that quickness is the ability of a person to respond instantly to external influences and to perform quick actions. Quickness in sports practice is manifested in specific forms of speed-power qualities. The mobility of nervous processes, the speed and efficiency of the nerve impulse sent to the muscle are considered physiological conditions of agility. The manifestation of the quality of speed also depends on the speed of biochemical reactions that ensure the resynthesis of the power source of ATF contractions. In moving at high speed, not only functional characteristics of a person, but also morphological qualities: height, body weight are of great importance. According to the structure of physical exercises used in training speed, it should be close to special movement skills. In other words, technically perfect forms of movement that can be performed at maximum speed are necessary as effective tools for the development of agility within sports specialization. The duration of each exercise should be such that its speed does not decrease towards the end. When the speed decreases, repeating the exercise loses its meaning, the speed does not increase.

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Rezyume: *Ushbu maqola mashg'ulot bosqichida sportchilarning tezkorlik sifatini tarbiyalashga e'tibor qaratish lozimligi, tezkorlik sifatini tarbiyalashga moslashtirilgan sharoitlarda bajarilgan tezkor-kuch mashqlari, tezlikni keng qo'llash, bunda bevosita tezlikni kichikroq hajmda bajarib, uyg'unlashtirish lozimligi kabi ma'lumotlarni qamrab olgan.*

Резюме: *В данной статье акцентируется внимание на необходимости акцентирования внимания на тренировке качества скорости спортсменов на тренировочном этапе, необходимости сочетания скоростно-силовых упражнений, выполняемых в условиях, адаптированных к тренировке качества скорости, широком использовании скорости и необходимо совместить прямую скорость с меньшим объемом покрытия.*

Kalit so'zlar: *Jismoniy sifat, tavsif, nazariya, sog'lomlashtirish, metodika, vosita, qobiliyat.*

Ключевые слова: *Физические качества, описание, теория, реабилитация, методика, инструмент, способность.*

**FROM SILENCE TO ELOQUENCE: TRANSFORMATIVE METHODS FOR BOOSTING
ENGLISH SPEAKING COMPETENCE IN STUDENTS**

Temirxanova Z.

Karakalpak State University named after Berdakh

Summary: *This article discusses the ways of how storytelling, role play, task based language teaching, a small-group discussion can develop students' speaking competence and suggests ways to implement them in academic lyceums.*

Key words: *speaking skill, speaking competence, communicative competence, storytelling, role play, task based language teaching, small-group discussion*

Introduction

In the ever-evolving landscape of global communication, proficiency in English has emerged as a critical skill, transcending geographical and cultural boundaries. As the lingua franca of the modern world, English serves as a pivotal tool for academic, professional, and personal success. Within this context, the development of students' speaking competence in English has garnered significant attention in educational discourse. The ability to articulate thoughts, engage in meaningful conversations, and convey ideas fluently is not merely an academic goal but a fundamental necessity for navigating the complexities of contemporary society.

Effective English language teaching hinges on the successful cultivation of speaking skills, which are often perceived as the most challenging aspect of language acquisition. Unlike other linguistic abilities such as reading or writing, speaking necessitates real-time processing, immediate feedback, and spontaneous interaction. This dynamic nature of spoken communication presents unique challenges for both educators and learners. Consequently, innovative pedagogical strategies and methodologies are essential to foster an environment conducive to the enhancement of speaking competence.

The fundamental reforms being carried out in the continuous education system of our country are advancing the problems of creating the necessary conditions for not only for young people to learn a foreign language, but also to perform communicative activities in it, to use effective methods that demonstrate competence in the process of communication, and to be able to express themselves in all fields with a perfect knowledge of a foreign language. It is also important to develop the competence of academic lyceum students to think and speak a foreign language fluently.

This article delves into the multifaceted approaches to developing students' speaking skills in the context of teaching English. It explores various pedagogical techniques, including communicative language teaching, task-based learning, and the integration of technology, all aimed at creating immersive and interactive learning experiences. By examining the role of classroom interaction, feedback mechanisms, and the socio-cultural dimensions of language learning, this article seeks to provide a comprehensive understanding of the factors that contribute to effective speaking competence development.

Moreover, the article highlights the importance of teacher training and professional development in equipping educators with the necessary skills and knowledge to implement these strategies effectively. It also addresses the challenges faced by learners, such as anxiety, lack of confidence, and limited exposure to authentic language use, proposing practical solutions to overcome these barriers.

Materials and Methods

Speaking, as a type of speech activity, means expressing an idea orally. Speaking, an essential skill in oral communication, is one of the key speech activities. It involves the psychological process of expressing ideas. Initially, learners must be motivated to develop the intent to speak. Subsequently, the speaker selects appropriate words or grammatical structures from their memory, typically relying on their native language's readily available material. Ultimately, speaking involves the act of

conveying an idea and pronouncing words, which means using language in verbal communication. Speaking is one of language skills which is developed in language learning. Together with Listening, Reading, and writing, speaking is seen as one of four language skills. It is the way people communicate the language orally. Speaking is often an undervalued skill, possibly because almost everyone can speak and thus we tend to take it for granted. However, speaking deserves as much attention as literary skills, both in our first and second languages. The four skills are interrelated, and speaking is often considered difficult for EFL learners to master because students have to acquire other language components such as grammar, vocabulary, pronunciation, and fluency in order to be proficient English speakers. Thus, they can become nervous, be afraid of making mistakes, and lack confidence [13:159-182]. Also, the act of speaking can be challenging because it also involves an interactive process of constructing meaning that includes producing, receiving, and processing information [18].

We can express our opinion verbally/orally in two ways namely monologue and dialogue. Teaching monologue and dialogue is one of the main requirements of the curriculum. The teacher should know the main features of both forms. For instance, the usage of complete clauses and structural forms are essential for monologue, but ready models or elliptical sentences are essential for dialogue [9:162]

Speaking in English is regarded as the most challenging of the four language skills because it involves a complex process of constructing meaning. This process requires speakers to make decisions about why, how, and when to communicate based on the cultural and social context of the conversation. Additionally, it involves a dynamic interaction between speakers and listeners, necessitating the simultaneous production and comprehension of spoken discourse within time constraints.

A student who has mastered speaking skills well may have difficulties in acquiring speaking competence. Speaking competency is the ability of organizing and synchronizing both the knowledge of the language and the skills of the language in real-life use or other word, in real communication [15:29].

To teach speaking holistically and comprehensively, it is essential for teachers to understand the components of speaking competence and how these different aspects are interconnected. Johnson [10:155] describes speaking as a “combinatorial skill” that “involves doing various things at the same time”. Learning to speak in a second language entails enhancing the ability to utilize various components to produce spoken language that is fluent, accurate, and socially appropriate, all within the limits of the speaker's cognitive processing capabilities.

Figure 1 below illustrates a model of second language speaking competence, which comprises knowledge of language and discourse, core speaking skills, and communication and discourse strategies.

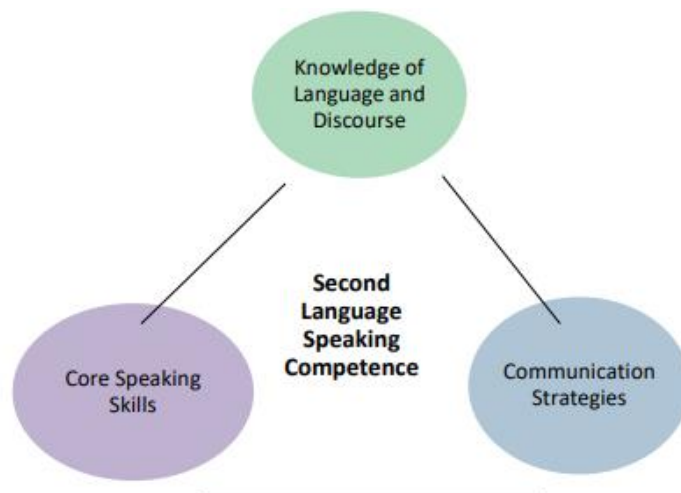


Figure 1: Components of second language speaking competence [4:53]

This model suggests that speaking lessons should not merely be occasions for practicing or "doing" speaking. Instead, they should be structured and supported learning opportunities that develop various components of speaking competence. Teachers must systematically guide learners by introducing integrated and sequenced activities that help them become aware of the knowledge, skills, and strategies needed for different types of interaction and discourse. Students may need guidance on specific language aspects, such as pronunciation features at the segmental or suprasegmental level, or support in dealing with affective factors like anxiety, nervousness, or embarrassment about speaking in another language.

It is clear from this that it is possible to develop speaking competence by mastering speaking skills. Apart from that, the key role of the speaking skill in developing learners' communicative competence has also become evident, as this skill requires learners to know how to produce utterances that are both linguistically correct and pragmatically appropriate. One of the earliest concepts of communicative competence was introduced by Hymes [8:269-293] who believed that the ability to communicate properly should be cultivated in language teaching. Students should learn to use a language in their daily communication to demonstrate their mastery of it.

Communicative competence - the ability of speaking appropriate things in different situations (what?, how? and when?) and the skill of expressing opinions fluently, coherently and logically in English. [2:12]. So, we can assume that students' speaking competence develops within communicative competence.

Effective learning methods will empower students to achieve proficiency in the language, whether through spoken or written expression [5]. Undoubtedly, mastering speaking skills, which are often seen as challenging, requires extensive practice. Kusnierek mentioned the teaching of speaking skills is depended in classroom whereby students have been exposed to the language and practise speaking within the lesson [11:73-111]. Kusnierek mentioned the teaching of speaking skills is depended in classroom whereby students have been exposed to the language and practise speaking within the lesson. Moreover, as mentioned by Torky [17], often teachers monopolize the lesson by continuously speaking and explaining concepts, which can demotivate students from actively participating and becoming proficient speakers during language lessons. Choosing effective language learning strategies for speaking skills can boost students' confidence and motivation to speak in English. This approach can help them enhance their speaking abilities without the fear of making mistakes.

We will consider the following methods of improving students' speaking competence in teaching English.

Storytelling. According to Stanley and Dillingham [16], storytelling is an engaging oral activity that captivates audiences by evoking multi-sensory emotions through narrating events in a story. It includes improvisation, facial expressions, and body movements to enhance the storytelling experience.

Fikriah [3:87-101] stated that storytelling builds confidence, develops language skills, encourages speaking and listening fluency, and increases motivation and interaction for the students. Employing the storytelling method makes the learning process more enjoyable for students. Not only do they develop language skills, but they also gain knowledge of history, information, science, and more through this engaging approach.

The storytelling method is a powerful tool in ELT for developing students' speaking competency. It engages students in meaningful and context-rich activities, builds their confidence, and improves their overall language skills in a holistic manner. The integration of storytelling in language teaching offers a dynamic and interactive approach that not only enhances speaking skills but also fosters a deeper cultural and emotional connection with the language.

Role play. Role play places learners in realistic situations, allowing them to practice using the language in contexts they are likely to encounter in real life. This contextual practice helps in mastering the practical use of the language.

Role play requires active involvement from all participants, making the learning process more engaging and dynamic. This active participation is crucial for developing speaking skills. Learners interact with their peers, which helps in reducing anxiety and building confidence in speaking. This interaction also provides immediate feedback from peers.

Role play activities is considered to be a good option to be implemented in teaching speaking and develop students' speaking skill [6:305-311]. Role play teaches vocabulary and everyday language to learners. These are significant elements learners need to develop their communicative competence. It can be concluded that, role play improves learners' speaking skills [1:27-33].

It is clear that the role play method is a versatile and effective approach for developing speaking competency, providing a practical, interactive, and engaging way for learners to improve their language skills.

A small-group discussion. Many researchers define a small group as having at least three but no more than twelve or fifteen members. When a group becomes too large, with more than twelve or fifteen members, it can hinder effective communication among group members. Ornstein and Lesley say [14:294] that small group occurs when the large group is broken up into subgroups according to ability, interest, project, or other criterion.

When people come together, they often engage in discussions, whether in casual interactions or during group activities where members assemble and interact with one another. According to Hoover, discussion is the process of talking things over among two or more persons, preferably face to face [7:110]. He emphasizes that the discussion process ideally involves a cooperative effort among several individuals working together as a group. This collaboration occurs through the exchange of thoughts and ideas orally, aimed at achieving a common group goal.

Small-group discussions in speaking activities are believed to enhance students' speaking competency, enabling them to communicate effectively in real-life situations. Additionally, individual learners can sharpen their problem-solving skills in speaking by observing and exchanging ideas with other learners in these discussions.

Class discussions are very wasteful in terms of the ratio of teacher or student-effort and time to actual language practice taking place; group discussions are relatively efficient. Moreover, this heightened participation is not limited to those who are usually articulate anyway; students who are shy of saying something in front of the whole class, or to the teacher, often find it much easier to express themselves in front of a small group of their peers.

Task based language teaching (TBLT). Task-based learning is viewed as a solution to meet the mentioned demands, particularly in creating an optimal environment for EFL (English as a Foreign Language) students to improve their speaking skills. TBLT is a learner-centered approach; it has primary focus on the task completion, uses analytical approach and specifies learners' real-life communication needs. Furthermore, TBLT has an outline as a set of activities used by the learner for a communicative purpose in order to achieve an outcome [19]. Task based learning is an approach in teaching speaking, the teacher asks the students to perform tasks that resemble authentic, "real-life" situations [12].

Studies show that students generally display more positive attitudes towards learning English when engaged in task-based activities. These activities tend to be more engaging and less stressful, fostering a better learning environment. For instance, the study on Palestinian secondary EFL students showed that TBLT not only improved speaking skills but also positively influenced students' attitudes towards learning English [20].

Overall, TBLT is a highly effective approach for developing students' speaking competency in ELT. It promotes practical communication skills, fosters positive learner attitudes, and can be adapted to suit various educational contexts and learner needs. The combination of engaging, real-life tasks and an emphasis on communicative competence makes TBLT a valuable methodology in modern language teaching.

Discussion

The development of speaking competence in English language learners is a multifaceted challenge that requires innovative and diverse pedagogical approaches. This article has explored several methods, including storytelling, role play, small-group discussion, and task-based language teaching (TBLT), each offering unique benefits in enhancing students' speaking abilities.

Storytelling has been highlighted as a powerful tool in English Language Teaching (ELT). By engaging students in narrative activities, storytelling fosters confidence and fluency in speaking. It allows students to express themselves creatively, enhancing both their linguistic and cognitive skills. The multi-sensory experience of storytelling, incorporating visual, auditory, and kinesthetic elements, ensures that learners are deeply engaged and motivated.

Role play is another effective strategy that immerses students in realistic scenarios, promoting practical language use. It encourages active participation, reduces anxiety, and builds confidence. By simulating real-life interactions, role play helps learners to practice vocabulary and everyday language, making it a valuable method for developing communicative competence.

Small-group discussion offers a platform for collaborative learning, where students can share ideas and solve problems together. This method enhances critical thinking and allows learners to practice speaking in a less intimidating environment compared to whole-class discussions. The exchange of ideas in small groups also fosters a sense of community and encourages quieter students to participate more actively.

Task-based language teaching (TBLT) focuses on using language as a tool to complete meaningful tasks. This approach is particularly effective in creating authentic learning experiences that mirror real-life communication. TBLT not only improves speaking skills but also positively influences learners' attitudes towards language learning by making it more engaging and relevant to their needs.

Each of these methods contributes to the holistic development of speaking competence by addressing different aspects of language use. Storytelling enhances creativity and narrative skills, role play provides practical language practice, small-group discussions promote collaborative learning, and TBLT offers real-life communication experiences. Together, they create a comprehensive framework for developing speaking competence in English language learners.

Conclusion

In conclusion, developing speaking competence in English language learners requires a combination of diverse and innovative teaching methods. Storytelling, role play, small-group discussion, and task-based language teaching each offer unique advantages that address various facets of speaking skills. These methods not only enhance linguistic abilities but also build confidence, reduce anxiety, and foster positive attitudes towards language learning.

To effectively implement these strategies, educators need to be well-trained and adaptable, creating an engaging and supportive learning environment. Overcoming challenges such as student anxiety and lack of confidence is crucial, and these methods provide practical solutions to these issues. By integrating these approaches into their teaching practices, educators can significantly improve their students' speaking competence, preparing them for successful communication in academic, professional, and personal contexts.

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Rezyume: Ushbu maqolada hikoya qilish, rolli o'yinlar, topshiriq asosida til o'rgatish va kichik guruhlarda muhokama o'quvchilarning til kompetensiyasini rivojlantirish yo'llari ko'rib chiqiladi va ularni akademik litseylarda amalga oshirish yo'llari taklif etiladi.

Резюме: В данной статье рассматриваются способы, как рассказывание историй, ролевые игры, обучение языку с помощью задач, дискуссия в малых группах могут развивать речевую компетентность учащихся, и предлагаются способы их реализации в академических лицах.

Kalit so'zlar: nutq qobiliyatlari, og'zaki kompetentsiya, kommunikativ kompetentsiya, hikoya qilish, rolli o'yin, topshiriq asosida til o'rganish, kichik guruh muhokamasi.

Ключевые слова: умение говорить, речевая компетентность, коммуникативная компетентность, рассказывание историй, ролевая игра, обучение языку на основе задач, обсуждение в малых группах.

THE ROLE OF SERVICES IN THE SOCIO-ECONOMIC DEVELOPMENT OF THE REGION

Kalmuratov B.S., Allamuratova G.M.

Karakalpak State University named after Berdakh

Summary: *In the article directions of comprehensive development of the region from the socio-economic point of view and the role of service provision in the economy and gross regional product of the Republic of Karakalpakstan were analyzed and development directions were recommended.*

Key words: *socio-economic growth, service industries, information and communication services, financial services, transportation services, accommodation and catering services, trade services, real estate services, education services, health services, rental and leasing services.*

Introduction. It is no secret that the economy of the Republic of Karakalpakstan is the least developed region among the regions of the Republic of Uzbekistan compared to other regions. At present, the legal and regulatory documents adopted by our Government and the President of the Republic of Uzbekistan, including the Republic of Karakalpakstan, are the priority directions of economic reform and important target complex programs for the development of sectors and industries, with a wide mobilization of available reserves and opportunities in the following years for the socio-economic complex development of the Republic of Karakalpakstan. envisages the implementation of strict measures aimed at its full implementation [3].

The main part. Analyzing the results of the works to be carried out in the Republic of Karakalpakstan in the following years, the trend of growth in terms of the main economic indicators was preserved, and in 2021, the gross regional product of the region increased by 7.4% compared to 2020 and amounted to 26.3 trillion soums. In 2022, the gross regional product will be 27.6 trillion. It is planned to be soums, and it is forecasted to grow by 5.2% in 2021, 6% in 2023 and 6.4% in 2024. In 2022, the growth rate of the industrial sector, which is the main macroeconomic indicators of the Republic of Karakalpakstan, is planned to be 105.2%, the growth rate of the agricultural sector is 103.2%, and the growth rate of the retail trade turnover is planned to be 111% [2].

According to the "Complex Concept of Socio-Economic Development of the Republic of Karakalpakstan until 2030" adopted by the Council of Ministers of the Republic of Karakalpakstan, the indicators are 108.6 percent in 2030, 2.6 times increase of GNP in 2030 compared to 2018 or 9755.1 billion in 2022. we can observe that it will reach 50357.5 billion soums, such economic growth rates are based on the stable and balanced development of the main industries and sectors.

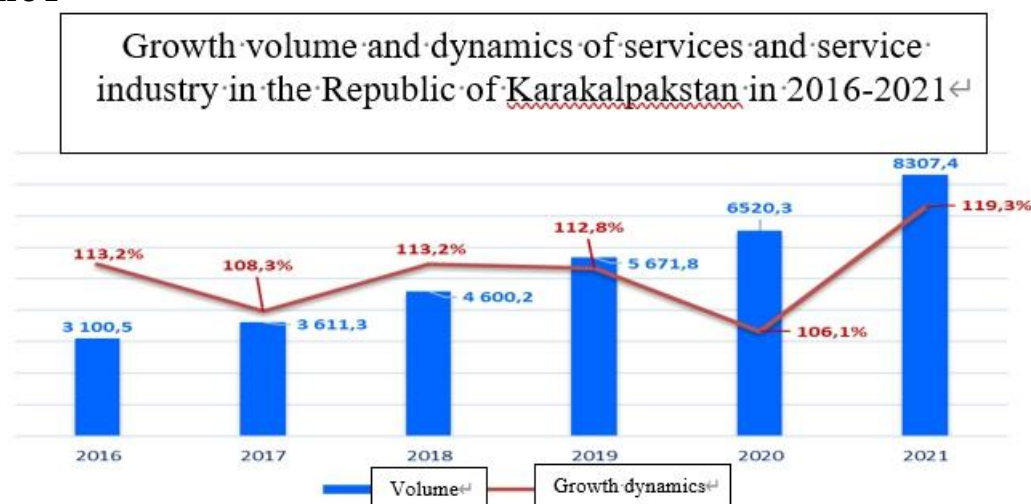
Also, by the end of 2030, the share of industry (including construction) in the gross regional product is estimated to increase by 1.1 times compared to 2022 to 43.5 percent. As a result of the implementation of reforms on diversification and structural change of the economy, the volume of services in the Republic of Karakalpakstan in 2021 will be 8.3 trillion. amounted to soums and increased by 19.3% compared to 2020. The share of the service sector in the gross regional product of the region was 36 percent [5].

In our country, the expansion of the service sector plays an important role in creating new jobs, providing employment and increasing the income of the population. There is a great opportunity to develop this industry in our country. Because it does not require extra funds. The money spent on it or the loan received will return in a short period of time. As a result, the way is opened to direct this amount as another investment. Analyzes show that in developed countries, for example, the USA, Great Britain, Canada, France, Germany, Italy, Japan, the share of services and services is 70-80 percent of the gross domestic product. Its share in the gross domestic product of our country was 37 percent in 2000, and today it is 50.5 percent [4]. As a result of the measures taken, the industry is developing. Unfortunately, there are also disadvantages. At the meeting of the Cabinet dedicated to the end of the last year, it was emphasized that this industry, which does not require a lot of money,

will have a significant positive effect on the growth of the economy, the increase in employment and income of the population, especially in rural areas, there are great unused opportunities for its further expansion. preparation of the intended program draft, in which the task was assigned to increase the share of the sector in the gross domestic product of our country to 54-56% in 2022-2026. It should be noted that "Development strategy of New Uzbekistan for 2022-2026 in the "Year of glorifying human resources and active neighborhood" In the state program, special attention is paid to the development of the service sector [1]. In particular, it is planned to exempt from fixed taxes for a period of three years to support entrepreneurs engaged in services such as hairdressing, tailoring, shoe and home appliance repair, thereby encouraging job creation. It serves to ensure employment of the population, expand access to quality services of our people, of course [4].

In the last 5 years, the volume of the service sector in the region has increased by almost 2.7 times. In particular, in 2016, 3.1 trillion. Soum services are provided.

Figure 1



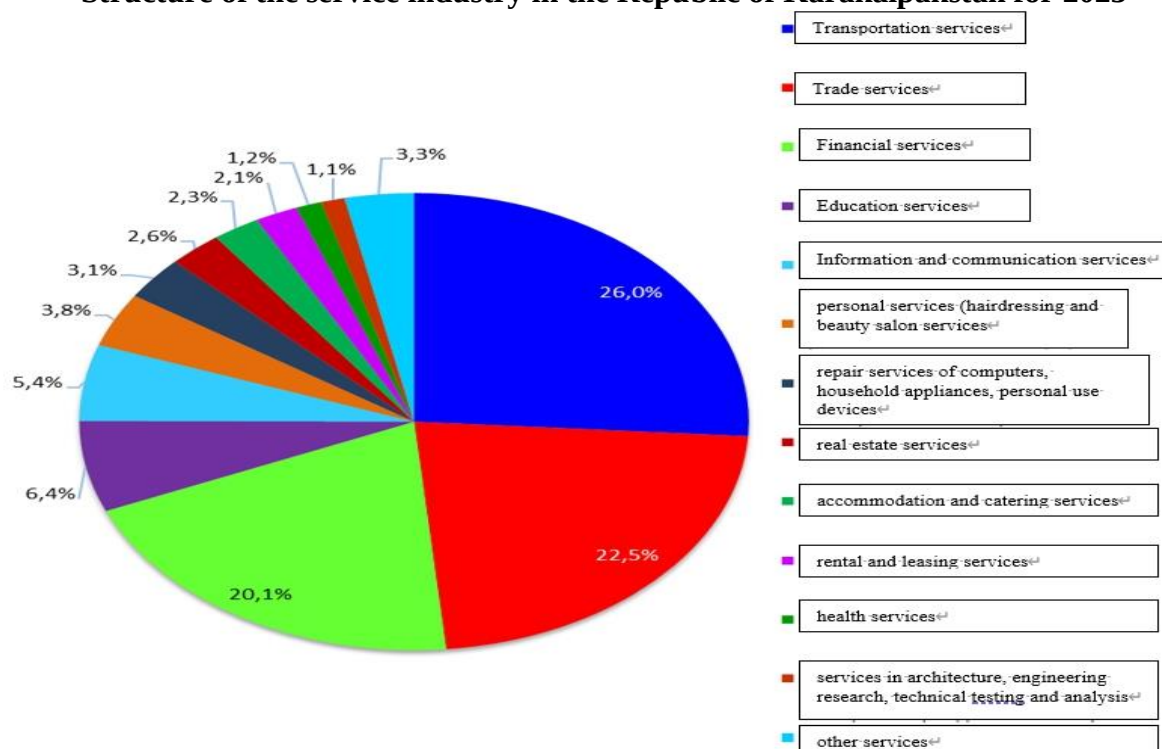
When we analyzed the composition of the service sector in the Republic of Karakalpakstan, it was determined that the region mainly consists of 13 types:

- information and communication services;
- financial services;
- transport services;
- accommodation and catering services;
- trade services;
- services related to real estate;
- educational services;
- healthcare services;
- rental and leasing services;
- repair services of computers, household appliances, personal items;
- personal services (hairdressing and beauty salon services);
- services in the field of architecture, engineering research, technical testing and analysis;
- other types of services.

In 2023, the largest share in the structure of the service sector was transport (26%), trade (22.5%) and financial (20.1%). 2.16 trillion in 2023. transport services, 1.87 trillion sums. trade services, 1.67 trillion sums. provided financial services worth sum[7].

Figure 2

Structure of the service industry in the Republic of Karakalpakstan for 2023

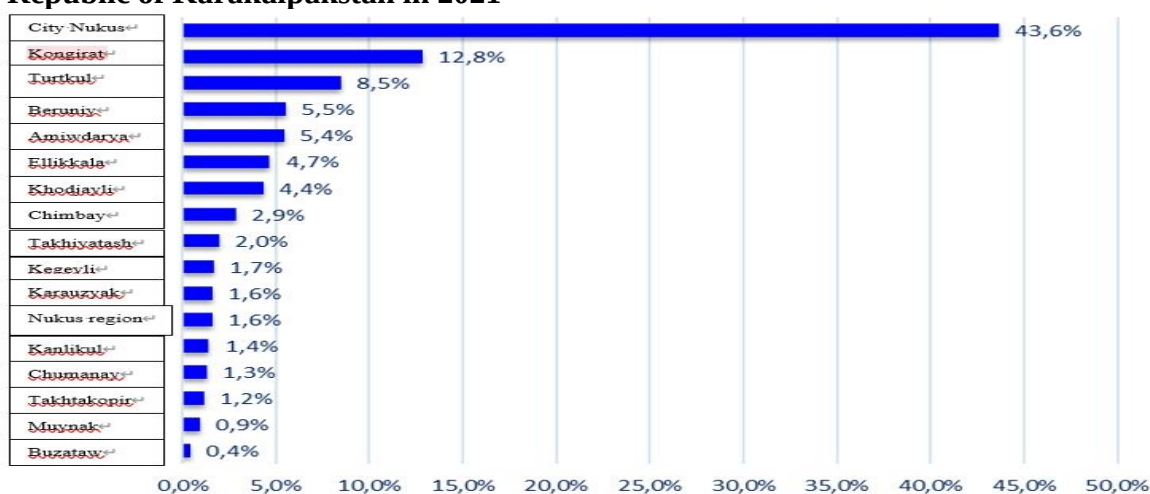


Education services (6.4%), information and communication services (5.4%) and personal services (hairdressing and beauty salon services) (3.8%) took the next place in the service sector. These types of services will cost 535.8 billion in 2023, respectively. 448.6 billion sums. sums and 317.8 billion shown in the amount of sums.

The analysis showed that in 2023, compared to 2020, there was a sharp increase in the dynamics of some types of services. Education services 36.3%, financial services 27.7%, health services 22.5%, transportation services 22.0%, real estate services 20.9%, computers, home appliances, personal goods repair services 19.2% , personal services (hairdressing and beauty salon services) increased by 15.3%. In turn, architecture, engineering research, technical testing and analysis services, as well as accommodation and catering services decreased by 1.6% and 1.2%, respectively.

Figure 3

The share of the city of Nukus and districts in the total volume of services provided in the Republic of Karakalpakstan in 2021



Also, the analysis showed that 43.6% of the volume of services provided in 2023 was contributed by the city of Nukus. Kungirat (12.8%), Tortkol (8.5%), Beruniy (5.5%), Amudaryo

(5.4%) and Ellikkala (4.7%) are the next places with the largest shares in the total volume of services provided in the region. contributed to the districts.

At the same time, Takhtakopir (1.2%), Moynaq (0.9%) and Bozatov (0.4%) districts have a very small share in the total volume of services provided in the region. Nevertheless, it is precisely in these districts that the service sector has grown rapidly. For example, in 2023, the growth rates in Takhtakopir, Moynaq and Bozatov districts compared to 2022 were 123.5%, 121.1% and 129.5%, respectively [6].

Conclusions and recommendations. By 2030, the volume of services will be approximately 12445.1 billion. it is expected to reach soums (113.6%). The main tasks of the development of the service sector are as follows:

- increasing the volume and quality of services and attracting the population by providing loans for the development of the trade and service sector and carrying out explanatory work on the specified tax benefits;
- establishment of "Resident Service Centers" in order to provide convenience and quality service to residents and tourists;
- improving the quality of transport services, introducing an automated system of fare payment;
- to increase the number of base stations of digital telecommunication and mobile operators in the field of communication and information, to develop by increasing the size of facilities providing postal services for electronic money transfer;
- establishment of a comprehensive information system on tourism and hotel infrastructure.

The development of the service sector is important for ensuring high economic growth rates. In particular, by ensuring the full implementation of all the target indicators set within the framework of the service and service sector development program in each service sector and in each district, by developing modern and popular types of services, by widely attracting investments in the sector, the share of the service sector in the gross regional product by 2030 will be 47.3 percent is set.

In general when we come to conclusions on the development of the service sector in the Republic of Karakalpakstan, based on the specific characteristics of the region, in the development of the priority directions of the service sector, the development of specific business maps for each region of the region (for example, southern, central) and coordination of their implementation to increase the efficiency of the system, to enter the local services market as the main strategic direction of the service sector in the region and to maintain a strong position in the market, and then to enter the international markets, to inculcate the characteristics of the national identity in the service sector, to use foreign experiences in the organization and conduct of service activities should be achieved by using the closest elements.

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Rezyume: Maqolada mintaqani ijtimoiy-iqtisodiy tomondan kompleks rivojlanish yo'nalishlari va Qoraqalpog'iston Respublikasining iqtisodiyotida, yalpi hududiy mahsulotida xizmat ko'rsatishning o'rni tahlil qilingan va rivojlantirish yo'nalishlari tavsiya qiligan.

Резюме: В статье рассматривается направления социально-экономического комплексного развития региона и роль сферы услуг валовом региональном продукте Республики Каракалпакстан.

Kalit so'zlar: ijtimoiy-iqtisodiy o'sish, xizmat ko'rsatish soxalari, axborot-kommunikatsiya xizmatlari, moliyaviy xizmatlar, transport xizmatlari, turar joy va ovqatlanish xizmatlari, savdo xizmatlari, ko'chmas mulk bilan bog'liq xizmatlar, ta'lim xizmatlari, sog'liqni saqlash xizmatlari, ijara va lizing xizmatlari.

Ключевые слова: социально-экономический рост, услуги, услуги информатизаций связи, финансовые услуги, транспортные услуги, услуги жилья и общественного питания, услуги торговли, услуги недвижимости, услуги образования, услуги здравоохранения, услуги аренды и лизинга.

JADIDISM IN CENTRAL ASIA: A SOCIAL AND PHILOSOPHICAL ANALYSIS

Qosnazarova P.Q.

Nukus State Pedagogical Institute named after Ajiniyaz

Summary: . *The article will talk about such issues as the emergence of the jadidism movement in Central Asia at the end of the 19th and beginning of the 20th centuries, the manifestations of the jadidism movement, the ideology of the Renaissance, the originators of the jadidism movement, the renaissance in literature.*

Key words: *jadid movement, jaded method, jadid schools, October coup, revolution, European technique, flag of criticism.*

At the end of the 19th century and the beginning of the 20th century, like in other regions, individuals with progressive and innovative ideas emerged in Central Asia. In the second half of the 19th century, the socio-economic system in Central Asia was backward, the living standards of citizens were extremely low, and the influence of Islamic leaders was strong in the cultural and spiritual life. While there was a growing desire to revive the traditions of Sufi philosophy, opposing forces and conflicts began to emerge.

The leaders of the Jadidism movement in Turkestan included Mahmudxo'ja Behbudiy, Abduqodir Shukuriy (Shakuriy), Ajziy (from Samarkand), Munavvarqori Abdurashidxonov, Abdulla Avloniy, Majid Qori Qodiriy, Ubaydullaxo'ja Asadullaxo'jayev (Ubaydulla Xo'jayev), Toshpo'latbek Norbo'tabekov (from Tashkent), Fitrat, Fayzulla Xo'jayev, Usmonxo'ja Po'latxo'jayev, Abdulvohid Burhonov, Sadridin Ayniy, Abdulqodir Muhiddinov (from Bukhara), Obidjon Mahmudov, Hamza, Cho'lpon, Is'hoqxon Ibrat, Muhammadsharif So'fizoda (from the Fergana Valley), Boltihoji Sultonov, Rahmonberdi Madazimov, Fozilbek Qosimbekov (from the Osh district), Polvonniyoz hoji Yusupov, and Boboouxun Salimov (from Khorezm).

The Russo-Japanese War of 1904-1905, the First Russian Revolution of 1905-1907, the Iranian Revolution of 1905-1911, and the Young Turks Revolution in Turkey in 1908 had a strong impact on the worldview of the Jadids. They gathered around newspapers, journals, new-method schools, various libraries, reading rooms, and amateur theater groups. Many of them were prominent creators, poets, and writers of that era.

With their works, they created a new national literature. The literature resonated with the events of the time. As early as the 1910s, the ideas of enlightenment and freedom became central themes. Concepts of "nation" and "homeland" entered the literature, and national poetry gained popularity. Modern epic poetry emerged, journalism (such as by Behbudiy, Fitrat, Munavvarqori, Mirmuhsin) flourished, and realistic prose developed.

Thus, the literature of this period, after Uzbekistan's independence, was classified as the literature of the national awakening. This literary revival also extended to cultural life at the time. The Jadids introduced a true national theater into the life of the Uzbek people. With the emergence of the national printing press, book printing began. The Jadids, who became familiar with European polyphonic music, also called for the reform of traditional Uzbek music styles.

In 1919, in the Old City part of Tashkent (in the building near the present "Turon" Library), the Jadids initiated the creation of the national section of the Turkestan People's Conservatory. In this way, the Jadids sought to elevate all forms of art and uplift the nation's cultural identity. Many sections of the special "Republic of Uzbekistan" volume—literature, theater, and music—reflect the influence of Jadidism.

The Jadids prioritized teaching both religious and secular subjects to the youth. They reformed the curriculum and teaching methods of Muslim schools and established new-method schools. Behbudiy, Munavvarqori, Abdulvohid Burhonov, Abdulla Avloniy, and others wrote and published textbooks for these new-method schools.

Additionally, the Jadids focused on developing the press, aiming to highlight the shortcomings of the existing political system and society.

In 1909, Tashkent's young intellectuals established the "Charity Society," which aimed to prepare specialists for government positions, industry, and commerce, and to provide cultural and spiritual support to impoverished Muslims. These efforts sought to prevent the nation's cultural assimilation into other peoples.

The publications of the Jadids familiarized the people with the beginning of a new era, encouraging self-awareness and unity. They exposed the exploitation of the region's material and spiritual wealth. At the heart of the Jadid movement, poet Cho'lpon, in his poems and articles, unmasked the true face of the colonizers.

The continuation of the movement contributed to the formation of progressive-minded individuals in society. However, writers were forced into artificial molds to create a "national in form, socialist in content" proletarian literature.

In his 1923 work "Literature and Revolution," L. Trotsky wrote that "proletarian culture has never existed and never will." This idea challenges the notion of distinct literature for peasants and intellectuals. Cho'lpon's works, of course, were not considered proletarian literature. He was subjected to severe political persecution by the authorities, who labeled him a nationalist poet and critic.

By 1937, Cho'lpon was declared an "enemy of the people." The political system did not forget or forgive his friendship with Ahmad Zakiy Validiy, his support for Bashkir national independence, his active participation in the Turkestan autonomy movement, or his openly expressed political views. His "crime" may have been that he was the most famous and internationally recognized Uzbek poet, whose popularity among the people, especially the youth, could not be diminished.

The greatness of a person always transcends their time. Such individuals are either elevated or physically eliminated. However, Abdulhamid Cho'lpon's memory could not be erased, as his poems, ideas, and love for his people remain alive.

The loss of many enlightened individuals was a significant tragedy for the Uzbek people. Through his works, Cho'lpon inspired society to pursue freedom and to follow its intellectual path. Even when he couldn't publish his poems in his homeland, as illustrated by his poem "Leaves":

"The crows cawing in the gardens,
I do not know whose fate is broken.
They grasped at the leaf,
I do not know whose hope is gone.
Oh, you who come dressed in frost from cold lands,
May your harsh voices fade in the snow!
Oh, you who have plucked the fruit from my garden,
May your dark heads be buried in the earth!"

"In this poem, a deep pity for the people and boundless hatred toward enemies are clearly felt. The poet devoted his entire life to his homeland and people.

We are confident that many young people like Cho'lpon can be found among the current youth of Uzbekistan. The efforts of the Jadids did not go in vain. Nowadays, many works have been carried out in their memory, their books have been published, and a Jadid garden has been established in addition to this.

Mahmudkhoja Behbudiy (1874-1919), an enlightened man, literary scholar, playwright, philosopher, politician, and theorist of cultural studies, was one of the prominent leaders and theorists of the Jadid movement. 'None of the Turkestan Jadids of that era could match him in terms of political and social activity or the breadth and depth of knowledge,' wrote F. Khojaev.

The elderly orientalist L. Azizzoda, as early as 1926, placed him among the greatest humanists and thinkers of the East, stating: 'If we are to immortalize a third person in science and culture after Ulugbek and Navoi in Uzbekistan, it should undoubtedly be a monument to Behbudiy.'

M. Behbudiy was not only knowledgeable in Islamic traditions but also frequently referenced the works of O. Kant in his writings and was seriously interested in the new currents of European philosophy, such as positivism, neo-Kantianism, neo-Hegelianism, and Machism.

All of Behbudiy's works, from the issue of education to the topic of independence, were dedicated to important problems determining the fate of Turkestan. His thoughts can be viewed as a coherent theoretical concept for the development of society and the country. Of course, he did not limit himself to mere theory, but also developed practical methods for implementing new ideas into life.

In the traditional education system focused on Islamic knowledge, M. Behbudiy strongly demanded that the curriculum also include the wide range of natural and social sciences, which he united under the concept of 'intellectual sciences.' In doing so, he sought to revive the tradition of rationalism. The thinker particularly emphasized the need to study history and geography.

In his view, history explains everything, including the development and decline of states, the level of people's faith, the roots of the Muslim crisis, and the reasons for the misinterpretation of the sacred foundations of Islam. Without studying history, it is impossible to fully master any science.

In the article 'History and Geography,' published in the journal 'Oyna' (which he founded), M. Behbudiy wrote: 'In order to have faith in life and to become a perfect and just person, one must study and know history.' He continues: 'Anyone who wants to gain knowledge about divine and worldly life must study history because the origin and essence of all existence are understood through history.'

Behbudiy linked the progress of his people not only to education but also to independence, with fundamental changes in their political status. Through his numerous articles and passionate activities, he exposed the colonial policies of the Russian Empire and the Provisional Government, criticizing their laws, which worsened the condition of the local population. However, according to Behbudiy's firm belief, independence cannot be achieved without a struggle. 'One must know,' he wrote, 'that rights are taken, not given. Every nation and people gain their religious and political rights through struggle.'

However, Behbudiy advocated a bloodless struggle against colonialism. He closely followed the activities of the Duma and believed that much could be achieved through parliamentary struggle. As a staunch supporter of Turkestan autonomy, he favored evolutionary (gradual) forms of progress.

In Behbudiy's vision, the political structure of Turkestan would include elected state bodies (Center and Majlis), the abolition of the judicial system of qadis (Islamic judges) and its replacement with state courts, appeal commissions, and a Supreme Court chamber.

The range of issues raised by M. Behbudiy was extremely broad. They included education, political problems, spirituality and morality, issues of marriage and sexual education, historical and geographical topics, language policy, ethnography, and more.

The main outcome of Behbudiy's activity was undoubtedly the journal 'Oyna,' which he founded in 1913 and quickly became popular, serving as the voice of the Jadids. The journal covered new processes in cultural and social life, as well as topics on cinema, theater, new libraries, and reading rooms. Scientific articles on social order took a central place. A great deal of attention was also paid to life in foreign countries, from Japan to America.

Thus, issues of spirituality and morality were central to the Jadids. In addition to raising these issues, they themselves embodied a 'new Muslim morality,' which absorbed elements of world experience.

In the Soviet period, starting from the second half of the 1920s, the ideology of the Jadid movement came under ideological criticism. Fayzulla Khojaev, one of the leaders of the Jadid movement in Bukhara, and later the first chairman of the government of the Uzbek SSR (1924-1937), shed light on the history of this movement as a direct participant, giving it a fair assessment. However, for his research 'Materials on the History of the Bukhara Revolution,' he was accused at a party congress in 1927 of 'idealizing the Jadid movement.'

His following words, in particular, were unforgivable to the Communist Party leadership: 'We are grateful to the Jadids for producing cadres capable of leading the national-revolutionary movement in Central Asia.'

Jadidism was declared to be a reactionary bourgeois-nationalist movement, allegedly aimed at 'poisoning the minds of the masses with nationalist ideas and diverting them from revolutionary struggle,' and the Jadids themselves were repressed and destroyed. Bolsheviks eradicated the Jadid movement because their concept of national-state construction and the idea of leading society out of the colonial dead-end posed a serious alternative and a threat to the authoritarian Soviet regime."

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Rezyume: Maqolada XIX asrning oxiri va XX asrning boshida Markaziy Osiyoda jadidlik harakatining vujudga kelishi, jadidchilik harakati namoyandalari, uyg'onish mafkurasi, jadidchilik harakatini vujudga keltiruvchilar, adabiyotdagi uyg'onish kabi masalalar haqida so'z etiladi.

Резюме: . В статье рассматриваются такие вопросы, как возникновение джадидистского движения в Центральной Азии в конце XIX-начале XX века, представители джадидистского движения, идеология возрождения, создатели джадидистского движения, Возрождение в литературе.

Kalit so'zlar: jadidchilik harakati, uyg'onish mafkurasi, jamiyati xayriya, xalq dushmani, ilm-fan, adabiyot, proletar madaniyat, mistik madaniyat, aqilli ilmlar.

Ключевые слова: движение джадидизма, идеология возрождения, общество филантропия, враг народа, наука, литература, пролетарская культура, мистическая культура, разумные науки.

PRINCIPLES OF DESIGN-THINKING DEVELOPMENT IN FUTURE PRIMARY CLASS TEACHERS

Mamadaminova M.M.

Uzbekistan-Finland Pedagogical Institute

Summary: *This article describes the role and essence of the formation of design professional activity in students. According to him, the educational environment, pedagogical conditions, education and upbringing process should fully realize the student's personal potential, develop his abilities, ensure his maturity as a person, enrich his thinking and worldview, design thinking. theoretical aspects of development are described.*

Key words: *education, teacher design, personality, thinking, motivation, pedagogy, method, development, principle, method.*

To increase the quality level of personnel training in Uzbekistan, to create the necessary conditions for the training of highly qualified specialists based on international standards, to establish close cooperation relations of each higher education institution with the leading scientific educational institutions of the world, to introduce advanced pedagogical technologies and educational programs based on international educational standards into the educational process and materials, effective use of interactive methods in the development of modern professional knowledge and creative abilities of students, scientific pedagogues, and thinking levels is one of the urgent issues.

In modern conditions, it is demanded that the educational process should be directed to the development of the individual, socialization and education of independent, critical, creative thinking abilities. In the conditions of globalization, education plays an important role in the development of a person in all aspects, in the formation of perfection and the qualities characteristic of a qualified specialist. Today's fast-paced era requires the creation of necessary conditions for students to be armed with reasonable information in a short period of time, and for their thorough mastering of the basics of various subjects. In the educational process, it implies the development of the teaching environment based on values, adaptation to the student's capabilities. According to him, the educational environment, pedagogical conditions, education and upbringing process fully realize the student's personal potential, develop his abilities, ensure that he matures as a person, and enrich his thinking and worldview. This type of education serves to educate students in qualities such as independence, initiative, responsibility, as well as independent, creative and critical thinking skills. In the organization of this type of education, pedagogues are required to approach each student as individually as possible, to respect his personality, to show confidence in him. [1].

As mentioned in our topic, the choice based on the student's personality and the student's inclination towards different areas of design activity, the specific type of designer's activity (artistic creativity, design, research activity, etc.), the ability to accept it, is very important. In other words, we can see that the designer shapes and develops himself as a person during his work, when the information is given by us, that is, by the pedagogue as a tool to the learner as a tool.

Design-thinking is an innovative problem-solving process based on a set of skills. This approach has been around for decades, but it only began to gain traction outside the design community after a 2008 Harvard Business Review article titled "Design Thinking" by Tim Brown, CEO and president of design firm IDEO. At a high level, the steps involved in the design thinking process are simple: first, fully understand the problem; second, to explore a wide range of possible solutions; third, extensive iteration through prototyping and testing; and finally through the usual deployment mechanisms. [2].

The skills associated with these steps help people creatively solve real-life problems better than they could. They can be easily learned, but make an effort. For example, when trying to understand a problem, it's important to set aside your own assumptions. This method, once learned, can be applied even to the problems of everyday life.

Today, innovation is considered as important for school management as in all fields. This is why we need design thinking. Design thinking (eng. design thinking) is a method of developing decisions, products and services aimed at solving existing problems of people (consumers, users, clients). This human-centered approach to problem solving begins with understanding people and ends with innovative solutions tailored to their individual needs. [3; 123].

Design thinking can be implemented by:

- organizational design - reconstruction of roles in the organization and the organization itself;
- achieving simpler and more efficient organization of work by employees through design thinking;
- to develop the ability to conduct quantitative and qualitative analysis of information when making management decisions;
- generating ideas, sorting and comparing them when developing decision options;
- ability to build economic, financial and organizational-management models and adapt them to specific management tasks;
- development of new digital tools to facilitate and improve work in digital management, where design thinking is crucial, etc. [3; 123].

Most people have a linear mindset: identifying a problem, looking for solutions, and finding the best one among them. Managers who think like a designer do not make this mistake and put themselves in the shoes of the customer: one of the main aspects of design thinking is its human orientation.

In conclusion, it should be noted that the development of methods and tools aimed at the active mastery of the student on the basis of relevant values has a great impact on the development of the designer's professional activity. In this regard, it should be noted that it is necessary and necessary to dwell on the role of human psychology in the educational process. The reason is that based on the human temperament, it is the responsibility of the pedagogue to motivate the student to learn, develop, complete the assignments on time, and learn based on the relevant rules. The reason is that in the process of forming a person, the pedagogue must convey emotions that encourage him to form his own internal drivers (motives), to contribute to the value directions of the person.

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Rezyume: Mazkur maqolada talabalarda dizaynerlik kasbiy faoliyatini shakllantirishning o'rni va mohiyati bayon etilgan. Unga ko'ra ta'lim muhiti, pedagogik shart-sharoitlar, ta'lim hamda tarbiya jarayonini to'raligicha talabaning shaxsiy imkoniyatlarini ro'yobga chiqarish, qobiliyatini rivojlantirish, shaxs sifatida kamolotga yetishini ta'minlash, tafakkuri va dunyoqarashini boyitishni, dizayn-tafakkurini rivojlantirishning nazariy jihatlarini bayon etilgan.

Резюме: В данной статье описывается роль и сущность формирования профессиональной деятельности дизайнера среди студентов. По его мнению, образовательная среда, педагогические условия, образовательно-воспитательный процесс должны в полной мере реализовать личностный потенциал ученика, развивать его способности, обеспечивать его зрелость как личности, обогащать его мышление и мировоззрение, проектировать теоретические аспекты развития мышления.

Kalit so'zlar: ta'lim, o'qituvchi dizayn, shaxs, tafakkur, motivatsiya, pedagogika, metod, rivojlanish, tamoyil, usul.

Ключевые слова: образование, педагогический дизайн, личность, мышление, мотивация, педагогика, метод, развитие, принцип, метод.

**PROSPECTS OF USING INNOVATIVE TECHNOLOGIES IN FORMING
PROFESSIONAL COMPETENCE OF TEACHERS**

Rakhmonov B.

*Samarkand branch of the Institute of retraining and professional development of specialists in
physical education and sports*

Summary: *This article is devoted to the topic of formation of professional competences of pedagogues, information about competence, types of competence, approach to competence, basic competence is presented. Also, it is logically proven that the formation of all-round competence in the activity of a pedagogue is the main condition of modern society and education.*

Key words: *competence, types of competence, competence approach, basic competence, basic competence.*

Each country focused on scientific research, modern changes, and creation of national innovations on the basis of world-experienced innovative technologies in defining its own development path. Bringing the ideas and visions of each individual to a new level on the basis of innovative technologies in society, especially relying on the spirituality of our people to achieve the effectiveness of education, will give positive results. New ideas are gaining strength in the world day by day, changing the national thinking of every citizen in the society, the attention and value of education is rising to a higher level. This is important in the development of society to develop the system based on philosophical thinking.

Funds allocated for innovative technologies in our country are large, and it is desirable that these expenses are targeted by the level of knowledge acquired by young people, and that there are thousands of intellectuals who serve to determine their future.

At this point, the formation of professional competence of pedagogues is considered one of the most urgent issues today.

Recently, special attention has been paid to concepts such as "competence", "competence approach".

In the national encyclopedia of Uzbekistan, the word "competence" is defined as follows.

Competence (Latin: *cometo* - I am achieving, I am worthy, I am worthy) - 1) the range of powers, rights and duties of a specific state body (local self-government body) or official defined by law, charter or other document;

2) knowledge, experience in this or that field. [1].

According to scientific sources, competence is the result of mastering the appropriate competence of the student, which includes his personal attitude to the subject of activity. Therefore, competence in a specific field of education is a combination of relevant knowledge, skills and abilities, abilities and experiences that allow to effectively identify and solve problems specific to a specific field of activity [2]. Competency-based approach focuses on the outcome of education, and education as an outcome is not a set of acquired information, but a person's ability to act in various situations.

In our country, it is desirable to use a number of tasks in order to further enrich the innovative infrastructure, to raise the intellectual potential to a higher level, and to implement the field on a large scale.

- First, it is desirable to produce programs that provide modern knowledge based on updating educational standards for teaching each field and to effectively use the achievements of the latest innovative educational technologies.

-Secondly, it is necessary to strengthen the activity of young people in society by creating national and international systems aimed at the future of all changes in education, and to increase the number of reforms aimed at their penetration into the system.

-Thirdly, it is necessary to form a system of training junior specialists aimed at providing employment to school graduates.

-Fourthly, it is necessary to enrich education based on innovative technologies and develop the national education system based on foreign experiences.

In the effective use of innovative technologies, every teacher should first of all be an expert in his field and possess scientific knowledge. "It is important that people implement various technological, innovative projects and discoveries, thereby helping our country to take its place in the world political and economic processes." It is permissible for us to revive the desire for the latest educational achievements in the minds of the young generation, to use innovative technologies in our national policy for noble purposes. A new philosophical approach to the issue of modern personnel training at all levels of education and, on this basis, the training of specialists capable of creating new ideas and technologies from young people is showing its relevance. All of us should know that the true nature of these created opportunities is a parallel process with the fate of young people, and the depth of scientific potential.

Today, new ideas, fundamental scientific developments, innovations under the national brand, intellectual opportunities created at all levels of the education system are aimed at serving the future of young people. Our young people who are getting an education should use them effectively and contribute to the acceleration of reforms in society [3].

Innovative methods of increasing economic activity among young people have come to Uzbekistan based on its social development. Also, based on the factor of mentality, the implementation of a sustainable education policy regarding the formation of innovative activity is visible to everyone.

In accordance with the Decision of the head of our state on May 7, 2018 "On additional measures to improve the mechanisms of introducing innovations into economic sectors and industries", the processes of strengthening the activities of innovation funds and increasing various scientific developments and startups in society are being approached based on the structure of higher education institutions.

In the conditions of the new Uzbekistan, the following goals are set for the commercialization units of scientific and innovative developments:

- systematic analysis of the market and study of demand for innovative products (work, service), assessment of payback period, profitability and risks associated with commercialization of innovative products;
- selection of promising projects for development, which have high commercial potential and are ready for implementation;
- attraction of investors, partners and other interested parties for implementation of innovative projects;
- mutual cooperation with industrial enterprises in order to introduce new technologies and produce innovative products.

We need to provide a stable economy in the society, educate young people with innovative thinking who will brighten the future of the new Uzbekistan based on it, and raise attention to education, which is a guarantee of well-being in their minds, to a high level. Changes in education are mainly effective in the use of methods in the form of innovative technologies. That is why we all need to look at education at the level of individual state policy and contribute to its development.

Researchers who have conducted research on the above issue "propose that these technologies can be evaluated based on the formation of the following competencies in the student by using innovative methods in the educational process".

1. Operational competence - the student can work independently with information. He can effectively use the interactive possibilities of computer technology, and the student's activity increases and motivation is formed.

2. Cognitive competence forms knowledge, organizes and systematizes knowledge. The ability to independently analyze the student's work is formed.

3. Communicative competence forms the competence of communication.

4. Self-improvement competence. Through independent work, it is important for the student to be able to analyze not only the material he studies, but also to analyze his own behavior related to this process.

Thus, innovative educational technologies in education are based on modern achievements of science and information technology. They will be aimed at increasing the student's creative ability and independent learning.

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Rezyume: Ushbu maqola pedagoglarning kasbiy kompetensiyalarni shakllantirish mavzusiga bag'ishlanib, kompetensiya, kompetensiya turlari, kompetensiyaviy yondashuv, tayanch kompetensiya haqidagi ma'lumotlar bayon etilgan. Shuningdek, pedagog faoliyatida har tomonlama kompetentlikni shakllantirish hozirgi zamon jamiyati va ta'limining asosiy sharti ekanligi masalasi mantiqan dalillangan.

Резюме: Данная статья посвящена теме формирования профессиональных компетенций педагогов, представлены сведения о компетентности, видах компетентности, подходе к компетентности, базовой компетентности. Также логически доказано, что формирование всесторонней компетентности в деятельности педагога является главным условием современного общества и образования.

Kalit so'zlar: kompetensiya, kompetensiya turlari, kompetensiyaviy yondashuv, asosiy kompetensiya, tayanch kompetensiya.

Ключевые слова: компетентность, виды компетентности, компетентностный подход, базовая компетентность, базовая компетентность.

UDK: 651.15

THE WAYS TO INCREASE ECONOMIC EFFICIENCY OF MILK PRODUCTION IN THE REGION.

Sherbekova A.R.

Institute of Agriculture and Agrotechnologies of Karakalpakstan

Summary: *This article gives the concept of economic efficiency, ways to increase economic efficiency of milk production.*

Key words: *efficiency, economic efficiency, ways increasing economic efficiency, dairy farming.*

Dairy farming is one of the most important livestock industries and the main activity most agricultural organizations of the Republic of Belarus. Dairy farming is a source of such valuable food products such as milk, meat, as well as a source of raw materials for industry. At the present stage of development of the country's economy, increasing the efficiency of the dairy cattle breeding industry is one of the pressing problems, the successful solution of which opens up new opportunities to accelerate the pace of its development, increasing the competitiveness of milk in the food industry market and reliable supply of products to the republic [1].

Milk is a complete and high-calorie food product; in terms of its chemical composition and nutritional properties, it has no analogues among other types of natural food, since it contains the most complete proteins, milk fat, milk sugar, and also a variety of minerals, vitamins, large the amount of enzymes and other biological compounds that are easily digested and well absorbed by the body.

Economic efficiency is a complex indicator that contains many economic laws; its main criterion is effectiveness. Efficiency is a good indicator of development, as it shows in which direction the further strategy of action should be taken.

The dairy industry is one of the most important sectors of livestock farming. This industry not only provides the population with valuable food products, such as cottage cheese, sour cream, cheese, milk, but is also a supplier of raw materials for many areas of light industry [2].

Since dairy farming is one of the main branches of agriculture, it largely determines the level of progress in this area as a whole.

In order for progress to continue, it is necessary to constantly improve production efficiency. The highest level of efficiency can be called the state of the industry in which the needs of all consumers are fully satisfied. That is, in essence, efficiency is the result of the correct use of labor tools. In this case, the greatest efficiency of the industry is achieved by providing consumers with a product with low labor costs [3].

For additional convenience, the initial indicators are converted into cost indicators. Since dairy products are a commodity, cost indicators have economic significance and the price of goods depends on them.

Increasing the economic efficiency of milk production

You can increase the level of economic efficiency by implementing the following activities:

- Increased growth of gross output.
- Reduced production and maintenance costs.
- Setting up product distribution systems, increasing the number of sales channels.

It is worth remembering that it is agriculture that provides the population with food products, and provides the necessary raw materials for industry. Therefore, increasing economic efficiency is an important and responsible task.

First, it is necessary to identify indicators and types of efficiency in milk production in the economy. They are:

- Quantity of products produced in relation to labor costs.
- Animal productivity.
- Feed costs for milk production.
- Profitability of the production process.
- Amount of profit per unit of cost.
- Labor intensity of the process.
- Profit and cost.
- Payback period of investments.

These are the main indicators that you should rely on when increasing efficiency. To calculate cost indicators based on the basic ones, you should calculate gross, net income and total profit. When increasing the efficiency of milk production, its types and indicators are taken into account. The main emphasis is on reducing labor costs and capital investments, rational use of products and improving their quality. These are the main sources that will help increase the production and turnover of dairy products [4].

Directions in which to move to improve production performance include improving and updating the technical scientific base, improving the production process, automating systems and improving work performance. Attention should also be paid to accelerating the production process, which can be achieved by replacing equipment with new ones, using the latest production technologies that will produce higher quality dairy products, as well as improving the management strategy for all processes.

Increased efficiency is also influenced by external factors, such as government support and funding. If you comply with the stated norms and rules, you can significantly improve the quality of dairy products and achieve the development of this sector of agriculture, since the industry is one of the key ones - it is necessary to develop it, this will have an impact on many other production areas.

To increase the economic efficiency of production milk the organization offers:

- increase the efficiency of use of financial resources;
- ensure the increase and replacement of existing livestock cows considering breed in order to increase productivity.
- make maximum use of existing reserves on the farm.
- strengthen your own food supply, since food takes up formation of product costs is one of the main places.
- ensure strict adherence to the technology of procurement and storage of feed, a complete balance of the diet to expand the area of leguminous crops.
- tighten the requirements when selecting first-calf heifers for the main herd, strive to obtain offspring of the same type, of a high-level productivity.
- ensure the selection of highly qualified personnel, improve incentives for workers, ensure regular vocational training for all livestock workers and farming specialists.
- carry out product quality management according to a clearly developed plan.

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Rezyume: Ushbu maqolada iqtisodiy samaradorlik tushunchasi, sut ishlab chiqarishning iqtisodiy samaradorligini oshirish yo'llari keltirilgan.

Резюме: В данной статье дано понятие экономической эффективности, пути повышения экономической эффективности производства молока.

Kalit so'zlar: samaradorlik, iqtisodiy samaradorlik, iqtisodiy samaradorlikni oshirish yo'llari, sut chorvachiligi.

Ключевые слова: эффективность, экономическая эффективность, пути повышения экономической эффективности, молочное животноводство.

THE ROLE OF MORAL VALUES IN THE DEVELOPMENT OF TEENAGE CULTURE

Umidullayeva M.U.
Karshi State University

Summary: *The article examines the unique philosophical aspects of the family, which is considered the sacred place of the Uzbek people today, and views related to the culture of family behavior in it as an object of philosophical research. In it, the processes of developing moral values in the upbringing of children in the family are expressed in harmony with the control of parents, the neighborhood, and the public, and the issues of educating each member of the family according to national values are revealed.*

Key words: *family, youth, society, Uzbek family, child, moral values, spirituality, worldview, culture of behavior, parents, peace*

The world of philosophical thinking formed by the process of social development of each nation manifests its identity through its own family behavior culture. Communication plays a key role in the successful implementation of such strong relationships in the family. The family culture of the Uzbek people, which has developed over the centuries in accordance with Uzbekism, is still distinguished by its generosity. Every moral value in it is manifested on the basis of the reality corresponding to the national mentality on the basis of the culture of behavior, which is of special importance in the education of children. It is important to harmonize his image with the brotherly peoples. "Establishing a space for permanent communication between the youth of Central Asia, preserving the high moral values and incomparable spiritual heritage of the brotherly peoples, enriching them further and helping to pass them on to future generations"[1]. We need to instill in the minds of the young generation that the family outlook of the inhabitants of this region is close to each other, and the culture of behavior is also harmonious. Each family in the society forms its own family needs based on its own way of life and internal secrets. This, in turn, is based on the family values of the child's views on the family and his desire to learn. In the same way, it is important to improve cooperation between educational institutions in sharing information about families and children and their development. Elucidation of the appropriate methods of information exchange from the family, as well as the methods and possibilities of caregiving remains relevant [2].

In the process of globalization of family relations, issues of educating the young generation on the basis of moral values are becoming more and more important. It should not be forgotten that there is a small innovation, which seems insignificant at first glance, but is directed against human spirituality, that forgetting values, even if it seems invisible, can cause a lot of damage to society in the future. It cannot be covered with anything. In the fight against such dangers, we must always be alert, sensitive, and careful. We can respond to this with deeply thought-out, scientifically established, permanent and continuous moral values [3].

The culture of behavior, which is the basis of national values, means the beauty of human behavior, generosity, nobility, loyalty to promises, imagination, learning, wisdom, tolerance, decency, neatness and purity, innocence of the heart, politeness and this is how human qualities are understood. While parents communicate directly and indirectly with their children and nurture them meaningfully, first of all, they should be role models in the process of interaction and try to improve their speaking ability by listening more to their children and then it is very important that they explain their thoughts by using proverbs, proverbs, and real life examples. A person's purest feelings, first life concepts and imaginations are formed primarily in the family through the love, sweet words, and culture of behavior of parents. The spiritual criteria and views that determine the child's character, nature and worldview - the foundations of sacred concepts such as goodness, nobility, kindness and honor - are settled in the family environment. Therefore, raising a child physically and mentally on the basis of national values is the most important task of parents in life.

The rights of the child from the day of his birth are stated in the hadith sharif as follows: - to give a name to the baby at birth; - if possible, make aqiqah for him; - teach him manners from the moment he speaks; - teaching the basics of religion; - teaching the basics of halal and haram; - vocational training. Indeed, in the social life of the society, it is natural that the national, historical, work, moral and spiritual experiences of our great ancestors in the family life are passed on to the new generation in the form of traditions, which become a national tool for educating young people. The most valuable aspect of traditions is that moral values should serve as an important tool in preparing young people for family and social life. In society, "ethical attitudes are a component of the social environment, which serves as a foundation for young people to learn tolerance and practice it at the level of need. The development of the culture of tolerance is connected with moral relations" [4]. The harmony of tolerance with family traditions becomes more perfect and more practical if the moral values of the people, which are passed down from century to century, from ancestors to generations, are strengthened in the upbringing of young people. Because family values are valued and respected by the Uzbek people and will continue to be so. Only when family traditions are transformed into moral values through the culture of behavior, their educational value and practical importance in the formation of young people will increase. That is why moral values remain an important tool in educating young people and preparing them for family life. For example, it can be shown that hundreds of family traditions, such as hashar, greeting, hospitality, wedding, kopcari, respect for the elderly, have become the traditional and moral values of the Uzbek people.

In the family, the culture of dealing occurs during daily greetings and farewells, as well as during formal events such as family reunions. All of these opportunities require one to be tactful and aware of family characteristics, including tone, word choice, and nonverbal communication such as facial expressions and body language. When you are aware of these characteristics, you will be more supportive and respectful of the family, and will seek to know the condition of your child. An effective communication culture helps to keep the family informed, reassured and involved in all good and bad situations. All this helps to establish strong bonds between family members. A single treatment, whether positive or negative, can signal a family's need for values, so effective communication skills should be developed early in children. Positive communication skills help you share information, share joys, and build trust.

In a family-oriented culture, trust greatly helps children work as a team with the family to help them achieve their goals. Despite the fact that some families have different languages and cultural values, values cause a culture of behavior. Every family teaches their children to succeed within their own culture, beliefs and traditions. The advantages of the culture of dealing in the family are related to the priority of moral values, the common solution of obligations together.

In order for each member of the family to feel comfortable and respected, a proper culture of treatment is necessary. Establishing strong meaningful moral relationships with children in the family begins with knowing values. It is important to respectfully learn about their interests, heritage and culture, needs and hopes and dreams for their children, and use this information to improve the culture of treatment. Parents have a great role in respecting each other when communicating in the family circle, making children always treat the family in the same way, maintaining privacy in the family, and respecting the right to privacy in the family.

Careful communication in the family should help to understand the child's development when exchanging information with them. Taking into account the cultural and linguistic background of the family, it is not always good to use jargon, including terms and abbreviations that the family does not understand, when using the family language.

As children grow and approach school age, families and professionals often talk about school readiness. In the family, whether the child is ready for kindergarten or his behavior, etc., plays a key role. Often, school districts and communities develop several tests or processes to help teachers and families determine whether a child is ready for kindergarten. School readiness is not just about children and their abilities or developmental stages. Encouraging the child to go to school in the family should take advantage of the opportunities that will help all children to succeed in school. It

is necessary to be able to respond to the individual differences of children and to form appropriate assumptions about what children should do, and to distinguish moral values in the family within the society. In the family, parental responsibility supports children's learning and development at their own level and provides developmentally appropriate services that meet the needs of each child.

Oriental values are of particular importance in raising children's various abilities, cultural origins, and various personal experiences in the family. "It has not escaped the notice of thinkers that in the proverbs and wisdom of the peoples of the East, the role of sweetness in human life is incomparable. It is appropriate for us to continue these traditions and draw appropriate conclusions from them" [5]. Therefore, it is permissible to pay special attention to the spirituality of our ancestors when teaching children various skills.

In conclusion, it is positive that the process of developing Uzbek values in the family is being supported by our state, and its rights are expanding. When educating young people, we need to inculcate the culture of dealing with nationality in their minds, starting from the family, enriching the way of social life with moral values.

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Rezyume: Maqolada bugungi kunda o‘zbek xalqining muqaddas maskani sanalgan oilaning o‘ziga xo falsafiy jihatlarini, undagi oilaviy muomala madaniyati bilan bog‘liq qarashlar falsafiy tadqiqot ob‘ekti sifatida o‘rganilgan. Unda oilada farzandlar tarbiyasida axloqiy qadriyatlarni rivojlantirishda ota-ona, mahalla, jamoatchilik nazorati bilan uyg‘un jarayonlar ifodalanib, oilaning har bir a‘zosini milliy qadriyatlarga monand tarbiyalash masalalari ochib berilgan.

Резюме: В статье рассматриваются уникальные философские аспекты семьи, которая сегодня считается священным местом узбекского народа, и взгляды, связанные с культурой семейного поведения в ней, как объект философского исследования. В ней процессы формирования нравственных ценностей при воспитании детей в семье выражаются в гармонии с контролем родителей, соседства и общественности, а также вопросы воспитания каждого члена семьи в соответствии с национальными ценностями. раскрываются.

Kalit so‘zlar: oila, yoshlar, jamiyat, o‘zbek oilasi, farzand, axloqiy qadriyatlar, ma’naviyat, dunyoqarash, muomala madaniyati, ota-ona, tinchlik.

Ключевые слова: семья, молодежь, общество, узбекская семья, ребенок, нравственные ценности, духовность, мировоззрение, культура поведения, родители, мир.

ANALYSIS OF INDICATORS REFLECTING THE COMPETITIVENESS OF POTENTIAL OF ENTERPRISES OF SERVICE SECTOR

Asenbaeva A.E.

Karakalpak State University named after Berdakh

Summary: *In the process of assessing the competitive potential of service sector enterprises, taking into account both economic and social indicators makes it possible to take into account the competitive advantage of the enterprise. Due to the conditions of a modern innovative economy, the processes of socialization of the service production process acquire priority importance.*

Key words: *index, coefficient, economic indicators, labor productivity, fixed assets, service efficiency, competitiveness of assessment.*

At the current stage of socio-economic development in our country, the importance of service enterprises in implementing structural reforms and transformation processes, forming a competitive economy, and ensuring sustainable growth is increasing. Because the enterprises of the sector are recognized as the main business entities for achieving economic growth in the national economy due to their ability to fully satisfy the needs of consumers based on the requirements of the market situation, quickly adapt to the market (most enterprises in the sector are small enterprises) and mobility. By developing and supporting private entrepreneurship in the field, the competitive environment in the country will improve.

When assessing the competitive potential of service enterprises, taking into account its competitive advantages in the service market or the economic indicators of the enterprise does not provide an integrated assessment of competitiveness and does not allow drawing sufficient conclusions. At the same time, it is necessary to pay attention to the indicators of the social development of the enterprise only in the process of improving its organizational and economic mechanism when increasing the competitiveness potential of service enterprises. Each of the researched methods of assessing the competitiveness potential of service enterprises has its own strengths and weaknesses. Also, when assessing the competitiveness of service enterprises, we perform a comprehensive assessment of the competitiveness of enterprises based on the above social and economic indicators.

System of service enterprise competitiveness assessment indicators⁹

T/p	Indicators	Calculation algorithm	Conditional signs
I. Economic indicators of service enterprise competitiveness			
1.1.	Labor productivity index	$I_{lp} = I_t \times I_{mc}$	I_{lp} – labor productivity index; I_t – average index of production (volume services provided) at constant prices for goods; I_{lc} – labor capacity index from sales of goods.
1.2.	Product sales profitability	$R_{mt} = \frac{SF \times 100}{M}$	R_{ms} – product sales profitability; SF – net profit; M – product cost;
1.3.	Return on fixed assets	$R_{af} = \frac{SF \times 100}{AF}$	R – profitability of fixed assets; CΦ – net profit; AF – the value of fixed assets;
1.4.	Return of funds	$FQ = \frac{X_k}{AF}$	FQ – Return of funds; X_k – volume of services provided.

⁹ These indicators have been improved by the author.

1.5.	Armed with funds	$\Phi K_{\phi} = \frac{A\Phi}{H_c}$	ΦK_{ϕ} – arming with the fund; $A\Phi$ – average annual price of basic funds, thousand s.; H_c – number of workers on the average list, person.
1.6.	Absolute liquidity ratio of the enterprise	$K_{al} = \frac{PM}{JM}$	K_{al} – absolute liquidity ratio; PM – funds; JM – current liabilities;
1.7.	Return of resources	$PK = \frac{X_{u/q}}{A\Phi + AM = MXX}$	PK – Return of resources; $X_{u/q}$ – produced services in total, thousand sums. $A\Phi$ – circulating funds, thousand s.; AM – working capital, thousand s.; MXX – labor costs, thousand s.
II. Social indicators of service enterprise competitiveness			
2.1.	Average skill level of employees	$\bar{K} = \sum C_i K_i$	C_i – number of workers in the category, people; K_i – category.
2.2.	Educational level of employees in the enterprise	$\mathcal{D}_{\mathcal{M}} = \frac{C_o + C_{o'm}}{C_{io'}} \cdot 100$	C_o – Number of workers with higher education, people; $C_{o'm}$ – Number of workers with condary specialized education, people; $C_{io'}$ – average annual number of workers, person.
2.3.	Level of service culture	$XD_m = \frac{\sum_{i=1}^n B_i}{5N}$	XD_m – average level of service culture; N – number of respondents, people; B_i – i - score given by the person asked.
2.4.	A comprehensive indicator of service quality	$K_x = \sqrt[3]{K_x \cdot K_v \times XD_m}$	K_x – purchase completion ratio; K_v – the coefficient of time spent by customers for one purchase
2.5.	Team cohesion index	$J_i = \frac{T}{\frac{1}{2} N(N-1)}$	J_i – group density index; T – the number of mutually positive choices; N – the number of possible choices in a team.
2.6.	Staff retention rate	$K_m = \frac{C_{cm>5}}{C_{uy}}$	K_m – coefficient of personnel stagnation; - the average annual number of oyees with more than 5 years of seniority, people; C_{uy} – average annual number of employees, person.
2.7.	Staffing rate	$K_{\phi} = 1 - K_{\kappa}$	K_{ϕ} – coefficient of constancy; K_{κ} – staff dissatisfaction rate

It is known that service provision is an activity in which the service provider has direct contact with the consumer. This service process is provided by means of production and employees of service enterprises. Service includes the analysis of customer orders, the development of service projects, that is, the implementation of organizational and technical tasks and the service process, the

determination and provision of the necessary quality of service, and the procedures and conditions of delivery to the customer.

Currently, approaches to improving economic methods and management mechanisms are considered to be urgent, to fully satisfy the needs of consumers and to increase the welfare of the population by ensuring economic growth in the service sector, to increase the competitiveness of enterprises and to achieve a competitive advantage. Accordingly, the method of determining the competitiveness of service enterprises of our republic will consist of the following stages:

1. Determining the mission, goals and objectives of assessing the competitiveness of the enterprise.

2. Analysis of external and internal environmental factors of enterprises that shape competitiveness.

3. Assessment of the achieved level of competitiveness.

4. Formation of competitiveness specialization of the enterprise.

The calculation of the ratios of private indicators of the enterprise's competitiveness is determined by the following formula¹⁰:

$$I_{ij} = \frac{K_{ij}}{K_{\max}}, \quad (2.1)$$

here:

I_{ij} – j- the ratio of the value of the nth private indicator of competitiveness among higher education organizations, which must be evaluated for the enterprise, to the maximum value of the nth indicator.

K_{ij} – value of n-specific indicator of competitiveness for j-enterprise;

$K_{\max}$ – the maximum value of the nth indicator for service enterprises to be evaluated.

At the next stage, a comparative indicator of a certain indicator is determined. The comparative indicator of a specific indicator is calculated based on the following formula¹¹:

$$KC_j = \sum_{i=1}^m I_{ij} \times W_i, \quad (2.2)$$

here: W_i – i - the weight coefficient of the indicator.

The weighting coefficient is determined by the method of expert evaluation.

In the process of the expert method, the competitiveness indicators are evaluated by experts based on a 10-point scale.

$$V_i = \frac{\sum K_i}{\max \sum K_i} \text{ auxiliary coefficient}, \quad (2.3)$$

$$W_i = \frac{v_i}{\sum v_i} \text{ weighting coefficient}, \quad (2.4)$$

In the third stage, the summary indicator of the enterprise's competitiveness is calculated according to the following formula:

$$KC_{\text{comp}} = \frac{1}{n} \sum_{j=1}^m KC_j, \quad (3.5)$$

n – number of competitiveness indicators.

In short, to increase the competitiveness and effective development of the selected service enterprises in the region, the need for a comprehensive assessment based on specific indicators of determining the rating of the impact of individual systems of their components allows to systematize the areas of activity and determine the efficiency according to individual indicators..

¹⁰ https://research.sfu-kras.ru/sites/research.sfu-kras.ru/files/Dissertaciya_Voloshin.pdf

¹¹ <https://cyberleninka.ru/article/n/metodika-otsenki-konkurentosposobnosti-vuza-na-oligopolisticheskoy-rynke-uslug>

At the next stage, the competitiveness rating of the selected service enterprises will be developed. Effective operation of regional enterprises and ensuring competitive advantage is determined by indicators of their development efficiency. Each of them contributes to the results of the enterprise. At the same time, the indicators that provide a generalized assessment of the development of the selected service enterprises, and the description of changes in each indicator in their areas of activity also allow to draw conclusions about the strengths and weaknesses of the enterprises based on the identification of promising directions of development.

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Rezyume: *Xizmat ko'rsatish sohasi korxonalarining raqobatbardosh salohiyatini baholash jarayonida ham iqtisodiy, ham ijtimoiy ko'rsatkichlarni hisobga olish korxonaning raqobatdosh ustunligini hisobga olish imkonini beradi. Zamonaviy innovatsion iqtisodiyot sharoitlari tufayli xizmatlar ishlab chiqarish jarayonini ijtimoiylashtirish jarayonlari ustuvor ahamiyatga ega.*

Резюме: *В процессе оценки конкурентного потенциала предприятий сферы услуг учет как экономических, так и социальных показателей позволяет учитывать конкурентные преимущества предприятия. В условиях современной инновационной экономики приоритетное значение приобретают процессы социализации процесса производства услуг.*

Kalit so'zlar: *indeks, koeffitsient, iqtisodiy ko'rsatkichlar, mehnat unumdorligi, asosiy fondlar, xizmat ko'rsatish samaradorligi, baholashning raqobatbardoshligi.*

Ключевые слова: *индекс, коэффициент, экономические показатели, производительность труда, основные фонды, эффективность услуг, конкурентоспособность оценки.*

MULTIMEDIA TECHNOLOGIES IN MODERN ANIMATION

Samigova G.A.

Uzbekistan State Institute of Arts and Culture, Acting Associate Professor of the "Information Technology" Department

Summary: *This article is devoted to the review of the influence of modern multimedia technologies on the development of the animation industry. The key areas of application of these technologies are considered, such as expanding the creative capabilities of animators, increasing the efficiency of the production process, and enhancing the emotional impact on viewers. The possibilities of 3D modeling, computer graphics, motion capture algorithms and procedural animation, virtual and augmented reality technologies, as well as interactive elements are analyzed. It is noted that the use of high-quality sound design, realistic physical simulations and non-linear plot solutions contribute to the creation of more emotionally rich and exciting animated works that can inspire viewers around the world.*

Keywords: *animation, animation, multimedia technologies, 3D modeling, computer graphics, motion capture, procedural animation, virtual reality, augmented reality.*

Animation as an art form originated long before the advent of the first cinematic devices. The roots of animation can be traced back millennia to early experiments with sequential images, the illusion of movement, and optical deception. From the "living" hunters drawn on cave walls to toy zoetropes and phenakistiscopes, humanity has sought ways to convey movement and dynamism in static images for centuries.

A true breakthrough in the development of animation occurred at the end of the 19th century with the invention of cinema. The first animated films were created using traditional techniques: hand-drawn, cutout, and puppet animation. Pioneers of this genre, such as Émile Reynaud, Winsor McCay, and the Lumière brothers, manually drew and photographed each frame, creating mesmerizing moving images.

Throughout the 20th century, animation rapidly evolved, incorporating new technologies and methods. The advent of frame-by-frame shooting systems, perforated film, collage techniques, and rotoscoping significantly simplified and accelerated the production process. In the mid-20th century, the computer revolution began, radically transforming the world of animation.

Today, digital technologies completely dominate the animation industry. Computer-generated 2D and 3D animation, motion capture, and software for storyboarding and compositing enable animators to create increasingly realistic, dynamic, and captivating works. Multimedia tools have become a key instrument, opening vast opportunities for creative expression among animators.

Animation, as a dynamic visual art, is closely tied to the development of multimedia technologies. The emergence and rapid advancement of computer tools for processing and synthesizing images, sound, and video have profoundly impacted the animation industry.

The introduction of digital technologies into animation has fundamentally altered the entire production process. Computer graphics, 2D and 3D modeling, frame-by-frame shooting, compositing, and other multimedia tools have simplified and accelerated the creation of animated films.

Computer programs for drawing, animation, editing, and visual effects offer animators a wide range of new tools and possibilities. The use of graphic tablets, programmable cameras, and motion capture allows for achieving the highest level of detail and realism in animated images.

Multimedia technologies have not only simplified and expedited the production process but also opened new horizons for artistic creativity. Thanks to them, animators have the opportunity to experiment with diverse visual styles, unconventional techniques, and methods. Today, animated films astonish viewers with their beauty, dynamism, and realism.

Thus, multimedia tools have become key instruments in the development and enhancement of the art of animation, allowing animators to push the boundaries of creativity and realize the boldest ideas.

The development of multimedia technologies has had a significant impact on the process of creating 2D animation. Digital tools have become indispensable aids to animators in such key aspects of production as drawing, storyboarding, and compositing.

Drawing: Modern graphic editors like Adobe Photoshop, Clip Studio Paint, or Krita offer extensive capabilities for creating and processing keyframes in animation. Artists can draw characters, backgrounds, and other elements using various brushes, textures, layers, and other tools typical of digital visual art.

Storyboarding: Specialized programs for frame-by-frame animation, such as ToonBoom Harmony or TVPaint, allow animators to effectively construct the storyline, control the movement of objects and characters, and synchronize them with dialogue and sound effects.

Compositing: Compositing tools like Adobe After Effects enable the integration of various animation layers, the addition of visual effects, titles, and other elements, creating the final composition of a frame.

By using these digital tools, animators gain flexibility, precision, and a high degree of control over all stages of 2D animation production. This allows them to bring bold creative ideas to life and achieve impressive visual results.

The development of multimedia technologies has significantly impacted the process of creating 3D animation. Digital tools for 3D modeling and animation have greatly simplified and accelerated the production of animated films.

Programs for 3D modeling, such as Blender, Maya, 3ds Max, or Cinema 4D, provide animators with a wide range of tools for creating three-dimensional objects. Artists can use various modeling techniques (polygonal, NURBS, spline) to build complex characters, props, sets, and other elements. Modern programs also support texturing, material assignment, lighting, and camera setup.

After creating 3D models, animators proceed to animate them. Programs for 3D animation, such as Blender, Maya, or 3ds Max, allow animators to set keyframes for movements using techniques such as frame-by-frame animation, skeletal animation, dynamic simulation, and motion capture. This opens up possibilities for creating smooth, realistic, and complex movements of characters and objects.

Multimedia technologies used in 3D animation have significantly simplified and accelerated the production process. Digital tools for modeling and animation have given animators more creative freedom and opportunities to realize their ideas, leading to a qualitative leap in the development of 3D animation art.

In modern animation, hybrid techniques that combine elements of 2D and 3D animation are increasingly used. This allows animators to expand their creative possibilities and achieve unique visual effects.

Hybrid techniques continue to evolve, opening up new opportunities for creative expression among animators. The combination of 2D and 3D elements allows for the creation of unique visual styles and a high level of expressiveness in animated works.

Motion capture is a technology that allows the recording and transfer of real movements of people or animals into a digital 3D model. This technology opens up vast possibilities for creating more natural and realistic animation.

Key principles and process of motion capture:

- **Sensor setup:** The actor or character wears a special suit equipped with numerous sensors (markers) that record the movements of various body parts.
- **Motion recording:** The actor performs the required movements, which are recorded by the motion capture system in digital format.
- **Transfer of movements to a 3D model:** The obtained data is applied to a three-dimensional computer model, visually replicating the actor's movements.

Advantages of using motion capture:

- **Realism of movements:** Motion capture ensures the most natural animation, capturing all the nuances of human motor functions.
- **Time-saving:** Instead of labor-intensive frame-by-frame drawing, animators receive ready-made movements that they can then adapt to their models.
- **Accuracy:** Movements recorded from real people possess a high degree of accuracy, which is especially important in documentary or historical projects.

Examples of motion capture use:

- Hollywood blockbusters ("Avatar," "Planet of the Apes")
- Video games (the "Assassin's Creed" series, "Call of Duty")
- Television shows ("Game of Thrones")

Motion capture has become an integral part of modern animation, enabling the creation of more realistic and expressive characters.

The creation of realistic and spectacular visual effects is an important part of modern animation and the film industry, with special attention given to complex effects such as fire, explosions, and magical phenomena.

Auditory technologies play a key role in modern animation and cinema, responsible for creating the sound atmosphere, musical accompaniment, and realistic sound effects

Key areas of auditory technologies:

Sound capture (sound recording) is one of the key aspects of auditory technologies in animation and cinematography. Professional sound recording involves several important components, such as:

- **Recording equipment** – professional microphones (condenser, ribbon, dynamic), sound interfaces (audio interfaces) for connecting microphones to a computer, acoustically isolated spaces (recording studios), as well as stands, mounts, and vibration isolation for microphones.
- **Recording methods** include the use of close and distant sound techniques to create spatiality, recording from multiple microphone sources (multitrack recording), the application of noise protection screens and isolation from external noises, and control of signal levels to avoid overload and distortion.
- **Processing of recorded material** – noise reduction and cleaning of audio tracks from extraneous sounds, equalization for frequency spectrum correction, compression and limiting for level balancing, and the addition of reverb and spatial effects.

Proper organization of sound recording and subsequent processing of the audio material allows for achieving high sound quality necessary for professional animation and film production. This creates a sense of realism and contributes to a deeper immersion of the viewer in what is happening on screen.

The use of modern digital technologies, such as multichannel recording, spatial sound, and virtual studios, significantly expands the possibilities of sound recording in animation and cinema.

Sound effects play a key role in creating an engaging and realistic atmosphere in modern animation. Thanks to the rapid development of multimedia technologies, animators have gained a wide arsenal of tools for working with sound.

One of the key areas of development is spatial sound technology. It allows for the creation of a volumetric, realistic sound environment that immerses the viewer in a virtual world. The use of headphones with head-tracking sound technology allows for the precise localization of sound sources in three-dimensional space. This enhances the sense of presence and the interaction of characters with their surroundings.

The ability to reproduce high-quality, "clean" sound in animated films has significantly increased. Higher resolution and sampling rates of audio, expanded dynamic range, and frequency spectrum allow for maximum realism in sound effects. This applies to both character voices and the recording of ambient noises, background music, and other sound elements.

Modern animation projects feature highly interactive sound effects. The sound is synchronized with visual events, creating a sense of natural interaction. Moreover, sound design adapts to changes in the environment and character movements, enhancing the effect of presence.

Animation actively uses new formats and sound transmission technologies, such as audio for 360-degree video and VR. This opens up additional opportunities for creating truly immersive animated worlds. Wireless high-quality audio transmission technologies are also being used in modern animation.

The development of sound technologies significantly contributes to enhancing the realism, interactivity, and emotional engagement of viewers in animated projects. Animators actively utilize new opportunities to create captivating soundscapes, enhancing visual effects and complementing artistic vision.

Music plays a key role in creating an emotional atmosphere and enhancing the narrative aspect of animated films. Modern multimedia technologies have significantly expanded the possibilities of musical accompaniment in animation.

The development of surround sound technologies allows for the creation of musical scores that literally envelop the viewer. The use of multichannel audio systems supporting formats like 5.1, 7.1, or Dolby Atmos enables the distribution of musical elements in three-dimensional audio space. This enhances the sense of immersion in the virtual world and the emotional impact on the viewer.

Modern sound recording and audio processing technologies allow for achieving excellent quality in the musical accompaniment of animated films. The use of high resolution, a wide dynamic range, and a detailed frequency spectrum makes the music richer, more vibrant, and realistic. Additionally, musical accompaniment becomes more dynamic, synchronizing with the action on screen.

Modern animation is characterized by the close integration of music and visual effects. Composers and sound designers work closely with animators to achieve perfect synchronization of musical elements with character movements, scene changes, and other visual events. This enhances the emotional impact and helps more effectively convey the mood and atmosphere.

A unique musical style becomes an integral part of the artistic identity of animated projects. Composers create original musical themes, leitmotifs, and soundtracks that give animated films a special character and make them easily recognizable. The use of modern sound technologies allows composers to fully realize their creative potential.

The development of multimedia technologies has significantly expanded the possibilities of musical accompaniment in animation projects. Modern animation is distinguished by high-quality, immersive, and dynamic sound, closely integrated with visual effects. This contributes to the creation of truly captivating and emotionally rich animated worlds.

Audio technologies, particularly the processes of mixing and mastering, play an important role in the creation of high-quality animation.

Mixing in animation is a key stage where the sound engineer brings together various sound elements – music, dialogues, sound effects. The task of mixing is to create a balanced, spatial, and harmonious soundscape that perfectly complements the visual part.

The sound engineer adjusts volume, panning, equalization, and applies various effects to each sound track so that they blend organically without overpowering each other. They also establish the correct proportions between music, speech, and sound effects, creating a cohesive sound atmosphere.

After mixing, the next important stage is **mastering**. At this stage, the mastering engineer performs the final fine-tuning of the entire mix.

The main tasks of mastering in animation are:

- Bringing the overall sound to a professional quality level;
- Ensuring optimal loudness and a "captivating" sound quality;
- Applying equalization, compression, limiting, and other processes to maximize sound improvement.

Competent mastering allows the full potential of the recorded sound track to be revealed and harmoniously integrated with the visual elements of the animated film.

Professional mixing and mastering are critically important for achieving high-quality, competitive sound in animation projects. They enable:

- Conveying the authors' intent and emotional delivery to the audience;
- Creating a cohesive, harmonious sound atmosphere;
- Ensuring the commercial success and demand for the project.

Mixing and mastering are indispensable stages in the creation of modern high-quality animation, which, together with visual technologies, determine the final look and success of the multimedia product.

One of the key aspects of creating high-quality modern animation is the harmonious integration of sound and image. This implies close interaction and synchronization of the audio and video components of the project.

During the production of an animated film, sound elements (dialogues, music, sound effects) are recorded and edited in parallel with the creation of animated scenes. This ensures precise and natural synchronization of the characters' lip movements with their lines, the matching of sounds to the actions on screen, and the correct rhythmic interaction between music and animation.

Modern digital editing and post-production technologies greatly simplify the process of integrating audio and video. Specialized software allows for easy combining, editing, and synchronizing of sound tracks with the corresponding visual scenes.

An important task in the integration of sound and image is to create believable spatial sound that corresponds to the visual perspective. This is achieved through sound positioning and panning technologies.

Sound effects and music are placed in the three-dimensional space of the animated film according to the position and movement of objects on the screen. This immerses the viewer in a cohesive audiovisual environment, enhancing the emotional perception and realism of what is happening.

The harmonious interaction of sound and image is the cornerstone of creating a convincing, engaging audiovisual experience in animation. Only through their close integration can full immersion of the viewer in the world of the animated film be achieved, enhancing the emotional impact and fully realizing the creative intent of the authors.

The use of advanced multimedia technologies for synchronizing, positioning, and harmonizing audio and video components is a crucial factor in achieving high quality and competitiveness in modern animation.

Competent use of auditory technologies allows for:

- Enhancing the emotional impact on the viewer;
- Increasing the realism and immersion in what is happening;
- Highlighting the characters' personalities and the atmosphere of the scene.

Leading specialists in sound design and soundtracks play a key role in creating high-quality animation and films.

Modern animation is a high-tech art form that widely employs advanced multimedia technologies. Their effective use is a key factor in achieving high quality and competitiveness in animation projects.

Computer graphics and three-dimensional modeling open up limitless possibilities for creating complex, realistic, and visually impressive animated scenes. The integration of sound with images enhances the emotional impact on the viewer, increases the sense of immersion in what is happening, and emphasizes the characters' personalities. Specialists in sound design and soundtracks play a key role in achieving high-quality animation.

The use of modern motion capture tools, procedural animation, and artificial intelligence algorithms significantly increases the efficiency and flexibility of the production process and expands the creative possibilities of animators.

Overall, the use of advanced multimedia technologies in animation is a powerful tool that allows for the creation of vivid, captivating, and highly artistic works capable of surprising and inspiring audiences worldwide

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Rezyume: Ushbu maqola zamonaviy multimedia texnologiyalarining multiplikatsiya sanoati rivojlanishiga ta'siriga bag'ishlangan. Ushbu texnologiyalarni qo'llashda animatorlarning ijodiy imkoniyatlarini kengaytirish, ishlab chiqarish jarayoni samaradorligini oshirish, shuningdek, tomoshabinlarga hissiy ta'sirni kuchaytirish kabi asosiy yo'nalishlar ko'rib chiqilgan. 3D modellashtirish, kompyuter grafikasi, harakatni qamrab olish va protsedurali animatsiya algoritmlari, virtual va to'ldirilgan reallik texnologiyalari hamda interaktiv elementlarning imkoniyatlari tahlil qilingan. Yuqori sifatli ovoz dizayni, realistik jismoniy simulyatsiyalar va noxiziqli syujet yechimlaridan foydalanish butun dunyo bo'ylab tomoshabinlarni ilhomlantirishga qodir bo'lgan yanada hissiy boy va qiziqarli animatsion asarlarni yaratishga yordam berishi ta'kidlanadi.

Резюме: Данная статья посвящена обзору влияния современных мультимедийных технологий на развитие индустрии мультипликации. Рассматриваются ключевые направления применения этих технологий, такие как расширение творческих возможностей аниматоров, повышение эффективности производственного процесса, а также усиление эмоционального воздействия на зрителей. Анализируются возможности 3D-моделирования, компьютерной графики, алгоритмов захвата движения и процедурной анимации, технологий виртуальной и дополненной реальности, а также интерактивных элементов. Отмечается, что применение высококачественного звукового дизайна, реалистичных физических симуляций и нелинейных сюжетных решений способствует созданию более эмоционально насыщенных и захватывающих анимационных произведений, способных вдохновлять зрителей во всем мире.

Kalit so'zlar: multiplikatsiya, animatsiya, multimedia texnologiyalari, 3D modellashtirish, kompyuter grafikasi, harakatni qamrab olish, protsedurali animatsiya, virtual reallik, kengaytirilgan reallik.

Ключевые слова: мультипликация, анимация, мультимедийные технологии, 3D-моделирование, компьютерная графика, захват движения, процедурная анимация, виртуальная реальность, дополненная реальность.

GREAT SCIENTISTS OF SAMARKAND AND THEIR SCIENTIFIC HERITAGE

Kattaeva G.K.

Doctoral student of Sharaf Rashidov Samarkand State University

Summary: *This article talks about the madrasahs that existed and operated in the ancient city of Samarkand, which is the crown of the earth, and the information about the great scholars of Samarkand and their scientific heritage is presented.*

Key words: *mudarris, scientist, science, history, madrasa, education, palace, scientific heritage.*

Madrasahs, the abodes of Zia, which gave the main impetus to the development of world science and civilization, are a product of Islamic religion and culture, and they appeared for the first time in our country.

Building mosques and madrasahs, bridges and baths, houses and caravanserais, writing books, digging wells and water are the most meritorious deeds from ancient times, and charity is considered to be present. Most of the scientists, governors and merchants who lived in Samarkand often built madrasahs in order to receive the reward of their charity. In particular, many madrasahs were built during the Somonian, Karakhanid, Timurid, Shaibani, Ashtarkhanid, and Mangit dynasties, and the kings and governors set an example.

This is especially evident in the case of the period of Barefoot Bahadur. This generous ruler, who ruled in Samarkand from the beginning to the middle of the 17th century, built the Sherdar and Tillokori madrasahs as almshouses and gifted his students to the sciences. Following his example, court officials, judges, scientists and other wealthy businessmen began to build madrasahs. From this I can come to the conclusion that if so many madrasahs were built during the reign of Yalangtush Bahadir, who ruled during the Ashtarkhanid dynasty, then it is clear that even more universities were established in the state of Tahirids, Samonis, Karakhanids and Timurids, which was called the "golden age of knowledge", and no one knows the number. However, most of those who built madrasahs during these times were not famous and did not aspire to it. Since the time when Islamic religion and culture entered our country, almost all of the great scholars who have passed by first got their education in mosques, and later in madrasahs, and taught and taught in universities. Applying theory to practice is often the basis of their scientific activities. Below, we recall one by one the blessed names of the great scholars who taught in Samarkand madrasahs and spread the first knowledge:

According to the ancient sources of the history of the city of Samarkand during the Ummavi period, the first Muslim governor of the city, Hazrat Shahizinda, who was one of the last Companions, Qusam ibn Abbas, began to teach the people of Samarkand about manners, prayer, zakat and zakat in the first Namazgah outside the city. When Muhammad ibn Khalid ibn Walid, one of the subordinates, was appointed as the first khatib of the city, 180,000 people of Samarkand learned and learned the Qur'an under him. Soon after, one of the other subordinates, with the cooperation of the general Qutayba ibn Muslim, Muhammad ibn Vose, built Hazrat Khizr mosque, one of the first mosques in the city, and began to invite the people to both worship and knowledge.[1. 22]. In those times, mosques served as places of worship and schools. In addition, Sharia supervisors were also appointed and spread knowledge among the people through commandments and prohibitions. This was the first spread of Islamic religion, culture and science to Samarkand. So, so to speak, we can say that even though madrasahs have not yet appeared or been formed, it would be appropriate to call them the first mudarris. [2. 242].

Among the scholars of the later class who spread knowledge during the Abbasid era, I would like to include Khwaja Abdu Berun, who was one of the subjects, and Khwaja Muizziddin Abdu Darun, the famous sons of the ul zat. Likewise, Abu Ali al-Fuzail ibn Iyaz al-Mas'ud al-Samarkandi, who was one of the famous pious scholars of his time, even the Caliph of Islam Harun al-Rashid did

not let him in when he came to visit him in Baghdad. Among the first scholars of this period, it is necessary to recognize Abu Ahmed Muas al-Khavasi al-Mutawa'vi al-Samarkandi and Imam Abu Muzahim Siba' ibn Nadr al-Wazari al-Samarkandi. [3. 109].

During the Tahiri and Samani period, the first great muhaddith Abu Muhammad Abdullah ibn Abdurrahman ad-Dorami al-Samarkandi was engaged in the teaching of science in the Samarkand madrasas, and many of his followers, who started the school of hadith studies established by the great student of the Prophet Abu Abdullah Muhammad ibn Ismail al-Bukhari, built madrasas and taught in the city. During this period, the schools of speech, wisdom and fiqh created by Imam al-Moturidi, Imam Abul Qasim al-Hakim al-Samarkandi, Imam Abu Lays al-Samarkandi were recognized by the world's scholars, and their works are still in use. At the same time, among the scholars of that time, it is worth noting the great teachers of the above Imams, Abul Fazl Muhammad Balkhi and Abul Faris Ali Baghdadi al-Samarkandi.

Among the famous scholars who worked academically in Samarkand during the Karakhanid period, I should mention the great Imam Ali al-Sugdi, whose blessed name is mentioned with respect in all books on Islamic jurisprudence. At the same time, he was considered one of the last of the "muttaqadimin Imams". Scholars of this period include Imam Abul Hasan Ali ibn Muhammad al-Pazdawi, Abul Mahomid Muhammad bin Abdukhaliq bin Abduvahhob al-Kindi al-Samarkandi, Abul Abbas Jafar al-Mustagfiri, Abu Said Abdurrahman al-Idrisi, and among them Imam Dobusi, who received the nickname Fakhrulislam, Imam Gobdini, Imam Usrushani, Imam Kosani, Imam Abdul Aziz Marginoni, Imam Osmandi, Imam Navqadaki al-Ishtikhani, who worked in Samarkand and are buried here, is a duty and a duty to remember.

Scholars such as Imam Abu Hafs Umar ibn Muhammad an-Nasafi al-Moturidi as-Samarqandi Faqih Ubaydullah ad-Dobusi, Abu Nasr Ahmad ad-Daylami, Burhoniddin al-Marg'inani, Faqihud bin Mahmud as-Samarqandi, who operated from Qarahitoy, Khwarazmshah period to Genghis' time, include and honorably commemorate their names. [3. 95, 96].

During the reign of Amir Temur, mudarris and shaykhulislom Mavlono Abdulmalik, his son, shaykhulislom Isomuddin ibn Abdulmalik, his cousin shaykhulislom Khoja Abdulawwal, "No"moni Soni" named No"moniddin Khwarazmiy, his son Abduljabbor ibn No"mon, muhiq alloma sa'duddin Taftazani of Iran, Sayid SHarif Muhammad Jurjani, Qazi kalon Mavlono Qutiddin, qori Mavlono Ubayd, mavlono Fakhruddin, mavlono domghani, Mavlono Asaduddin, Sharif hofiz Husayni, Mahmud Muhriq Al-Khwarazmi, jamoluddin Ahmad Al-Khwarazmi, Ecclesiastes mavlono Ahmad ibn Shamsul-Aimma, Mavlono Ahmad at-Termizi, Mavlono Mansur al-Kaghani, astrologer Mavlono Ahmad, famous healers Fazlullah and Jamoluddin Shomi, faqeh-muhaddis Alouddin at-Tabrizi, muhaddis Shaykh Shamsiddin Muhammad al-Jazari of rum, tafsirchi hofiz and muhaddis Khoja Muhammad az-Zahidi Bukhari and other eminent experts in the madrasas taught their knowledge to the Talib Sciences and were Gardens with theory of practice. According to Ibn Arabshah, Haqqani wrote: "Timur gathered every useful soul and brought his palace to Samarkand whatever it was. As a result, in Samarkand, every ajib fan was a mark on the forehead of his virtue from the people of Science and the extraordinary style of the arts, and in his field, above his equal, alloma people were gathered". [4, 87].

During the reign of Sultan Mirzo Ulugbek of temurizoda, dozens of alloma Mudarris operated under the Samarkand astronomical school he founded as well as the madrasa, with Mavlono Khawafi, Kazizoda Rumi, Ghiyosuddin Jamshid Koshy, Ali Qushchi and Mavlono Isomiddin being the bright stars of the sublime. Fazlullah Abu Laysi was also active during this period. Alloma Abdurahmani Jami, on the other hand, comes to Samarkand not only to receive knowledge, he started teaching young people as a Mudarris in the Ulugbek madrasa.

During the shaybanid period, the development of Science and science seemed to be relatively stagnant and the focus on secular sciences was somewhat diminished, but the continuation of the construction of madrasas was a sign that work was still being carried out in this area. The famous fiqhshun of this period, shaykhulislom Abulmakorim as-Samarqandi, wrote the work "Sharh muktasarul-viqoya", which was taught in madrasas. An authorized copy of this work, written by

shaykhulislom Abulmakorim with his own hands in 907/1501, has come down to us and is kept at No. 2184 of the foundation of the Beruniy Institute of Oriental Studies.

During the ashtarkhani period, the scientist Sheikh Azizan conducted scientific and mystical activities, his work "Lamahot min nafahotul-quds" was of great scientific importance not only in mysticism and hadithology, but also in balkhim historiography, and was taught in madrasas. Mir Abu Tohirkhajai sadri Mashhadi, his uncle who migrated to Samarkand from the Holy City of Mashhadi in Khorasan at the suggestion of Ashtarkhani ruler Nadir Muhammad Khan, and his descendants mudarrisied the madrasas of Sherdor and Tillokoriy until the beginning of the 20th century. [5, 10].

Emir Haydar, who was a King, scholar and mudarris during the time of the mangyts, showed great signs to others, not satisfied with the repair of old madrasas and the construction of new ones, and again did not spare his knowledge from the Taliban. During this period, the mufassir scholar qaziul-quzzot Abdulhaykhoja, whose son qaziul-quzzot Mir Abu Sa'idkhoja and grandson, Mufti Mir Abu Tohirkhoja, the author of the "Samaria", created and taught in the sherdor madrasa in the fields of Sharia, history, literature. Emir Nasrullah, who conquered the Kokand Khanate, personally brought thea Ol Muhammad Samarkandi to Samarkand and appointed mudarris and qaziul-quzzot to the tillokoriy madrasa.

It is also known from sources that mudarris scholars such as Mavlono Qazi Sadiqi Halwoi and Mavlono Darwesh Muhammad Oxund Turkistani operated in Ulughbek madrasa at various times, Amir Ibrahim (58,183) in Shaybani Khan madrasa, and Muhammad SHarif Mufti (58,188) in Nadir Devanbegi madrasa. Of the last period allomas, it is worth mentioning Kazi Isokonkhoja as-Samarqandi, whose name became popular among arabu novice scholars in the 19th century. As well as being the chief mudarr of the sherdor madrasa, he was also the Qazi Kalon of the province, and shul jihat had taken the name "Qazi mudarris".

During this period, it is worth mentioning Abu Sa'id Mazzum, mudarrisi of the Shaybani Khan madrasa, again.

Many more of the names of mudarris ulamoyu, which remain outside this correspondence, we honor our memories. The scholars whose names are mentioned are the blessed ones, the real allomas that the world knows, whose names and works are remembered with respect not only in the Islamic world, but also by scholars in many countries around the world. In recent times, not only on the scale of our Republic, but on the scale of a province, a city, even a district, served and operated in one way or another, as well as some large and small breeds that received and received their fees from the state, are also entering the udum to be called "allomas". The people of our country, balkim, the whole world enjoy their life, health and property, and the main thing is that not only the people of our country, but also the people of science can enjoy their knowledge, and the honored scientists can bear such a high honor.

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Rezyume: *Ushbu maqolada yer yuzining sayqali bo'lmish qadimiy Samarqand shahrida mavjud bo'lgan va faoliyat ko'rsatgan madrasalar to'g'risida so'z yuritilgan bo'lib, Samarqandning buyuk mudarris olimlari va ularning ilmiy merosi haqidagi ma'lumotlar bayon etilgan.*

Резюме: *В данной статье рассказывается о медресе, существовавших и действовавших в древнем городе Самарканде, являющемся венцом земли, и даются сведения о великих мударрисоведах Самарканда и их научном наследии.*

Kalit so'zlar: *mudarris, olim, ilm, tarix, madrasa, ta'lim, saroy, ilmiy meros.*

Ключевые слова: *мударрис, учёный, наука, история, медресе, образование, дворец, научное наследие.*

**ISSUES OF THEORETICAL AND METHODOLOGICAL FOUNDATIONS OF THE
STUDY OF MALOMATIA**

Yazdonov Z.Sh.

Samarkand State University

Summary: *This article describes the issues of the theoretical and methodological foundations of Malomatia study. Also, Since the Malomatism movement is one of the earliest and most distinctive branches of Sufism, it is scientifically based that its study presents certain theoretical and methodological difficulties.*

Key words: *tradition, malomatia, mysticism, mysticism, gnosis, sincerity.*

Since the Malomatism movement is one of the first and unique directions of Sufism, its study brings certain theoretical and methodological complications. Because this movement focuses on the inner spiritual processes of Sufism, its scientific analysis and methodology must be linked to contemporary spiritual and mystical research.

The unique subtleties of the East, the history of its culture go back to such deep roots that world science studies it with great interest. In particular, the role of Sufism and its sects in the history of the culture of thought is of particular importance. According to the analysis of the sources, malomaty appeared in Nishapur in the second half of the 9th century, and its main idea is to train the "nafs" and train the body by smoking "riyazat". Blame and calamity are mentioned as actions in many sources. Malomatism arose in Khurasan under the influence of Nishapur schools of Sufism in the 9th century and is considered an ascetic movement. It was based on the views of Haris Mukhasibi (d. 857). This movement, associated with the name of Hamdun Qassar, influenced almost all Khurasan Sufis [1].

What separates the categories belonging to blame from various contemporary sects and categories is that they focused on purifying the "nafs" from sins, wrongdoings and bad vices in order to achieve "sincerity" in the presence of God. The main principles of propriety are: not to wear special clothes; preferring secret dhikr over public dhikr; Some of its characteristics, such as refraining from wandering aimlessly, excessive dieting, had an impact on the Naqshbandi order, which had its own prestige in the Middle Ages, and Naqshbandi adopted and absorbed these principles [2].

In spite of the fact that the ideas of blameworthiness occupy an important place in the history of Islamic Sufism, there are not many sources that provide information about this movement, its ideas, main principles, and representatives. The most famous of these sources is the work of Abdurrahman al-Sulami (d. 412/1021) from Nishapur "Risala al-malomatiyya". Abdurrahman al-Sulami was a disciple of Abu Usman al-Hiri (d. 298/910), one of the famous Shaykhs of Malamatism, and on the other hand, he was a follower of Abu Amr Ismail ibn Nujaid, who was his maternal grandfather. Most of the scientific researches on Malomatya have taken this work as a basis. It is noted in the sources that al-Sulami's work "Risola al-malomatiyya" was written to protect the movement of malomatiyya, which was related by his teacher and mother, from the claims of later times.

According to Hujwiri's opinion about Abu Usman al-Hiri in his work "Kashf al-Mahjub", "He was one of the ancients and one of the strongest Sufis. He was the only one of his time, whose value was high in all hearts. The beginning of his status was in the conversation between Yahya Ibn Mu'az and Shah Shuja Kirmani. He stayed with Abu Hafs until the end of his life." The work "Kashf al-mahjub" by al-Hujwiri, who lived half a century after al-Sulami, and the famous work "Awarif al-maarif" by Shihabuddin Abu Hafs Umar al-Suhrawardi (540 631/1145-1234) [3], the specific aspects of blame and spiritual - spiritual aspects are covered. For example, al-Hujwiri criticizes blameworthiness in his work "Kashf al-Mahjub": "A hypocrite believer does these things (good deeds) knowingly for the sake of hypocrisy, in order to attract people's attention. Blaming people knowingly make people hate themselves. Both they and these think about people's thoughts" [4].

But despite this, al-Hujviri in "Kashf al-mahjub" mentioned ten acceptable mystical sects and movements in Khorasan in the 9th-10th centuries [5]. Hujwiri placed blameworthiness in the second place in his list, which he compiled according to Sharia compliance.

Today, the following theoretical directions are important in the study of blame: Sufi philosophy and its influence on the human psyche serve as a basis for understanding blame.

It is important to study the practices of the Malomatis for spiritual purification, the struggle against the ego, and the approach to God within the framework of Sufism. Special attention is paid to the human psyche, its development process, and the struggle against the human ego.

Therefore, it is necessary to study the stages of human nature and spiritual development from the perspective of Islamic anthropology.

Malomati is studied as an action against self-criticism and manifestation of a person from a moral and ethical point of view. The connection of these ideas with Eastern philosophy and Islamic ethics is noticeable.

The main information about malomati is given in the literature of Sufism. It is important to analyze these written sources - the works of al-Bistami, Mansur al-Hallaj, and other Sufis - to learn how they propagated the ideas of censure. These sources require deep analysis through modern philosophical and social methods.

In conclusion, the theoretical and methodological study of malomati requires an interweaving of spiritual, philosophical, and historical approaches. The correct application of each approach will greatly help in the deeper understanding of the influence of the blame movement on the human psyche and society and its application in the life of society.

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Rezyume: *Ushbu maqolada Malomatiylik oʻrganilishining nazariy metodologik asoslari masalalari bayon qilingan. Malomatiylik koʻrinishi sufiylikning ilkning oʻziga xos yoʻnalishlaridan biri ekanligi sababli, uni oʻrganish nazariy va metodik jihatdan qanday xususiyatga ega boʻlganligi ilmiy asoslangan.*

Резюме: *В данной статье рассмотрены вопросы теоретических и методологических основ изучения маломатии. В связи с тем, что возникновение маламатизма является одним из первоначальных направлений суфизма, теоретико-методологический характер его изучения носит научно обоснованный характер.*

Kalit soʻzlar: *anʼana, malomatiya, tasavvuf, irfan, samimiyylik.*

Ключевые слова: *традиция, критика, мистика, мистика, фольклор, искренность.*

**ABOUT THE SOCIAL LIFE OF KARAKALPAKS IN END OF THE 19TH CENTURY
AND THE BEGINNING OF THE 20TH CENTURY**

Bekmuratova M.

Karakalpak State University named after Berdakh

Summary: The article deals with the study of changes in the social life and structure of Karakalpaks living in the lower part of the Amudarya river in the end of 19th century and the beginning of 20th century in the historical-ethnological aspect.

Key words: Karakalpaks of South Aral Seaside, Symbiosis, Karakalpaks, Sarbobo military title, ethnomonuments, social Elites, Beglarbegi, Biy, Bolis titles.

CONCLUSION

In the political, social and cultural life of the people of Karakalpak at the end of the 19th century and the beginning of the 20th century, evaluating the "old ideas" with a new look, in a real scientific, independent ideology is one of the important issues in the science of history.

The socio-political situation of the Karakalpaks in the Amudarya delta of Northern Uzbekistan-South Aral, their relations with the neighboring peoples, various "Symbioses", issues of the material and spiritual culture of the Karakalpaks, "Karakalpak studies" and historically from local historians R. Kosbergenov[1]; S. Kamalov[2]; O. Jalilov [3]; J. Ubbiniyazov [4]; T. Tukhtambetov [5]; Y.E. Brechel[6] and other scientific works focus on it.

Archive documents related to the social, political and cultural life of the Karakalpaks on the south (east) and west (west) sides of the Amudarya River. It is clear that there are historical manuscripts, ethnocultural heritages (family tree, epic, historical song, legends), among them in the "Uzbekarkhiv" fund, archive documents of the Khans of Khiva, historians of Khorezm: Munis, Ogahi, Bayani, Ahmadjon Tabibi. historical works of Berdaq: "Shejire", "Khorezm", "Aydos baba", "Ernazarbiy"; Ajinyoz's ethnocultural works called "Bozataw" and "Demishler" are considered valuable sources. It informs about the social life and spirituality of our ancestors in the new era in the holy places of pilgrimage (mosque, madrasa, cemetery, shrine, mosques, etc.) in the Karakalpak region.

The main reasons for the changes in the social life of the Karakalpaks in the Amudarya Delta along the South Aral Sea, the innovations in the social life of the Karakalpaks, the management system, ethnocultural relations, and the historical literature of the last century were not fully explored in the research.

The change and renewal of the administrative procedure in the peoples on the "other side" and "this side" of the Amudarya along the South Aral Sea, the evolution of deeds and titles given by the khanate, the reasons for some of them "disappearing without a trace", the king in the administrative order The application of "Bolis" management in the "European" way, the social condition of the Bolis period, ethno-cultural lifestyle are still not fully studied.

In the social life style of the Karakalpaks in the lower part of the Amudarya along the South Aral Sea, programmatic actions in the administration of the country, titles inherited from father to son, respectable degrees: Tora, Torakhan, Sultan, Sheikh, Batir, Sufi, Microgroups of social elites like Khan left the "stage of history" and were replaced by new actions, ranks and titles.

In the Karakalpaks along the Amudarya River along the South Aral Sea, instead of "khan" there have been such actions and services as Basbi, Ag'abi, Hakim, Beglerbegi, Ataliq, Mahrem, Qusbegi, Meter, Diywanbegi.

In Karakalpaks, the respectable rank of "Aga Baba" was given to AydosBiy and Erejepbiy of Kipchak [9]. They served for a long time in the military service of Khiva Khan, participated in various military expeditions and wars under the command of AydosBiy with an army of more than 500 horses. Aydos also called the dance "Serbaba", which means a military rank. In 1862, Kipchak ErejepBiy participated as a punitive detachment on the side of Khiva Khan with an army of 500 horses against

the Shawdir bandits who attacked the Khiva-Russian convoy in Dauhara. He served in Khiva Khan's military service for many years, so Erejebiy received the honorable title of "Aga baba" (Serbaba).

There was also a post and title called "Beglerbegi" in the order of social management of the Karakalpaks along the South Aral Sea. The historical figure Edigebiy "Beglerbegi" was the first to have this nickname. QutlimuratBiy, who ruled the country for 40 years in Karakalpaks, was in the position of "Beglerbegi". He was an intellectual who selflessly served in collecting the genealogy and epics of the Karakalpaks. On the left side of Amudarya, in the social life of the Karakalpak people, "Beglerbegs" were BaimaqliQojanbeglerbeg, AralbayQutlimuratbeglerbeg, AdayKaljanbeglerbeg, Qiyat Murtaza beglerbeg.

Officials in the social life of the South Aral Sea hermit crabs: 44 biy, 48 juzbas in calls, 92 in total; 45 biy, 129 juzbasi total 266 in fourteen tribes; there were 2 beglerbegi, 4 atalik, 2 nayip in the mangits. The respectable level of "Agabi" was only in Kipchaks[10]. Their place and services in the historical and social life of the people have not been fully researched. Also, the places where the Karakalpaks lived at that time, fortresses, and sacred places were not specially researched.

Since the years of independence, scientific articles have been published on the history of Karakalpak cities: Chimboy, Khujayli, Kunghiro, but the fate of the places called "Beskala" in the Northern region and the fate of the governors who created and managed "Beskala" have not been researched.

During the period of Tsarist Russia's colony, there was "ballistic" rule on "this side" and "this side" of the Amudarya along the South Aral Sea. The people of Karakalpak had nine Bulis first. After that, the management of Bulis increased to 12 bolis in the North and 12 bolis in the South. "Bolshevik" rule in Karakalpaks ended as a result of Bolshevik expansion and ideology.

In the social life of the Karakalpaks along the South Aral Sea, clerics and Muslims conducted religious affairs in the community. In the society of Karakalpaks, intellectuals named "iyshan" have been passed down from father to son. Karakalpak "Iyshan" suffered during the Bolshevik repression and totalitarian regime. In Karakalpaks, literate and educated intellectuals are also known as "akhun". The intelligent and intellectual mullahs of Karakalpak studied for nine years in the cities of Bukhara and Khiva and qualified for the rank of "San Akhun". In the society of Karakalpak, the title "mulla" was used as a way of respect for a smart, literate, educated, perfect person.

CONCLUSION

In the social life, ethno-cultural life of the Karakalpaks along the South Aral Sea, the temporary position of "Agabi" was preserved in historical sources [11]. The young men of Karakalpak organize a party and elect a well-known adult as "Agabiy". He led weddings and parties. The game "Agabi" disappeared without a trace as a result of Bolshevik expansion and ideology. Thus, the social status and structure of Karakalpaks in the new era was multifaceted. We must apply the history of our nation in science in every way.

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Rezyume: Ushbu maqolada XIX-XX asr boshida Amudario hududidagi qoraqalpoq turmushidagi boshqaruvlar, izhtimoyi hayotidagi uzgarishlar hakidagi yangi fiqrlar bayon qilingan.

Резюме: В статье в историко-этнологическом аспекте изучаются изменения социальной жизни и общественной структуры каракалпаков в низовьях Амударьи в конце XIX и начале XX века.

Kalit soʻzlar: Janubiy Orolbuyi qoraqalpoqlari, Simbiozlar, Qoraqalpogistonlik, Sarbobo, harbiy unvonlari, etnoyodgorliklar, ijtimoiy elitalar, Beglarbegi, Biy, bulis unvonlari.

Ключевые слова: Каракалпакстан, Южное Приаралье, Симбиозы, Сербоба, этнонаследство, социальная элита, Беглер-беги, Бий, Болыс.

CLASSIFICATION AND CARTOGRAPHY OF KARST CAVES IN THE SOUTHWEST OF UZBEKISTAN

Eshmamatov E.D., Meliyev B.A.

Samarkand State University named after Sharaf Rashidov

Summary: *Karst species obtained by combining morphological-genetic and lithological classifications are grouped into two classes of low-mountain and mountainous karst (with low-Mountain, Middle-Mountain, and high-mountain karst-younger classes).*

Key words: *karts, cave, classification, card, morphological-genetics, landscape, geology, lithology, vertical, horizontal, slope.*

Introduction. M. M. Sweeting (1972) identifies five main types of karst: 1) true karst (holokarst). 1; 2) fluviokarst; 3) glacial-nival karst, including karst in the area of permafrost; 4) tropical karst; 5) arid and semi-arid karst (the last type is discussed in the chapter on tropical karst and is characterized only by the characteristics of its tropical and subtropical variants). We have already given the contours of such a general geographical classification (1954), but M.M. The general geographical types of karst identified by Sweeting appear very wide, each containing several types of our more detailed classification, which is taken into account. Not only is the general physical and geographical position of karst development, but also the nature and thickness of the karst mountain cover rocks (determining a type of fluviokarst does not do this) and very important lithological features.

The main lithological types with Morpho-geneticists attached are: 1) limestone karst; 2) dolomite karst; 3) karsts in marbles; 4) chalk karst, including karst in chalk-like mergels; 5) gypsum-anhydrite karst; 6) salt karst.

Degree of learning of the problem. Famous cartographic scientists in the development of artistic decoration of cartographic works I.P.Zarutskaya, P.A.Skvorsov, K.Bocharovs in the development of the choice and theory of imaging methods - A.F.Aslanikashvili, M.Baransky, V.S.Preobrazhensky, K.A.The salishevs contributed. In developing the theoretical and practical design of speleothuristic cartographic Works, R.V.Atoyan, A.A.Beydik, S.Wasmouth, A.L.Smirnova, D.Yu.Shirokov, N.V.Kurteva, A.S.Sudakov, Lit.Y.Shiryayev, Y.Y.Markova operated separately.

The purpose and objectives of the work. The karst types obtained by combining the two classifications are named as follows: bare limestone karst, covered gypsum-anhydrite karst, buried chalk karst, etc., and such types can be divided into plain or mountain class.

Main part. Morphological-genetic types are also common in tropical latitudes, and their counterparts are also found in karsts of temperate latitudes. For example, in the plains of Cuba, we observed partially chymed wooded karst, chymed karst and covered karst. Despite their similarity to the corresponding temperate karst types 1, they should be considered tropical karst types. The karst of coral reefs above ocean level should be classified as a special morphological-genetic type of tropical karst.

A distinctive version of the bare karst is located in the subboreal belt (e.g. on Gotland Island) in an area of glacial faulting associated with the nudity of the limestone surface.

Since Karst has a significant impact on individual components of the geographic landscape and the natural geographic complex in general, this allows us to consider karst areas as special geographic land forms. The degree of their classification is determined by the degree to which karst affects various components of the landscape and the landscape as a whole, and the degree of this influence depends primarily on the type of car[9].

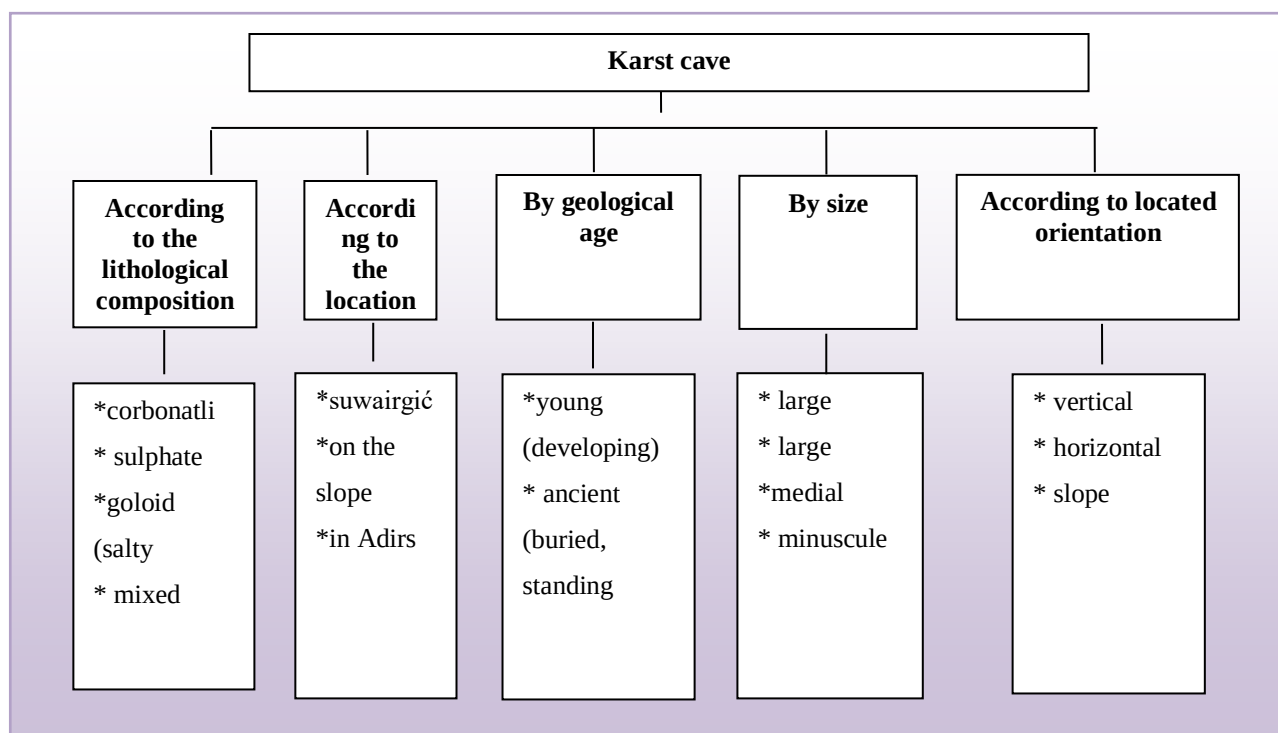
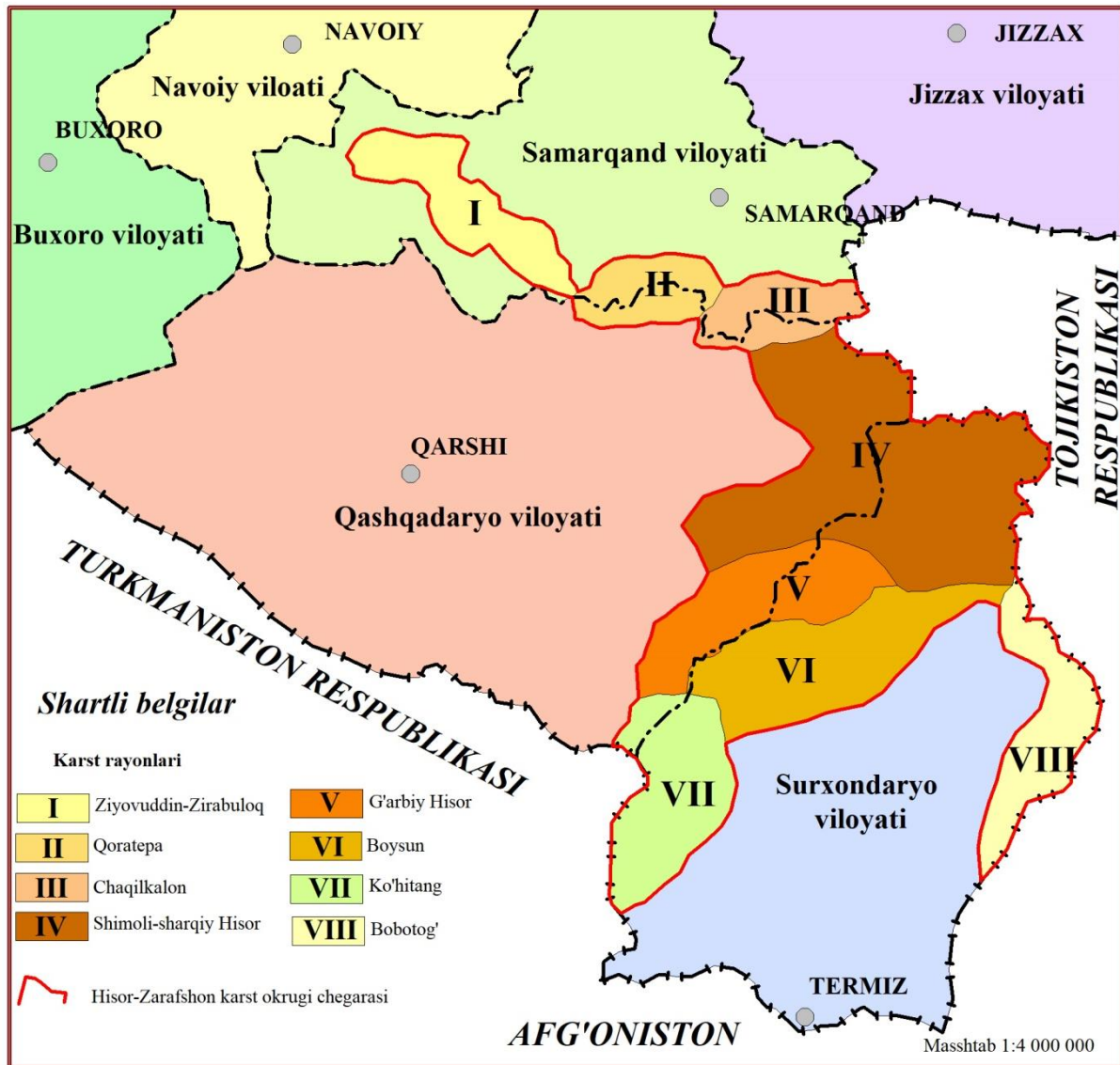


Figure 1. Classification of karst caves of southwestern Uzbekistan.

The following taxonomic units have been used in the classification of Central Asian karsts: Karst region, Oblast, province, sub-province, district and raion. The whole of Central Asia is divided into one large karst trench, and the plain in turn into mountainous and lowland karst oblasts. These karst oblasts are separated into separate provinces according to complex geologo-tectonic conditions. The mountainous karst region consists of two major provinces: 1. Paleozoic Burmese structures of Eastern Central Asia as well as 2. It is separated into the Alpine Burmese uplands to the South. The lowland Oblast, on the other hand, consists of a single Turonian province. The plain represents a relatively simple structure of the karst Oblast, in which there is no separation condition of individual provinces. In the Paleozoic burmali province to the East, the karst process develops in the pre-Paleozoic and Paleozoic age carbonates, while in the Alpine burmali province it is well developed in the washed carbonates of the meso-Cenozoic structure.

The area we are researching corresponds to the small province of Hisor-Oloy, East Paleozoic province. The sub-province of Hisor-Oloy is divided into 3 karst Counties: These are Oloy – Turkestan, Nurota and Hisor-Zarafshan. In Oloy-Turkestan and Hisor-Zarafshan karst counties, the process of karst formation is close together, due to arid climate denudation, karst formation is relatively worse in Nurota karst County [7]. The karst District of Hisor-Zarafshan fully corresponds to southwestern Uzbekistan. This district can be divided into lower region

1. Chaqilkalon region
2. Karatepa region
3. Ziyawuddin-Zirabulaq region
4. Northeast Hisor region
5. West Hisor region
6. Boysun mountain region
7. Kōhitang region
8. Babotog region



Draw 2 Southwest Uzbekistan karst cave zoning card.

Also, when the classification of the karst process is completed, the issue of obtaining them on a card is also considered important. It is required to carry out the Karst process in a certain sequence, preparing its cartographic, geographical basis and drawing on its principles the karst cartographic systems, including the karst spread cartography process.

During the study, the capabilities of GAT technologies as well as remote sensing materials were used adequately in the development of karst cave carding techniques.

Four Bashkir techniques were used to create Karst cave cards. The main focus in this was on the use of GAT technologies as well as remote sensing materials (figure 3.9).

The essence of such cards requires a lot of work on the colorfulness of the themes that can be reflected in them, a wide range of consumers of different ages, its content and equipment.

Cave cartography, the creation of a card of caves on the surface of the Earth, is of particular scientific and practical importance. To do this, several basic steps can be performed:

1. Object survey and data collection: first of all, it is necessary to collect information about existing caves. This information is often obtained from geological surveys, historical records, or previously studied cards.

2. Conducting field research: it is necessary to directly monitor the caves and study their characteristics. At this stage, the internal structure, dimensions, location and other attributes of the cave are recorded.

3. Geodesic measurements: geodesic measurements are made to determine the exact location of the caves. This can be the case, for example, with GPS or laser scanning technologies.

4. Data analysis: the data obtained is analyzed and the necessary indicators are prepared when making a card of the caves. This process can be carried out using mathematical modeling and GIS programs.

5. Card creation: this process is carried out using special programs (for example, QGIS or ArcGIS).

6. Edit and update: when the card is ready, it must be checked by experts and updated if necessary. In the event of news or changes related to the caves, it is important to update the card. Creating a cave card often helps a lot in scientific research, travel, and conservation work.

The content of speleotourism cards should be described without overloading, reflecting the data sufficiently fully. The card must be well read by tourists, expressive and beautifully equipped. Cards that meet such requirements allow less appeal to the legend for tourists. And the beautiful furnishing of cartographic works, in addition to the breathtaking effect, is also an advertisement for speleotourism for the purposes of speleotourism.

First by region under research at the preparatory stage 1:10 000, 1:30 000, 1:50 000 as well as 100,000 scale topographic cards, satellite-based distance images are collected, and text and tabular information on the topics of speleotourism objects are obtained.

Second, at the computer memory input stage 1:10 000, 1:30 000, 1:50 000 as well as 100,000 scale topographic Cards are scanned and Topoasos are prepared for GAT in Adobe Photoshop. Remote snapshots bind to topoasos and are entered into computer memory based on processing in Adobe Photoshop. Text collections related to speleothurism are systematized and stored in computer memory in Microsoft Word. Purposefully collected tables on the topic are also systematized and loaded into computer memory based on the Microsoft Excel program.

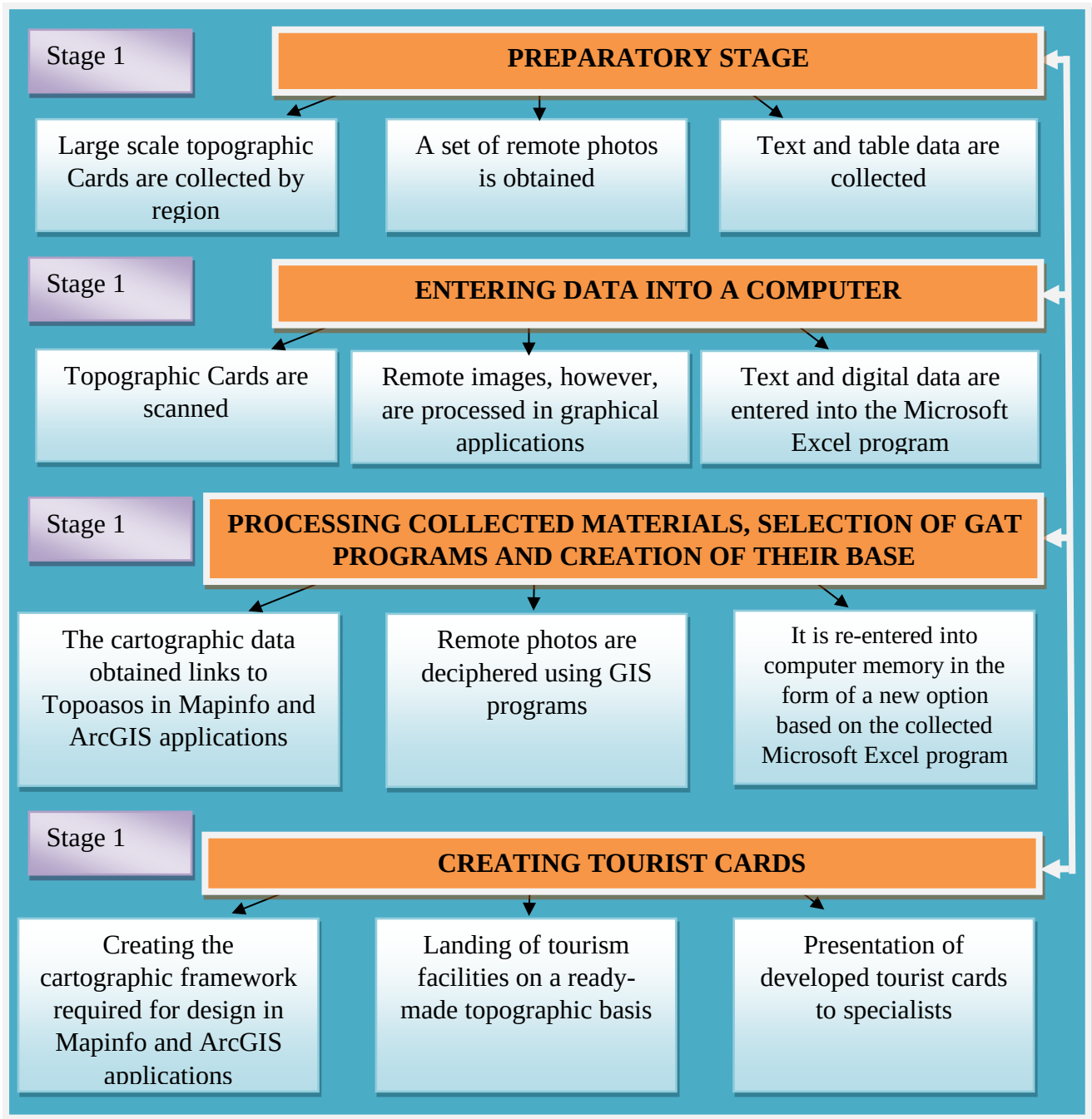


Figure 1. Stages of creating speleoturistic cards

Third, at the stage of processing collected materials, selecting GAT programs and building their base, Topoasos prepared for GAT in the Adobe Photoshop program are processed in the Mapinfo and ArcGIS program. And remote photos are deciphered using the GIS Panorama program and tied to topoasos [4]. The texts collected by object are completed on the basis of processed topoasos and distance shots as well as identified new materials. And the completed text data is systematized in the form of a table and re-entered in the form of a new option in computer memory based on the Microsoft Excel program.

Last, at the stage of creating final speleotourism cards, the main issue is organizing the creation and presentation of speleotourism cards, relying on the developed tourism database.

Conclusion. Thus, speleoturistic cards will consist of a system of updated data and documents on the geographical location, legal status, quantity, quality details and assessment of a particular type

of economic object or other object. Cartographic materials for Karst caves should be formalized in a non-standard composition. It is necessary that such cartographic materials are distinguished by the landscape of the territory being mapped, the variety of historical and cultural heritage.

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Rezyume: *Morfologik-genetik va litologik tasniflarni birlashtirish natijasida olingan karst turlari past tog'li va tog'li karstning ikki sinfiga (past tog'li, o'rta tog'li va baland tog'li karst-yosh sinflarga ega) birlashtirilgan.*

Резюме: *Карстовые виды, полученные путем объединения морфолого-генетической и литологической классификаций, сгруппированы в два класса низкогорного и горного карста (с низким, средним и высоким карстом — более молодыми классами).*

Kalit so'zlar: *karts, g'or, tasnif, kartochka, morfologik-genetika, landshaft, geologiya, litologiya, vertikal, gorizontal, qiyalik.*

Ключевые слова: *карты, пещера, классификация, карта, морфолого-генетика, ландшафт, геология, литология, вертикаль, горизонталь, склон.*

**A STUDY OF THE IMMUNOMODULATORY PROPERTIES OF THE ROOT OF
CAPPARIS SPINOSA L. PLANT**

Khalilova S.A., Dushanova G.A.

Genetics and Biotechnology of Samarkand State University named after Sharof Rashidov

Summary: The objective of this study was to investigate the immunomodulatory properties of extracts derived from the root part of *Capparisspinosa* L. *Capers*, a plant species indigenous to the Samarkand region of the Republic of Uzbekistan. The study employed the RAW 264.7 line of mice monocytic-macrophage cells as a model to assess the impact of varying concentrations of the root extract on the expression of specific genes. The genes in question were those encoding nitric oxide synthase (NOS), interleukin-1 (IL1), chemokine (C-C motif) ligand 2 (CCL2), and macrophage receptor with collagenous structure (MARCO). The expression level of the economy gene was compared to that of the TUB gene. The expression of the IL1 and CCL2 genes was determined in different concentrations of root extract. However, no MARCO gene activity or expression was observed.

Key words: *Capparisspinosa* L. medicinal plant, plant-based foods, bioactive components, immune system, diseases.

Given the pivotal role of the immune system in maintaining human health and preventing disease, there is a growing interest in research aimed at enhancing its functionality. Despite their widespread use in clinical settings for the treatment and prevention of a range of diseases, antibiotics often result in adverse effects due to their synthetic nature. The use of medicinal plants in healthcare practices has a long history, dating back to ancient times. Global studies have been conducted to confirm their effectiveness, with some of the results prompting the development of plant-based medicines. Additionally, plant-based diets have emerged as a leading contender in the field of chronic disease prevention. They offer a low-cost, natural origin, and convenient use. One of the primary reasons for their efficacy is their immunomodulatory effect, which stimulates immune cells and affects the development of immune molecules. A hydroalcoholic extract (300 mg/kg) derived from the roots of the medicinal plant *C. spinosa* has been demonstrated to possess anti-inflammatory properties in vivo [1].

Additionally, Kazemian, M.; Haeri, M.; Ebrahimi et al. have demonstrated that aqueous and hydroalcoholic extracts derived from the fruits, leaves, seeds, and roots of *C. spinosa* possess antihyperglycaemic, antioxidant, and Furthermore, the plant has been observed to exhibit hypolipidemic effects in diabetic and non-diabetic models at a wide range of doses (20–800 mg for 12 to 60 days/kg). Additionally, research has indicated that it possesses antihyperglycemic properties. For example, a four-week administration of 0.2 and 0.4 g/kg root extract per day demonstrated antidiabetic properties in diabetic rats (2). Nabavi, S.F.; Maggi, et al. propose that the antihyperglycemic mechanism of *C. spinosa* root and leaf extract is based on the reduction of carbohydrate absorption from the small intestine (3).

In order to study the immunomodulatory properties of the root part of *Capparisspinosa*, one of the medicinal plants growing in the Samarkand region, a comparison was made between the expression of several genes (NOS, IL1, CLL2 and MARCO) and the expression of the TUB gene, which is present in all cells. The results of this study were then analysed.

The initial objective was to gain insight into the immunomodulatory properties of the plant *Capparisspinosa* L. To this end, the effects of extracts prepared from various plant organs on RAW 264.7 macrophage-monocyte line cells were studied.

Material and methods.

Plant material

The plant material, *Capparisspinosa* L. (2.5 kg), was collected from mountainous areas of the Urgut District, Samarkand Region. The plant was identified as *Capparisspinosa* L. by the Botany

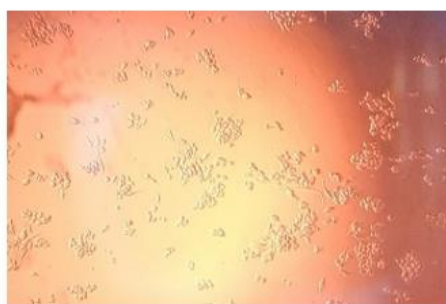
Department of Samarkand State University, named after SharofRashidov, based on standard procedures. The plant was identified by the Botany Department of Samarkand State University, named after SharofRashidov, in accordance with standard procedures. The plant samples were meticulously cleaned and desiccated in a shaded environment. The samples, taken from various organs of the subject under investigation, *Capparis spinosa* L., were subjected to drying at room temperature. The dried samples were then subjected to a laboratory milling process, resulting in a powdered form.

A total of 15 grams of the dried samples were weighed on an electronic scale and extracted in 200 milliliters of 96% alcohol. The extraction was prepared for 24 hours at 60°C with constant stirring in an Orbital Shaker-Incubator ER-20/60 model of Biosan. The remaining 8 ml of the prepared samples were extracted, and after the samples were ready, they were cooled and passed through filter paper, and then centrifuged in a centrifuge at 3000 rpm for 10 minutes.

RESULTS.

In the initial phase of the investigation, 5 ml of RAW 264.7 cell lines were combined with 50 ml of DMEM medium using a pipette, and 0.5 ml of RAW 264.7 cells were introduced into separate 48-well plates. The cells were maintained in a CO₂ incubator for one day at a temperature of 36.5°C and a humidity of 41%. Subsequently, the cells were treated with bacterial lipopolysaccharide (LPS) at a concentration of 0.5 µl, which resulted in the production of an inflammatory effect. The control group was exposed to root extracts of *C. spinosa* at varying concentrations (1, 1, 0.5, 2 µl), while the tablet was the subject of investigation. The effects of the plant extracts were analysed after a period of 24 hours.

In the subsequent stages of the study, the proliferation rate was observed to be relatively low in cells that had not been stimulated with LPS. In the control variant, the cells exhibited a high level of mortality following the administration of 1 µl of the root extract. In cells stimulated with LPS, the level of proliferation was observed to be high at a concentration of 0.5 µl of root extract. The average level of proliferation was noted in 1 µl of root extract. At a concentration of 2 µl of plant parts, the level of proliferation in cells was low. (Fig. 1 a, b, c, d)



a)



b)



c)



d)

As a specific factor, the extract of the root of *Capparis spinosa* L, which demonstrated proliferative activity, was selected for further investigation. The expression of the NOS, IL1, CCL2 and MARCO genes was observed to vary in response to different concentrations of the extract. The results are presented in Figure #2.

Table 1.

#	Gene	Forward primer	Reverse primer
1	NOS	AGCGGTGATAGGATAAAGCAG G	TGCATCAATACGCAGGGACG
2	IL1	TGACTGAAGAGCCGATTGCC	CACCAATGTACACCGGCCC
3	CCL2	CAGGTCCCTGTCATGCTTCT	GTGGGGCGTTAACTGCATCT
4	MARCO	GCACAGAAGACAGAGCCGAT	AGTGATCCATTGCCACAGCA
5	TUB		

It is established that the NOS gene plays a role in the synthesis of the enzyme nitric oxide synthase, which is responsible for the formation of the oxide nitrogen free radical. Nitric oxide (NO) radicals are synthesised by a number of different cells within the body, including lymphocytes, neutrophils, platelets, macrophages, neurons and hepatocytes. They play a role in controlling a number of different biochemical processes.

IL1 has a wide range of functions within the immune system, including the stimulation and control of immune processes, as well as a role in the development of both acute and chronic inflammation.

CCL2 exerts tight control over cellular mechanics, attracting monocytes, T-memory cells, and dendritic cells to the site of tissue inflammation caused by infection.

The gene MARCO (Macrophage Receptor With Collagenous Structure) belongs to the family of receptors and plays a role in the innate immune antimicrobial immune system.

TUB gene

All genes in sheep are associated with the activity of macrophages in the innate immune function, and their expression can be increased by a certain factor.

The expression of the NOS gene was not observed at different concentrations of 1, 0.5 and 2 µl of *Capparis spinosa* L. root extract. In contrast, the expression of the IL1, CCL2 and MARCO genes was higher under the influence of 2 µl of root extract compared to the control variant (see Figure 8). In the control variant, RAW 264.7 macrophage-monocyte cells were stimulated with LPS, but the root extract was not added.

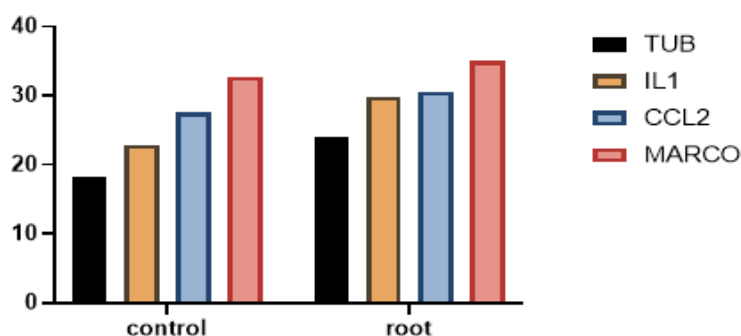


Figure 2. This study examines the impact of varying concentrations of *Capparis spinosa* L. root extracts on the expression of specific genes, namely NOS, IL1, CCL2 and MARCO.

Conclusion. The root extract of the *Capparis spinosa* L. plant has been demonstrated to possess proliferative activity. Proliferative activity is manifested in a number of different ways. The root of the *Capparis spinosa* L. plant contains factors that activate the proliferative and immunomodulatory properties of macrophages. No expression of the NOS gene was observed at concentrations of 1, 0.5 and 2 µl of *Capparis spinosa* L. root extract. In contrast, the expression of IL1, CCL2 and MARCO genes was higher under the influence of 2 µl root extract compared to the control

variant (see Figure 2). In the control variant, RAW 264.7 macrophage-monocyte cells were stimulated with LPS, but the root extract was not added.

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Rezyume: Tadqiqotlarda O'zbekiston respublikasi Samarqand viloyatida o'suvchi *Capparis spinosa* L. Kapers o'simligi ildizqismining har xil konsentratsiyasidagi ekstraktlarini ta'sir ettirib sichqonlarning RAW 264.7 liniyasidagi monotsitar-makrofagujayralariga immune modulytor xususiyatini NOS, IL1, CCL2 va MARCO genlarining ekspressiyasini uy xo'jaligigeni TUB geniga nisbatan ekspressiya darajasi o'rganildi. IL1, CCL2 genlar ekspressiyasi ildiz, ekstrakti turli xil konsentratsiyalarida aniqlangan. MARCO geni faolligi va ekspressiyasi kuzatilmagan.

Резюме: В исследованиях воздействие различных концентраций экстракта корня *Capparis spinosa* L. Каперс, произрастающего в Самаркандской области Республики Узбекистан, на моноцитарно-макрофагальные клетки линии RAW 264.7 мышей показало иммуномодуляторное свойство и экспрессия генов NOS, IL1, CCL2 и MARCO. Изучали уровень экспрессии гена TUB. Экспрессию генов IL1, CCL2 определяли в различных концентрациях экстракта корня. Активность и экспрессия гена MARCO не наблюдались.

Kalit so'zlar: *Capparis spinosa* L. dorivor o'simlik, o'simlik asosidagi oziq-ovqatlar, bioaktiv komponentlar, immunitet tizimi, kasalliklar.

Ключевые слова: лекарственное растение *Capparis spinosa* L., продукты растительного происхождения, биологически активные компоненты, иммунная система, заболевания.

**MATERIAL CULTURE OF THE KARAKALPAKS ALONG THE SOUTH ARAL SEA
(LATE 19TH-EARLY 20TH CENTURIES)**

Bekmuratova M.

Karakalpak State University named after Berdakh

Summary: The article deals with the study of changes in the social life and structure of Karakalpaks living in the lower part of the Amudarya river in the end of 19th century and the beginning of 20th century in the historical-ethnological aspect.

Key words: Shezhire, dastans, historical songs, madrasah mosques, priceless heritage.

INTRODUCTION.

One of the important issues and problems in the new history of Karakalpakstan is the need to study and assess the material and spiritual heritage of the Karakalpaks in the Amu Darya delta in a new, real, scientific-pedagogical aspect from the perspective of the national idea and national ideology.

There are works of ethnographers A.S. Morozova [1], A.T. Zhdanko [2], R. Kosbergenov [3], and I. V. Savitsky on the material culture of the Karakalpaks.

The material culture of the Karakalpaks along the South Aral Sea includes the places of our ancestors, fortresses, sacred places (mosques, madrasahs, cemeteries), places of residence (white grass), clothes, food, handicrafts, types of embroidery were studied. The priceless heritage of the spiritual culture of the Karakalpaks (genealogy, epics, historical songs, legends), the traditional programs of the people, as well as their characteristics are being studied from the point of view of the ideology of the national idea.

The material and non-material cultures of the Karakalpaks in the Amudarya region along the South Aral Sea remain unexplored from an ecological point of view. For four centuries, our ancestors have been living on the shores of the Aral Sea in difficult natural biological and ecological conditions and have been fighting for life. The mud brick and mud walls and fortifications built by our ancestors are getting old, losing their "historical" significance, and are on the verge of "disappearance" due to humidity and desertification. Invaluable objects, monuments of eco-culture should be studied and marked.

At the end of the 19th century and the beginning of the 20th century, the activities of Muslim schools and madrasa-mosques of the Karakalpaks in the Amudarya delta were limited and tried to be controlled by the decree of the "white king". For example, "Qum Ozek" received the "waqim" orders of religious scholars and was in economic crisis (blockade). The education of young people was supervised in the mosque madrasa of Atagulla in Iyshan Qala. The education and training activities of the "Qaraqum" Muslim mosque madrasa in the South region were taken over by the "White King" after the "Mardikor" incident of 1916.

CONCLUSION

It is clear that the social, economic and social life style of the Karakalpak people along the South Aral Sea has not had regular development in every era. Our forefathers traveled the difficult and arduous path to independence.

Research of the material and non-material culture of the titled ethno-Karakalpaks along the South Aral Sea in the scientific-pedagogical aspect, the use of knowledge and education is considered an important task of the present time.

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Rezyume: *Ushbu maqolada XIX-XX asr boshida Amudario hududidagi qoraqalpoq turmushidagi boshqaruvlar, izhtimoyi hayotidagi uzgarishlar hakidagi yangi fiqlar bayon qilingan.*

Резюме: *В статье в историко-этнологическом аспекте изучаются изменения социальной жизни и общественной структуры каракалпаков в низовьях Амударьи в конце XIX и начале XX века.*

Kalit so'zlar: *Shezhire, rivoyadlar, tariyhiy kushiklar, mechit-madrassa, biybaho miyrosdari, .*

Ключевые слова: *Шежире, дастаны, исторические песни, мечети-медресе, бесценное наследство.*

**CHARACTERISTICS OF "GREEN ECONOMY" AND ITS DEVELOPMENT IN
UZBEKISTAN**

Jiemuratov T.P., Muratbaev B.

Karakalpak State University named after Berdakh.

Summary: *This article describes the goals and tasks of reducing energy and resource consumption, widely introducing energy-saving technologies in production, and expanding the use of renewable energy sources in order to modernize and diversify the leading sectors of the national economy in Uzbekistan.*

Keywords: *green economy, renewable energy, green technology, resource, eco-innovation, new development model, low-carbon economy.*

The concept of "Sustainable Development" promoted by the United Nations Organization (UN) has become the main goal of the countries of the world. In the 21st century, the goal of all countries to achieve high economic growth has been replaced by the goal of sustainable development. This means that it is important that all directions of the world economy: agriculture, industry, transport, finance, energy, and construction are all "green".

In the current era, the unlimited needs of humanity require a certain amount of resources that exceed the capabilities of our planet. Over the past quarter of a century, world GDP has quadrupled, but economic growth has been achieved mainly at the expense of natural resource consumption. If human demand for natural resources continues to grow at its current rate, the equivalent of two current planets will be needed to support human life in 2030 and 2.8 planets in 2050 [1].

Today, the issues of green economy are attracting great interest from representatives of various organizations and committees within the framework of international systems. The goal of the "green economy" is to reduce environmental risks and environmental deficits, as well as to achieve sustainable development without damaging the environment. In this context, the "green economy" emphasizes that social welfare can be achieved by reducing environmental risks and threats. The green economy can be included in the long-term plans of enterprises, markets and investors, which guarantee long-term profitability and strive for sustainable development. The theory of "green economy" is based on 3 axioms: 1. It is impossible to expand the sphere of influence in a limited space; 2. In the conditions of limited resources, it is impossible to demand the satisfaction of endlessly growing needs; 3. Everything on earth is closely connected [2]. The main goals of the green economy are as follows

- increasing social welfare, combating scarcity and reducing environmental threats;
- efficient use of resources, reduction of carbon dioxide emissions and social responsibility;
- increase public funding to combat carbon emissions and create green jobs;
- a strong commitment to energy efficiency and achieving biodiversity [3];

"Green" economy means saving energy and resources, reducing carbon emissions into the atmosphere, transport using clean energy, alternative sources of energy, organic agriculture, eco-development (construction with minimal impact on the environment). , based on advanced logistics. This, in turn, allows the economy to develop without harming nature and preserve the ecological well-being of the population, increases production efficiency due to the preservation and increase of natural capital, reduces the release of toxic substances and carbon, expands biodiversity, and also increases higher incomes and employment. Careful and rational use of both primary and secondary resources is characteristic of the "green economy", in which a society with traditional consumption becomes a society with responsible consumption. The "green economy" model normalizes the cooperation of human activity and nature [4].

Environmental protection, rational use of natural resources, transition from a resource-intensive economy to an innovative model of development, and ensuring sustainable economic

development in the 21st century will make any country economically viable. and determines the priority directions of social development.

In his speech at the 72nd session of the UN General Assembly, the President of the Republic of Uzbekistan, Shavkat Mirziyoev, said that the content of the "Strategy of Actions on Five Priority Areas of Development of the Republic of Uzbekistan in 2017-2021" is in line with the Sustainable Development Goals of the United Nations. emphasized that [5]. The goal is to deepen the structural changes planned in the "Strategy of Actions", increase its competitiveness due to the modernization and diversification of the leading sectors of the national economy, reduce the consumption of energy and resources in the economy, widely introduce energy-saving technologies in production, and expand the use of renewable energy sources. and tasks are defined [6].

In the period after 2015, the Republic of Uzbekistan has supported the sustainable development program of 17 goals and 169 tasks set by the UN until 2030, and announced that it will carry out comprehensive work in three areas of sustainable development (economic, ecological and social) [7].

The Sustainable Development 2030 program consists of 17 new Sustainable Development Goals (SDGs), or Global Goals, and is a program that sets the direction of global policies and investments for the next 15 years.

As we know, the basis of the green economy is the effective use of renewable energy sources. From this point of view, the initial legal basis for the effective use of renewable energy sources in Uzbekistan has been created. In particular, on May 21, 2019, the law of the Republic of Uzbekistan "On the use of renewable energy sources" was adopted. This Law includes Article 28, which regulates the use of renewable energy sources, state support and encouragement of the use of renewable energy sources, and the state in the use of renewable energy sources accounting and covers priority aspects such as technical regulation, standardization, conformity assessment in the field of use of renewable energy sources.

On December 2, 2022, the decision of the President of the Republic of Uzbekistan "On measures to increase the effectiveness of reforms aimed at the transition of the Republic of Uzbekistan to a "green" economy by 2030" was adopted. The program of transition to "green" economy and provision of "green" growth in the Republic of Uzbekistan until 2030 was approved [8]. The program aims to achieve the following strategic goals:

- reduce the country's greenhouse gas emissions by 35% from the level of 2010;
- increase the production capacity of renewable energy sources by 15 GW and increase their share to more than 30% of the total volume of electricity production;
- increase energy efficiency in industry by at least 20%;
- reducing the amount of energy consumption per unit of gross domestic product by 30%, including by expanding the use of renewable energy sources;
- significantly increase the efficiency of water use in all sectors of the economy, introduce water-saving irrigation technology on an area of up to 1 million hectares;
- by planting 200 million seedlings per year and increasing the total number of seedlings from 1 billion to more than 30% of green spaces in cities;
- increasing the level of solid household waste processing from 65%, etc.

In accordance with this program, starting from June 1, 2023, a system of "green certificates" was introduced based on the requirements for limiting the impact on ecology and the environment in the production of products. Also, in 2022-2026, measures such as taking into account the emission of greenhouse gases by the state and maintaining their state cadastre, setting target indicators for reducing greenhouse gas emissions in the sectors of the economy, and state support for activities to reduce greenhouse gas emissions the implementation of activities is determined. Investments in "green" technologies are the driving force behind "green economy" as the basis of sustainable development in the future.

These technologies serve to save energy and resources, reduce carbon emissions, use alternative energy sources, grow organic agricultural products, process waste, develop the economy in general without harming nature and the environment, and ensure the ecological safety of mankind.

Together with the World Bank and the European Bank for Reconstruction and Development, a long-term strategy (LTS - Long-Term Strategy for Decarbonization) development project has been launched. According to Article 4 of the Paris Agreement, countries are required to develop their own long-term strategies aimed at achieving carbon neutrality by 2050. Within the framework of this strategy, an investment plan has been developed that indicates the main measures and projects to be implemented to achieve carbon neutrality in economic sectors, as well as the amount of required capital investments.

Also, together with the World Bank, the direct and indirect effects of climate change on the economy of Uzbekistan until 2030 have been studied. The implementation of the project of national assessment on ensuring economic growth in the conditions of climate change (CCDR - Climate Change and Development Report) has been started. This assessment helped the economy to attract international low-cost "green" financial support. Work is being carried out in the republic within the framework of the UN Global Compact initiative. The Global Compact Initiative by the United Nations (UN) is an international initiative to promote the implementation of corporate social responsibility and sustainable development principles (CSR, ESG) in the private sector. Currently, it unites more than 15,000 companies, 4,000 NGOs, and more than 70 business networks in more than 160 countries of the world.

This initiative supports the private sector in strengthening environmental responsibility, promoting the development and implementation of "green" technologies, and conducting socially responsible business activities through the following instruments:

- implementation of environmental, social and corporate management (ESG) principles by attracting foreign experts;
- transformation of business activities and investment attraction through international business incubators and accelerators;
- helping to establish cooperative relations with large foreign companies through international events;
- training, exchange of experience, etc. at the UN Global Compact Academy;

In conclusion, it can be noted that the green economy, along with ensuring regional and macroeconomic development, leads to an increase in the well-being of the population, improvement of the natural environment and public health. It is known from the experience of developed countries that in the process of initial development of the green economy, it is effective to focus on the priority sectors and expand their capabilities, while greening other sectors of the economy as well.

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Rezyume: *Ushbu maqolada O'zbekiston milliy iqtisodiyotining yetakchi tarmoqlarini modernizatsiya va diversifikatsiya qilish orqali energiya sarfini va resurslarning intensivligini kamaytirish, energiya tejoychi texnologiyalarni ishlab chiqarishga keng joriy etish, qayta tiklanuvchi energiya manbalaridan foydalanishni kengaytirishning maqsad va vazifalari bayon etilgan.*

Резюме: *В данной статье обозначены цели и задачи по снижению энергопотребления и ресурсоемкости, широкому внедрению энергосберегающих технологий в производство, расширению использования возобновляемых источников энергии за счет модернизации и диверсификации ведущих отраслей национальной экономики Узбекистана.*

Kalit so'zlar: *yashil iqtisodiyot, qayta tiklanadigan energiya, yashil texnologiyalar, resurs, eko-innovatsiya, yangi rivojlanish modeli, kam uglerodli iqtisodiyot.*

Ключевые слова: *зеленая экономика, возобновляемая энергетика, зеленые технологии, ресурс, экоинновации, новая модель развития, низкоуглеродная экономика.*

**THEORETICAL AND PRACTICAL PRINCIPLES OF TEACHING FOLK ORAL
CREATION IN PRIMARY GRADES**

Abdivasiyeva G.Yu.

Teacher of school 62, Payariq district, Samarkand region

Summary: *Folklore is an integral element of educational activities in the classroom - it helps students to learn new material better, to strengthen it, to form skills and competencies, folklore develops students' initiative, activates cognitive activity and thereby develops thinking. The use of examples from historical songs or narratives, proverbs and riddles at one or another stage of the lesson expands the worldview of students, educates them with patriotic feelings, arouses interest in history, literature, develops speech, makes it correct, makes it rich and expressive. This article provides information about folklore and its types, the use of folklore in the course of lessons in primary classes.*

Key words: *folklore, fiction, practical activity, folklore, folk music, education.*

The large-scale reforms being carried out in our country in the way of building a democratic legal society require the need to educate a person who has the ability to think independently, mature mentally, spiritually and physically. After all, the social activity of the mature generation provides an opportunity to establish a legal society in which the priority of national and universal values is ensured. [1].

Among the methods of education, the most used type is an example, showing an example, that is, being an example. This can be done in two ways. The first one is taught to learn from the exemplary aspects of a person with good qualities, while the second one is taught to hate it by showing the bad deeds of people with negative morals. The life path of great scholars and thinkers will always be a school of lessons for us. For example, adults in the family should always be role models for their children.

Folk creativity - artistic, creative-practical and amateur activities of the masses; folk art of traditional material and non-material culture, folk music, folk theater, folk games, puppetry, gallows and wooden leg games, folk fine and practical decorative arts, and technical and artistic hobby. The types of folk art, whose creation and creative process involved the participation of many people, were formed according to the people's lifestyle, living conditions, level of social work, and from generation to generation, they were constantly perfected, polished, and became more and more traditional. [2].

It is known that primary education serves as a foundation for a person's knowledge and education. In this process, the use of folklore plays an important role in the development of students. In the process of reading the materials related to folk art given in the elementary school "Reading Book" textbook, students will not only enjoy the immortal spiritual springs of the Uzbek people, but they will also fall in love with They dream of becoming patriotic, brave, brave, hardworking, humble and kind people like the heroes of fairy tales.

The works of our great scholars about the exemplary lives, peace and honor of the people are very valuable. Narratives are covered with analysis and examples from the topic. Studying stories is always an interesting and important resource for the younger generation. Anecdotes and riddles are important for being present, quick sayings are important for always pronouncing words correctly, and proverbs are important for giving meaning to words. Songs express the joy, happiness or sadness of our people. Fairy tales play a big role in developing children's imagination. Each told fairy tale leaves a special impression on children. Children always want to be like a wizard, want to have magic items, want to have unlimited power, and see every fairy tale hero, first of all, in himself. With the help of fairy tales, they go to space, go underground, walk on the mountains and stones of the earth and deserts. During this period, they begin to understand what is good and what is bad. [3].

The idea of a perfect person has been sung in folklore since time immemorial, and it has been a noble dream of our people, an integral part of its spirituality. In the holy book of Zoroastrianism,

"Avesta", honest work is interpreted as the main criterion of perfection. The idea of a perfect person has acquired a broader meaning, nourished by the philosophy of Islam. [5].

In primary grades, folklore plays an important role in teaching students about culture, tradition and history. These forms of creativity not only give children interesting and useful knowledge, but also develop their language and logical thinking. It is also possible to increase the interest of students, encourage them to actively participate and involve them in creative activities by using folklore in the course of the lesson. These processes are important in the development of children as individuals.

1. Interest:

- Short stories or fairy tales for children.
- Filled with playful and fun meanings.

2. Fairy tales:

- Heroes, legends and fantastic events of the past.
- Teaching moral lessons through fairy tales.

3. Examples:

- Short stories that are easy to read and learn.
- They often contain a moral lesson.

4. Chants and songs:

- Children's songs containing national musical traditions.
- Can be performed together with dance and games.

5. Anecdotes:

- Interesting and funny stories.
- Helps to make children laugh and develop their social communication.

6. Monuments:

- Poems or stories intended to commemorate historical figures of the Uzbek people.
- Explaining the historical heritage through them.

It is necessary to pay attention to the following aspects when using folklore.

- Use in lessons: The use of folklore in the course of the lesson increases children's interest and encourages them to actively participate.

- Creative activity: inviting students to write their own stories, create fairy tales, develops their creativity.

- Events: Demonstrating folk art on national holidays or events will increase children's interest in culture.

In conclusion, folk art in primary classes not only increases children's knowledge, but also forms their respect for cultural heritage. This process is important in the development of children as individuals. The issues of spiritual and moral education of the young generation in folklore are comprehensive, and at their core are education methods, human values and patriotism, friendship, brotherhood, harmony, hard work, love for the profession, the difference between good and bad. definition, consequences of good and bad words, honesty, correctness, education of nobility, justice, honesty and dishonesty, importance of brotherhood and blood brotherhood, bravery and cowardice, rudeness, guest and hospitality categories like stlik are interpreted. Strengthening and developing the spiritual heritage and spirit of our people is the most important task of the state and society in Uzbekistan.

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Rezyume: *Xalq og‘zaki ijodi darsdagi o‘quv faoliyatining ajralmas elementi-o‘quvchilarga yangi materialni yaxshiroq o‘zlashtirish, uni mustahkamlash, ko‘nikma va malakalarni shakllantirishga yordam beradi, folklor o‘quvchilarning tashabbuskorligini rivojlantiradi, bilish faoliyatini faollashtiradi va shu orqali tafakkurni rivojlantiradi. Darsning u yoki bu bosqichida tarixiy qo‘shiq yoki rivoyatlardan, maqol va topishmoqlardan namunalar qo‘llash o‘quvchilarning dunyoqarashini kengaytiradi, ularni vatanparvarlik tuyg‘ulari bilan tarbiyalaydi, tarix, adabiyotga qiziqish uyg‘otadi, nutqini rivojlantiradi, uni to‘g‘ri, boy va ifodali qiladi. Ushbu maqolada xalq og‘zaki ijodi hamda uning turlari, boshlang‘ich sinflarda dars jarayonida xalq og‘zaki ijodidan foydalanish haqida ma‘lumotlar berilgan.*

Резюме: *Фольклор является неотъемлемым элементом учебной деятельности на уроке – он помогает учащимся лучше усваивать новый материал, закреплять его, формировать навыки и компетенции, фольклор развивает инициативу учащихся, активизирует познавательную деятельность и тем самым развивает мышление. Использование на том или ином этапе урока примеров из исторических песен или повестей, пословиц и загадок расширяет мировоззрение учащихся, воспитывает в них патриотические чувства, вызывает интерес к истории, литературе, развивает речь, делает ее правильной, обогащает и выразительный. В данной статье представлены сведения о фольклоре и его видах, использовании фольклора в ходе уроков в начальных классах.*

Kalit so‘zlar: *xalq og‘zaki ijodi, badiiy adabiyot, amaliy faoliyat, folkyor, xalq musiqasi, ta‘lim-tarbiya.*

Ключевые слова: *фольклор, художественная литература, практическая деятельность, фольклор, народная музыка, образование.*

**LOCATION ARCHITECTURE IN A WEB APPLICATION ENVIRONMENT FALSE
STARTS OF THE SYSTEM IN THE DETECTION OF ATTACKS IN THE NATIONAL
SEGMENT**

Botirov F.B., Haydarov E.D., Gafurov A.A.

TUIT named after Muhammad al-Khwarizmi

Summary: *This article presents suggestions for reducing the number of false starts of the system for websites in the “.uz” domain located in the national segment, as well as reducing errors of the first and second types and anomalies. Also, a mechanism has been developed to check false starts of the system in the detection of errors, location architecture in the web application environment, and errors of the first and second types.*

Key words: *.UZ domain, Internet network, fraud, cyber attacks, web resources, national segment.*

Introduction. Along with the increase in the number of websites in the national segment, the number of risks, threats and attacks to websites also increases. This trend means that the increase in the possibilities of digital technology will in turn increase the number of new threats and attacks in terms of information security. But not all network incidents are incidents, threats, or attacks. It is important to distinguish between incidents, threats, and attacks among network events. One of the main requirements for incident, threat and attack detection systems is to minimize the number of false activations of the protection system. Threat and attack detection systems may have high detection rates, but attention should be paid to the number of false positives of these systems. If the number of false starts in the system is high, the reliability and efficiency of the system will be low. That is why, when improving or developing new methods of detecting threats and attacks on web applications and resources located in the “.uz” domain, there is a demand to pay special attention to cases of false activation of the system.

Main part. By reducing the number of false starts of the system, the number of errors of the first and second type and anomalies is reduced. Develop and implement a mechanism to reduce false positives of attacks on the national segment in the course of performing their core functions of information security professionals in managing databases and investigating incidents and reacting to attacks and implementing it in the protection system have proposed several approaches. In information security, scientific research is being conducted to develop methods and algorithms aimed at reducing the number of these two types of errors or to improve existing methods. When carrying out threats and attacks on web applications and resources located in the “.uz” domain, the attacker can leave control marks of the attack in the log files. In addition, the sensors of the detection systems give a warning to the administrator. For example, in the normal process of the network, a message about suspicious activities similar to hacking is transmitted in real time to the system administrator.

In recent years, when analyzing the effectiveness of information security systems, the methods used in protection systems allow for a high rate of detection of attacks, as well as a decrease in the level of accuracy in detection. The main reason for such a situation is the increase in the number of errors of the first and second type. For example, in the last five years, in the process of identifying threats and attacks aimed at the national segment, the PCAPlib system detected more than two thousand errors of the first and second types from international Internet traffic using the Campus BetaSite Real module. When analyzing the results of their detection, there were many options for accepting the errors of the first and second types as anomalies in most cases.

Above information, it is possible to improve the effectiveness of the protection system by reducing the first and second types of errors in the methods and algorithms used in the detection systems of threats and attacks to web applications and resources located in the national segment. In order to reduce type 1 and type 2 errors, it is necessary to develop a methodology for estimating type 1 and type 2 errors from all real traffic of the national segment. Based on this methodology, a

mechanism for reducing false positives (type 1 and type 2 errors) of attacks on the national segment is proposed.

The proposed mechanism is based on experiential environment and static analysis and provides analysis based on the separation of web applications located in the national segment into two environments (Front-end and Back-end).

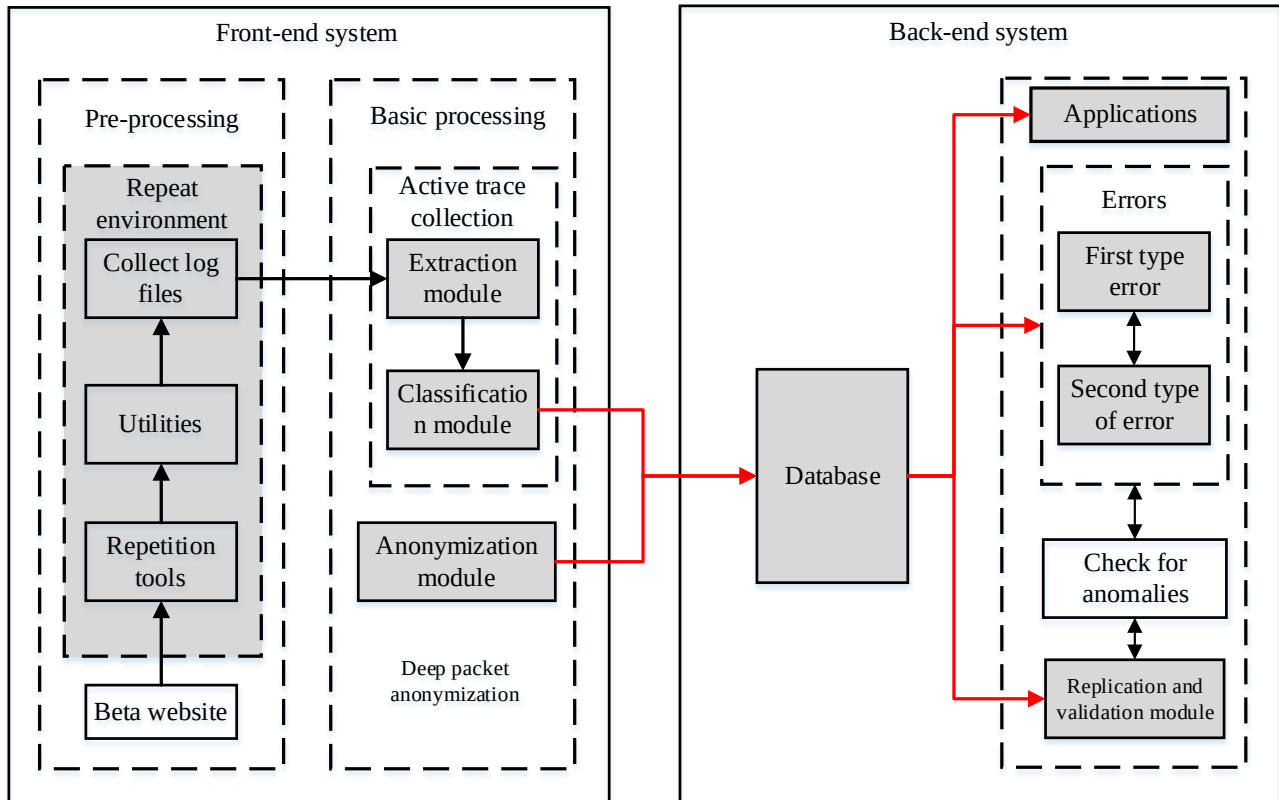


Figure 1. The location architecture in the web application environment of system false starts in attack detection

In order to reduce the first and second types of errors in detecting threats and attacks on web applications and resources located in the “.uz” domain, the two environments of web applications are of great importance. In addition, this architecture has an operational network that allows network users to capture packets of network traffic (using the Logging module). The proposed architecture requires that the volume of network traffic between users in the national segment does not exceed approximately 100 GB per hour.

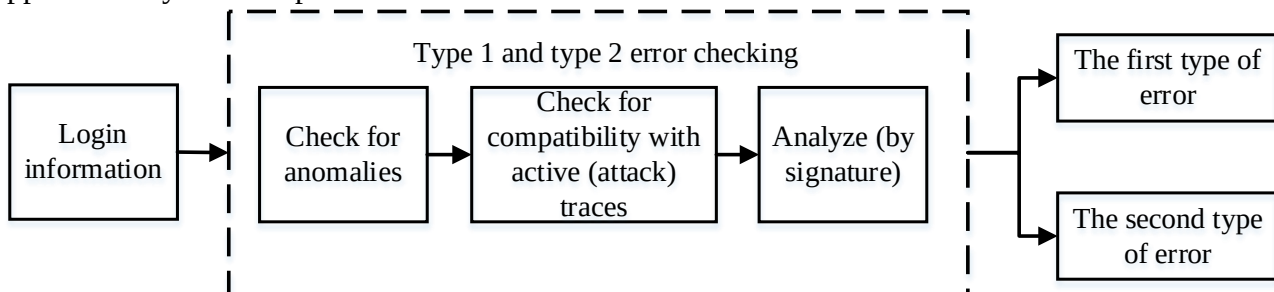


Figure 2. A mechanism for checking attacks for anomalies and type 1 and type 2 errors

The preprocessing component of the front-end system uses a traffic repeater to repeat the initial traffic recorded to multiple device utilities under test to use their domain knowledge. If unusual behavior is detected in the utility system, it will trigger an alert. There are two mechanisms for the main processing component of the front-end system. These are: Active trace collection, deep packet anonymization. Based on utility alerts, the active tracer identifies packets that trigger alerts, processes packets and connection associations to store each session into packet traces, and uses supervised

classification to categorize stored packet traces. In-depth packet anonymization, on the other hand, parses application-level protocol identifiers and passes them to an anonymization module to protect the privacy of packet traces while maintaining their utility.

Conclusion. Nowadays, with the increase in the number of internet users, the number of false starts in web systems is also increasing, which requires research to prevent such cases. In the detection of attacks proposed in this article, the location architecture of the system in the web server environment and the mechanism of checking the attacks for anomalies and type 1 and type 2 errors will reduce the number of false starts to a certain extent.

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Rezyume: *Ushbu maqolada milliy segmentda joylashgan ".uz" domenidagi veb-saytlar uchun tizimning noto'g'ri ishga tushishini kamaytirish hamda birinchi va ikkinchi turdagi xatolar va anomalialarni kamaytirish bo'yicha takliflar keltirilgan. Shuningdek, xatolarni, veb-ilova muhitidagi joylashuv arxitekturasini, birinchi va ikkinchi turdagi xatolarni aniqlashda tizimning noto'g'ri ishga tushishini tekshirish mexanizmi ishlab chiqilgan.*

Резюме: *В данной статье представлены предложения по снижению количества ложных срабатываний системы для веб-сайтов в домене «.uz», расположенных в национальном сегменте, а также по снижению ошибок первого и второго типов и аномалий. Также разработан механизм проверки ложных срабатываний системы при обнаружении ошибок, архитектуры расположения в среде веб-приложений, ошибок первого и второго типов.*

Kalit so'zlar: *.UZ domeni, Internet tarmog'i, firibgarlik, kiberhujumlar, veb-resurslar, milliy segment.*

Ключевые слова: *домен .UZ, сеть Интернет, мошенничество, кибератаки, веб-ресурсы, национальный сегмент.*

UDC 17.022.1

EXPLORING MORAL VALUES: THEIR IMPORTANCE AND IMPACT ON SOCIETY

Reymov R.M., Uzakbergenov R.

Karakalpak State University named after Berdakh

Summary: *In this article, moral values are social standards, religious beliefs and cultural differences, knowledge of the importance of moral principles, moral principles have been significantly shaped by the science of philosophy and its specific aspects have been shown. scientifically based.*

Key words: *honesty, empathy, moral values, self-discipline, moral principles, teamwork, respect, responsibility, justice, empathy, fearlessness, gratitude, cultural, development, friendship, philosophical, ethics, , upbringing, originality, universality, humanitarianism*

The moral values consist of all the information in social standards, religious beliefs, and cultural distinctions. This information helps in defining what is good and bad for the following people to make decisions that determine their place in society. These principles are important for helping children grow up with a feeling towards social duty, empathy, moral judgement, etc.

Firstly, here we start telling how to promote the well-being of the person and the community requires a thorough investigation of moral principles. [1] This article explores the importance of moral principles and clearly how they affect single development and social unity. Moral principles tell about the roots like roots in cultural, normative, and theological frameworks, and serve as decision-making guidance in moral and social quandaries. Kids need to understand these principles to develop all like to develop empathy, social responsibility, and moral judgment.

Knowing the importance of moral principles is important for single growth and common unity. We shall explain moral principles in this investigation and create a quick summary of the importance of creating a morally upright atmosphere. Hence, as we work through these fundamental ideas, it becomes more clear that moral principles are not only personal morality but also form the basis for both an ethically sound and socially conscious community.

What are Moral Values?

Moral values are the concepts that explain to us how to guide human behaviour and the difference between proper and incorrect. [2] They form the base of ethical selection-making and contribute to the improvement of someone's character. The advancement of moral principles is a complex and diverse process driven by a variety of elements, including philosophy, religion, and way of life.

Because cultures set societal norms and expectations, they have a significant impact on the development of ethical ideals. [3] Diverse cultural perspectives on morality are influenced by the emphasis placed on particular virtues and moral concepts. Religious ideals are also vital because they provide moral guidelines and guidance based on teachings and sacred texts. Within religious communities, these moods often serve as the foundation for moral behaviour theories.

Ethical principles have been significantly shaped by philosophy. [4] [5] Mental frameworks for information morality and ethical decision-making are provided by ethical theories and philosophical perspectives. Brilliant minds from various philosophical systems have influenced society's views about what's deemed moral by contributing to the discussion on morality.

10 Moral Values for Students

Here, we have found out the 10 essential ethical values that students must maintain, and encourage as a base for ethical selection-making and interpersonal relationships. [6]

Honesty:

The foundation of integrity, and honesty establishes credibility and fosters agreement. Students who feel honesty grow to have robust ethical convictions.

Empathy:

We will apprehend and proportion the emotions of others, and empathy promotes kindness and cooperation, growing a compassionate community inside academic settings.

Self-discipline:

Start exercising to manage one's moves and behaviours, and self-control. Hence students live centered on their educational goals, and encourage a strong work ethic.

Teamwork:

Collaborating successfully with teamwork builds vital social talents and teaches college students the price of cooperation, so this prepares them for future collaborative endeavours.

Respect:

Try to cost range deal with others civilly, and admire the paintings in a harmonious environment, wherein anyone feels preferred.

Responsibility:

Let's take ownership of one's movements duties, and responsibilities to empower students to satisfy instructional challenges with determination.

Fairness:

Encourage a feeling of justice and equality among students. Hence, they deal with them similarly treatment for all.

Compassion:

Beyond empathy, compassion encourages students to actively help the ones in want and fosters a subculture of help and care.

Fearlessness:

Have to be brave to face difficulties, that's an essential fine for defeating issues in both non-public and academic lifestyles.

Gratitude:

By spotting and appreciating the efforts of labour carried out by others, gratitude creates a great surrounding and improves gaining knowledge as a whole.

Importance of Moral Values

Moral values serve as the foundation for a healthy and flourishing society. Here's why they are of paramount importance: [7]

Social Cohesion: Moral values create a sense of unity, fostering cooperation and understanding among individuals.

Ethical Decision-Making: They guide individuals in making ethical choices, contributing to a morally upright society.

Personal Growth: Embracing moral values promotes character development and emotional intelligence.

Conflict Resolution: Shared moral values provide a framework for resolving conflicts peacefully.

Positive Influence: Upholding moral values sets positive examples, influencing others to follow suit.

Fostering moral values is vital for shaping fantastic behavior and moral decision-making in diverse situations. [8] Embracing virtues including honesty, admiration, responsibility, compassion, equity, loyalty, braveness, forgiveness, gratitude, generosity, perseverance, empathy, and tolerance creates a foundation for harmonious connections with others. As individuals and groups, let us prioritize and nurture those values to contribute to a society built on integrity and empathy. Together, we will make informed moral choices that result in private boom and collective well-being.

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Rezyume: Ushbu maqolada axloqiy qadriyatlar ijtimoiy standartlar, diniy e'tiqodlar va madaniy farqlar, axloqiy tamoyillarning ahamiyatini bilish, axloqiy tamoyillar falsafa fani tomonidan sezilarli darajada shakllangan va o'ziga xos jihatlari ko'rsatilgan. ilmiy asoslangan.

Резюме: В данной статье моральные ценности - это социальные стандарты, религиозные убеждения и культурные различия, знание важности моральных принципов, моральные принципы были в значительной степени сформированы философской наукой и ее конкретными аспектами. были показаны научно обоснованными.

Kalit so'zlar: halollik, hamdardlik, axloqiy qadriyatlar, o'z-o'zini tarbiyalash, axloqiy tamoyillar, jamoada ishlash, hurmat, mas'uliyat, adolat, hamdardlik, qo'rqqaslik, minnatdorchilik, madaniy, taraqqiyot, do'stlik, falsafiy, axloq, , tarbiya, o'ziga xoslik, umuminsoniy, insonparvarlik

Ключевые слова: честность, эмпатия, моральные ценности, самодисциплина, моральные принципы, командная работа, уважение, ответственность, справедливость, сочувствие, бесстрашие, благодарность, культурный, развитие, дружба, философский, этика, , воспитание, оригинальность, универсальность, гуманизм

A MECHANISM TO REDUCE SYSTEM FALSE STARTS IN ATTACK DETECTION

Botirov F.B., Haydarov E.D., Gafurov A.A.
 TUIT named after Muhammad al-Khwarizmi

Summary: This paper proposes a mechanism for preventing and mitigating threats and attacks against web applications and resources located in the national segment. A module-based method of error checking is proposed. It is noted that the mechanism of X atolic reduction mainly works on 3 processes .

Key words: anomaly, Time Performance, IDS/IPS, Fault tolerance, Scalability, national segment, Event boxes, E-boxes, Analysis boxes, A-boxes.

Introduction. When detecting threats and attacks on web applications and resources located in the national segment, the first and second types of errors are performed according to the proposed mechanism for reducing them as follows. In this case, the type 1 and type 2 error checking module is divided into 3 internal parts, and each part requires reanalysis of detected attacks to reduce the number of type 1 and type 2 errors. That is, detected attacks may not actually represent an attack action, while events considered valid may represent an attack action.

Main part. Making a decision based on a primary analysis of an arbitrary event that occurs reduces the reliability of the system, but increases the speed of the system. Based on the requirements for ensuring information security, the priority of the system reliability criterion is higher than the priority of the system speed criterion.

In order to detect threats and attacks in the national segment of the Internet network, it is necessary to collect packets passing through the network traffic belonging to the national segment, analyze them, and use the base of malicious codes identified in the process of filtering packets, as well as the knowledge of currently widely used attack signatures. requires identification using the database. After checking the knowledge base of attack signatures for the compatibility of active traces in the execution of the attack, it executes the command to enter a new type of knowledge into the knowledge base. The larger the knowledge base in the defense system (it contains a lot of knowledge), the more reliable the system is in comparing attack traces during the first and second type of error checking. This allows to reduce errors.

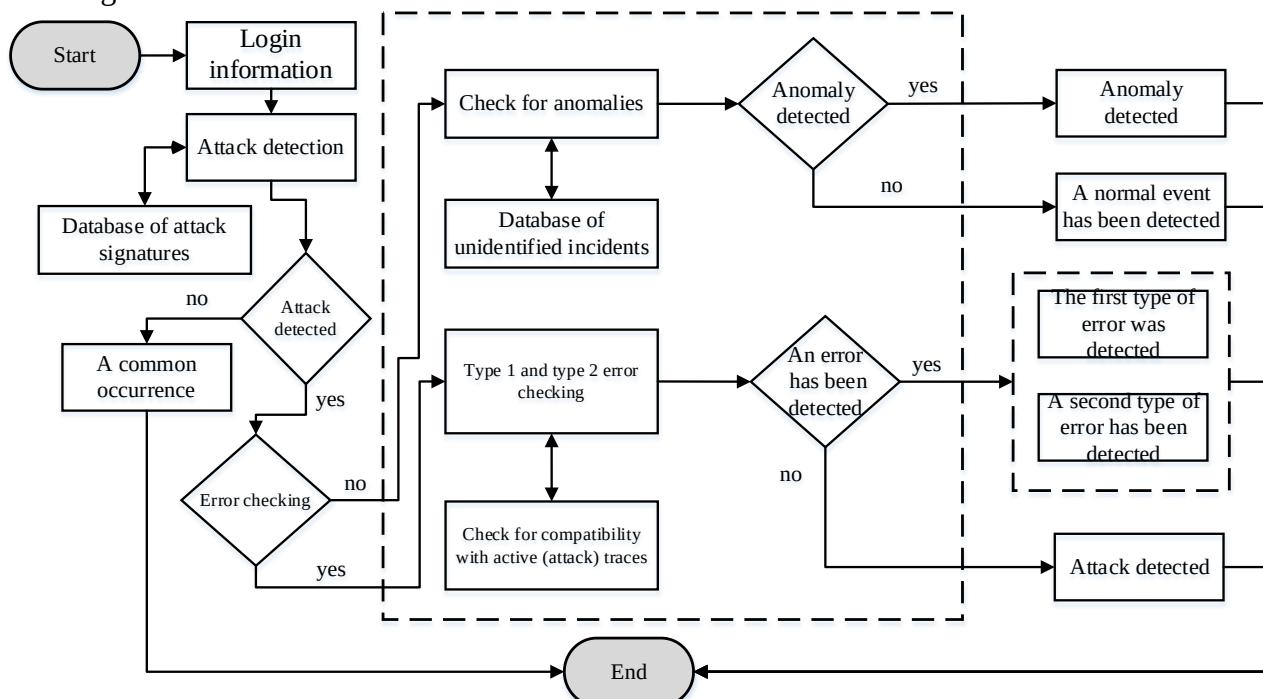


Figure 1. A proposed error mitigation mechanism

The proposed error reduction mechanism allows to work mainly on 3 processes. These are:

- check for anomalies;
- error checking;
- determine whether it is an attack or a normal condition.

Reducing errors and not considering all undetected events as anomalies, based on re-analysis of data without making decisions based on primary data, serves to increase the effectiveness of threat detection and elimination systems (IDS/IPS) in the national segment and provides the following advantages.

- *Time Performance.* Ensures that this time of the Threat and Intrusion Detection and Prevention System (IDS/IPS) matches the total time required to detect an intrusion. It includes processing duration and signal transit time. Processing time depends on the speed at which the threat and intrusion detection system processes data and the speed at which it processes events. If this speed is not high enough, there will not be enough real time to process protection events.

- *Completeness.* The system for detection and elimination of threats and attacks allows to prevent intrusion into the public network of the organization by all means using optional network nodes. It is important to note that meeting these requirements is difficult enough, as it is almost impossible to have global information about past, current and future attacks. Only with active attack traces and a sufficient knowledge base will it be possible to predict.

- *Fault tolerance.* The threat and attack detection and mitigation system itself allows for the creation of a reliable, robust and resilient module to attack and to be able to quickly recover after a successful attack and continue to provide protection. This is especially important in large-scale distributed DoS-attacks that fill the buffer and various pre-planned attacks that disable computer systems and thus the threat and attack detection and mitigation systems. Because many commercial threat and attack detection and remediation systems operate on networks and operating systems that are considered vulnerable to various types of attacks, this feature is critical to the proper operation of threat and attack detection systems. And error reduction offers just such an opportunity. In addition, threat and attack detection and mitigation systems must be resilient to scenarios where an attacker uses the defense system to send a large number of false or misleading signals. Such false alarms can easily have a negative impact on system usability, and threat and attack detection and mitigation systems need to be able to quickly overcome these obstacles.

- *Scalability* A threat and attack detection system must be in a position to process network events before information is lost or altered. This moment is relevant for systems that correlate events from different sources of hosts dedicated to each web application in a small national segment. Due to the continuous expansion of networks and the increasing speed of data flow, such nodes increase the load factor as a result of recording log files of real-time events in the network.

There are protection systems based on different conceptual structures and architectures. At the same time, almost all threats and attack detection and elimination systems have a common architecture. Therefore, error reduction allows to distinguish the main components of protection systems and their functionality.

Work in the following 3 modules of the protection system significantly increases efficiency, these are:

- *Event module (Event boxes, E-boxes).* Due to the fact that the role of the event module is to create events in the processing of the current data of the audit performed in the computing environment, the reduction of the first and second types of errors prevents the reception of network packets that generate events based on network traffic as anomalies, and in fact serves to increase the efficiency of the packet analyzer.

- *Analysis module (Analysis boxes, A-boxes).* The role of the analysis module consists in the analysis of events performed by other components. The result of the analysis is fed back to the system as additional events that indicate an alert.

F is the frequency module. This is between real-time data analysis and periodic (offline) systems allows you to transfer differences.

Conclusion. Based on the above information, it can be said that as a result of reducing the first and second types of errors of existing information security in the systems of identifying threats and attacks and eliminating them in real time, in addition to the reliability of the protection system, the above mentioned modules of the protection system also serve to improve the performance.

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Rezyume: Ushbu hujjat milliy segmentda joylashgan veb-ilovalar va resurslarga qarshi tahdidlar va hujumlarning oldini olish va yumshatish mexanizmini taklif qiladi. Xatolarni tekshirishning modulga asoslangan usuli taklif etiladi. Qayd etilishicha, X atolik qisqarish mexanizmi asosan 3 ta jarayonda ishlaydi.

Резюме: В данной статье предлагается механизм предотвращения и смягчения угроз и атак на веб-приложения и ресурсы, расположенные в национальном сегменте. Предлагается модульный метод проверки ошибок. Отмечено, что механизм X-атомного сокращения в основном работает на 3 процессах.

Kalit so'zlar: anomaliya, Vaqt ishlashi, IDS/IPS, xatoga chidamlilik, Scalability, milliy segment, Voqealar qutilari, E-qutilar, Tahlil qutilari, A-qutilari.

Ключевые слова: аномалия, производительность по времени, IDS/IPS, отказоустойчивость, масштабируемость, национальный сегмент, блоки событий, E-boxes, блоки анализа, A-boxes.

ORGANIZATION OF MULTI-YEAR SELECTION STAGES IN A SPORTS SECTION

Allanazarova A.B.

Karakalpak State University named after Berdakh

Summary: *The article covers the issues of organizing the stages of multi-year selection in a sports section. It presents the main stages of selection varieties in sports: mass selection, sports selection, sports orientation, sports tryout.*

Key words: *physical fitness, sports training, mass selection, sports selection sports orientation, sports tryout.*

Introduction. The main purpose of the selection system in sport is to identify the abilities for a certain motor activity (structure of competitive activity) of a particular individual and to predict the possibilities of achieving world-class results.

Determination of sports suitability is a time-consuming, multi-stage, multi-year process, covering all stages of sports training and is associated with the involvement of a large number of specialists - teachers of physical education, doctors, coaches and organizational staff of Sports school (Children's and Youth Sports School, Children's and Youth Olympic Games Sports School, etc.).

The complexity of selection for sports activities is proved by the numbers given by professors N.Y. Nabatnikova and V.M. Zatsiorsky, "if it is necessary to find a person by one indicator for a certain selection, for example, by body length, it is necessary to look through 1000 people, if by two indicators (high and fast), such a person will be found only out of 10000 thousand selected people, if it is necessary to find the best by three indicators (high, fast and coordinated), it is necessary to look through a million people!!!".

At the same time, four main stages of selection in sport are distinguished. According to a large group of authors, certain specific tasks are solved at each stage of selection (Table 1).

Aim of the study. Organization of stages of multi-year selection in the sports section taking into account age opportunities.

Data and methods of study. The study is based on the theoretical analysis of scientific, methodological and special literature on the issue, as well as the experience of wrestling coaches using various methods of sports selection.

In the methodology of sports selection, the aspect of interaction between biological and social, inheritability of sports talent, anatomico-physiological data, etc., the consideration of medical and biological factors, which are covered in detail in the works of G. V. Barchukova [2]; V. G. Bauer [3]; A. C. Puni [10], is also important. They not only characterize the state of health of athletes, the level of their physical fitness, but also reveal morphofunctional features.

Study results, discussions: the article summarizes the data of theoretical and experimental work on the issue of selection of children for sports wrestling, determining the level of fitness in a particular sport, functional parameters, mainly related to the occurrence of psychophysical, technical mastery with the capabilities of the main functional systems of the body.

High athletic achievement is mutually determined mainly by three components - the structure of competitive activity, the structure of special training and the conditions in which the competitive activity takes place.

Table 1

Multi-year selection stages	Aims, objectives, focus of the selection stage
1. Mass selection	Assessment of the psychophysical condition of all schoolchildren in the region, taking into account their age capabilities

2. Sports selection	A system of organizational and methodological arrangements, including pedagogical, medical-biological, sociological, psychological methods of research, based on which the abilities of schoolchildren of different age groups are identified for activities in school sections, sports classes, school sports clubs, children's and youth sports clubs.
3. Sports orientation	Finding out which sport is appropriate for a beginner athlete to specialize in a particular sport or group of sports
4. Sports tryout	Selection of athletes with the same high level of qualification for inclusion in national teams at different stages of sports perfection

The term "competitive activity" refers to the actual competitive activity of the athlete during the direct performance of the competitive exercise.

The structure of special preparedness for competitive activity requires the establishment of factors that determine the level of training in a particular sport, functional parameters, mainly related to the occurrence of psychophysical, technical mastery with the capabilities of the main functional systems of the body.

Conditions of behavior of competitive activity (condition of equipment, facility, sports base, weather, etc.) depending on their standardization indirectly contribute or prevent the achievement of the final high sports result.

The analysis of individual research studies, in which the structure of competitive activity was studied, indicates that the specific requirements for separating aspects of preparedness (physical, technical, tactical, etc.) are determined by the nature of the sport in question as a consequence puts a certain demand on the individual capabilities of the athlete and indicates the advisability with the growth of sportsmanship in this sport for further improvement.

The positive side of the study of competitive activity is that competitions take place in extreme conditions, and therefore requires the athlete to maximize the stress of physical, mental and moral-volitional qualities, and all these components are manifested in unity.

And today in the second decade of the XXI century, when it is scientifically proved and none of the professionals in the sphere of psychophysical education has any doubts about the validity of the statement that a high level of psychophysical state of a person is the result of a complex interaction of hereditary genetic factors and training influence. It is known that the basis of heredity is genetic information, which largely determines the growth and formation of the organism, its adaptive reactions to external influences, the level of fitness and the rate of progressive development of motor abilities.

The reality of this situation suggests that high athletic performance is genetically predetermined.

However, even today for a certain part of organizational and scientific workers of physical education and sports training, until now many specialists believe in the unlimited possibilities of training effects and that one person can achieve equally high results in the manifestation of all individual basic motor abilities.

It is scientifically proved that the outstanding sports result is provided: by 75-80% due to the natural talent of the student (genetic predisposition) to a certain structure of competitive activity; by

15-20% due to the optimal organization of the educational and training process; 5-10% of the professional skill of the coach-teacher.

Conclusion. Thus, the selection should be based not on one or two (even important) criteria, but on a broad range of indicators that could objectively assess the individual characteristics of children and adolescents, a set of properties and qualities that ensure success in sports activities include:

1. Morphofunctional indicators - anthropometric measurement data.
2. Hereditary factors.
3. Consideration of biological and chronological age.
4. Development level of motor abilities and their growth rates.
5. Identification of children and adolescents capable of mastering the technique of sports movements.
6. Psychophysiological peculiarities of individual functions and properties of personality.
7. Athletic performance in competitions, competitive reliability.
8. Functional capabilities of the body.

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Rezyume: *Maqolada sport seksiyasida ko'p yillik saralash bosqichlarini tashkil etish masalalari yoritilgan. Unda sportda seleksiya navlarining asosiy bosqichlari keltirilgan: ommaviy seleksiya, sport seleksiyasi, sport yo'nalishi, sport seleksiyasi.*

Резюме: *В статье освещены вопросы организации этапов многолетнего отбора в спортивной секции. В ней представлены основные этапы селекции в спорте: массовый отбор, спортивный отбор, спортивная ориентация, спортивная селекция.*

Kalit so'zlar: *jismoniy tayyorgarlik, sport mashg'uloti, ommaviy tanlov, sport tanlovi, sport yo'nalishi, sport seleksiyasi.*

Ключевые слова: *физкультурная подготовка, спортивная подготовка, массовый отбор, спортивный отбор, спортивная ориентация, спортивная селекция.*

ENGINEERING SERVICE MODELING AGRICULTURAL COMPLEX OF KAZAKHSTAN

Shakhanov A.A.¹, Kaspakov E.Zh², Shakhanov A.A.³, Baidauletova M.Zh⁴.

Department of technological machines and equipment Kazakh Agrotechnical Research University named after. S. Seifullina, Astana city, Kazakhstan

¹*Doctoral student, E- mail: arslan_shahanov@mail.ru orcid -0009-0005-6485-8174*

²*Candidate of Technical Sciences, Associate Professor,*

³*Doctor of Economic Sciences, Professor E-mail: shahanov_aa@mail.ru, Orcid-0009-0000-0846-6618*

⁴*Doctoral student, E-mail: mr.ernarimadina@ mail.ru, tel. +7-778-100-59-44*

Summary: *The article proposes methods for assessing machine systems and agricultural technologies using a mathematical model. Existing mathematical models in agricultural production are the result of the lack of objective criteria and measures of information productivity of the engineering service as a whole. The authors carried out work to determine the effectiveness of the engineering and technical service (ITS) in the agro-industrial complex (AIC) using a multifactor mathematical model. Modeling an ITS model based on an information system will significantly reduce the implementation phase of new advanced complexes and machine systems.*

Key words: *engineering services, agro-industrial complex, management. modeling, mathematical model, forecasting, resource saving*

Introduction

Relevance. Modeling the engineering services of the agro-industrial complex of the Republic of Kazakhstan is an urgent task and most enterprises solve these problems with low resource savings and without taking into account methods of mathematical forecasting and modeling. An integrated approach to modeling the engineering and technical services and the material base of a repair enterprise is used by S.L. Averbukh, Zimin N.E., Mishina Z.N., Gerasimov V.S. et al.

The authors of this work systematically examined repair enterprises in various perspectives - technological, production, cybernetic, informational, structural-hierarchical, social, economic, organizational, and one of the most important conditions for increasing the productivity of the agro-industrial complex is the provision of reliable agricultural processes with appropriate technologies and equipment.

It is the security of agriculture as the innovative base of agricultural production that is the most important engineering system that determines the volumes, quality and economic characteristics of final agricultural products and it will be considered in conjunction.

Goals and objectives of the study. Considering the important role of the engineering and technical service (ETS) in solving economic and social problems in the agro-industrial complex, this system has the following goals and objectives that must be fulfilled in integration with other areas of agricultural production:

- increasing intensive and extensive production, increasing productivity;
- improving product quality and minimizing losses at all stages of production;
- resource saving in each operation (reduction of costs for fuel, seed, feed, energy, etc.) by 15–25%;
- increase in energy saturation, energy supply of arable land per 1 hectare to optimal values;
- increasing the technical level, quality and reliability of machinery and equipment;
- high-performance use of the machine and tractor fleet, at a high level of performance (bringing the technical readiness coefficient of the MTP to 0.85–0.88 instead of 0.80–0.82);
- formation of an integrated engineering infrastructure for agricultural production services;
- systematic training and retraining of personnel;

- ensuring environmental safety (protection of soil and the environment), creating comfortable and safe working conditions.

All of the above factors, as experience in the application of a mathematical model, should show that high productivity of fields and farms is achieved as a result of the introduction and integration into agricultural production of new highly efficient, resource-saving, high-precision technologies based on high-performance intelligent technology and its effective use.

Materials and methods

The rationale for the rational composition of machine and tractor parks (MTP) of an enterprise is made taking into account many of the above factors using the necessary information technologies and computer technology. Methods for determining the rational composition of MTP include - engineering design of MTP work, determination of the volume and timing of mechanized work, justification of the brand composition of MTP, calculation of the need for machine operators, auxiliary workers, vehicles, loading equipment and agricultural machines, determination of technological and technical-economic indicators of the use of equipment.

The work of the MTP is planned on the basis of technological maps developed at the enterprise and a machine system recommended for a given natural and climatic zone. Initial information used to substantiate the composition of MTP: natural production conditions of the farm (average field area, rut lengths, average soil resistivity, production standards); sown areas and crop yields; cultivation technologies, their placement in crop rotations, agrotechnical timing of field work; availability and main operational indicators of technical equipment; availability and characteristics of mechanical personnel; book values of cars and other indicators. When solving such problems, the minimum of reduced costs is usually taken as an optimality criterion.

The economic and mathematical model of the problem of substantiating the optimal composition of MTP includes a goal function and restrictions determined by the conditions of the problem [1]. Solving any of the variants of the problem of optimizing the composition of the MTP of the economy during planned calculations was impossible due to the presence of one monopoly property without the use of modern assessment tools, the disadvantage of which was a large number of unknowns and restrictions. The results of solving the problem on a computer were issued late and were adjusted to work plans in the form of tables. In addition to the above costs, the evaluation criteria used were direct operating costs, minimum labor resources, minimum power machines, minimum energy costs, etc. The main processing factors were not ranked and did not include all possible actions of the units in the calculation; the cost characteristics of the machines did not change.

Based on the calculations obtained, graphs of machine use were constructed and the number of transport equipment was determined for each level of machine use. In this case, the problem was solved in two stages. First, the rational composition of tractor brands was substantiated, then the machine use schedule for tractors of each brand and the required number of tractors. The minimum number of tractors of each brand was used as a criterion, subject to timely and high-quality completion of all work.

Let's move on to mathematical modeling of the processes of formation and renewal of the machine and tractor fleet across the entirety of its structural formation. An important direction of modeling will be the relationship between relative and absolute indicators when determining the optimization criterion. At the final stage of ITS modeling, the overall criterion will be the choice of the optimal rearmament and support strategy.

For example, the first relationship is "the production and technological structure of work for the development and production of high-quality agricultural products - a machine and tractor park." A feature of this model will be the presence of various forms of ownership such as a private and hybrid agricultural system of machines and it has a structure, internal interdependencies and external economic relations that are significantly different from the system of machines in other industries and other forms of ownership. The form of ownership in mathematical processing has a significant gap and a smaller cost due to forms of acquisition of equipment and technology. For example, a purchase at the expense of a private owner's own funds significantly reduced the cost of mechanized work to

25%, although the productivity and other indicators of the machine systems are equal. To make the above premises clear and convincing, we will build a model of a system that combines many parameters of the subsystems “volume of work in agriculture and the machine and tractor fleet”. For mathematical modeling of subsystems “volume of farming work” we denote: M_1 - set of system - technical, technological characteristics. The structure of this set reflects all the complexity; it contains blocks by type of work in agriculture and by its purpose. And yet, despite the large dimension of this set, especially for a large development system in agro-industrial complex (agro-industrial complex) farms, it is necessary to proceed from its unity, since the entire agro-industrial complex is reflected. This, however, does not exclude, but presupposes division into sets into relatively independent blocks with the establishment of a relationship between them and iterative aggregation.

Let us make the following division according to the existing management structure into interacting organizational levels in the agro-industrial complex:

1. Agro-industrial complex. 2. Branches of the agro-industrial complex (agriculture, animal husbandry, processing, storage, land reclamation). 3. Agricultural firms, JSC, LLP (farms using MTP). 4. Mechanization units (MP) in brigades, units, groups, etc.

The above proposed four levels of agro-industrial complex were calculated from the fourth, then to the 3rd, then to the 2nd, and the calculations ended at the level of the agro-industrial complex of the Republic of Kazakhstan.

In each structural block of the set there are X required variables and denoting the number of purchased cars, the task is aimed at determining the ratio of the quantitative and qualitative composition of the transport and transport transport hub

$$X_i \geq \sum_{k \in K} \sum_{t \in T} \psi_{jkit} X_{kit} \quad (j \in J)(t \in T) \quad (1)$$

where J -is the set of brands of tractors and agricultural machines; ψ_{jkit} - is the set of cars of the j -brand in the k -th unit at the i -th job in the t -period; j - index of the tractor brand of potential participants; X_i -is the desired variable, indicating the number of purchased tractors, agricultural machines, i -brands; (in each case, when processing the model, each energy vehicle corresponds to an agricultural machine for some period)

The second group of research is a variable, and its characteristics are the required values; in this case, the range of technical characteristics of machine-tractor units (MTA) has a range. One of the tasks of forming a control system for mathematical modeling will be an economic assessment of the feasibility of the study in the form of:

$$M_1^3(x) \in M_1 \quad (2)$$

For mathematical modeling of the subsystem: machine and tractor fleet, we denote: M_1 - as a set of characteristics and parameters of the standard size and age composition of MTP. This set corresponds in its structure and complexity to the solutions to the structure of problem M_1 outlined above, reflecting the levels of management of the development of agriculture and the machine and tractor fleet. It contains three fundamentally different units for the purposes of technical re-equipment:

$$M_2 = \{M_2^1 M_2^2 M_2^3\}, \quad (3)$$

where M_2 is a set of characteristics of available machines, which, in terms of their technical and age level, correspond to production and technological requirements; $M_2^3(j)$ - the same thing, new machines offered to the market by mechanical engineering (fundamentally new technology for patent searches with corresponding technical solutions).

The elements of the M_2^1, M_2^2, M_2^3 set include, respectively, their funds Φ of machine resources of the existing machine and tractor fleet, as well as the required number X_i of new machines

and their variables, which must be acquired to carry out production and technological processes in agriculture or can be acquired to expand the volume of mechanized work. Thus, a set is formed:

$$\Phi \in M_2 \quad \Phi = \{\Phi_1^1 \dots \Phi_{m1}^1; \Phi_{m+1}^2, \Phi_1^2; \Phi_{.1+1}^2 \dots \Phi_{r3}^2\} \quad (4)$$

All groups of parameters included in the M_2 set are variables containing the technical and resource characteristics of the fleet and their composition will change due to the write-off of worn-out equipment, as well as the sale or lease of unused equipment; elements of the subset M_2^3 , containing the technical characteristics of new equipment of the machine-building complex, must be determined in their stock resource part Φ_r^3 of the number of new machines purchased or leased. Thus, the set M contains a subset of the required X , as well as the known parameters - new arrivals and write-offs of cars.

The model configurator is a part of a complex object under study, obtained by dividing it into simpler ones in relation to a machine-tractor unit. In other words, configurators are alternative models of the desired basic forming factors of the system. Looking further at configurators, the authors experiment with the system to obtain the desired result.

Processing using formulas 1-4 showed a more accurate model of compliance with the real conditions of agricultural production.

The results of the research conducted by scientists [2] made it possible to substantiate a scientific approach to the problem of modeling enterprises for specific conditions. Since management indicators are random variables that depend on various factors, to study the influence of the number and composition of the engineering service (engineering and technical service), as well as to develop mathematical models, a multifactor regression model for the formation of the number of engineering services is presented by the authors in the form of corresponding indicators.

The model for the formation of indicators is presented as the difference between the levels of factors for the use of technology and was considered in specific farms, in particular where the following phenomena occur:

- change in the number of engineers and technical workers (compared to this indicator in the base economy);
- change in the resulting indicator under the influence of objective factors in the base economy;
- change in the resulting indicator under the influence of controlled factors;
- increments of objective and adjustable factors, respectively.

Since the influence of uncontrollable factors in the studied groups of farms is comparable in strength, the analysis was carried out only with regulated organizational and technical factors that determine the number of ITS.

The resulting regression equations and transformations of factors corresponding to operating conditions revealed the main factors that determine the operating conditions of the engineering service as a complex system.

The group of factors determining the activity of ITS as a result of processing showed that for grain farms, after the procedure of eliminating unimportant factors, a multifactor model with low indicators of influence on the mathematical model is more effective. Regression coefficients changed the number of engineers for each set of farms under study; if you increase or decrease by one the average value of any of the factors with fixed values of the analyzed factors included in the model, then their numerical value also changed and the main factor remains such as the energy output of labor.

The structure is significantly influenced by the brand and quantitative composition of MTP farms. Research has revealed the negative role of multibrand MTP: it causes an expansion of the range of spare parts, an increase in the costs of their acquisition, maintenance (MRO) and repairs. The search, acquisition and delivery of spare parts require unproductive labor costs of engineers. In addition, with a variety of brands of MTP, the range of equipment for maintenance and repair of machines is significantly expanded, which complicates control of the completeness and technological

sequence of operations. This, in particular, determines the increase in the average number of engineering and technical personnel with an increase in the x_{1n} indicator.

The regression equation illustrates the relationship of other factors with the performance indicator. The resulting equations made it possible to determine the directions for improving the engineering service of farms in Kazakhstan. For example, first of all, reducing the variety of brands of transport equipment, reducing the number of structural divisions, optimizing the cost ratio of machines and energy resources, reducing the number of engineering and technical personnel by increasing the energy-to-labor ratio. The results of these studies in general and according to the study of M.I. Goryachkin made it possible to model a typical engineering service for one farm in Kazakhstan, justify the standards of the direction's needs taking into account the most influential factors, and also develop and implement unified methodological principles for assessing the activities of ITS [2].

Such methods of processing models would make it possible to streamline the remuneration of specialists and regulate the organization of work of engineers based on the use of modern management tools, which at this stage are chaotic.

In work [3], other factors on the result characterizing the activities of the engineering service of an agricultural enterprise were also studied. Research has revealed the irrational use of engineering workers' working time in management functions. For example, up to 80% of the time of ITS specialists was spent on issues the solution of which does not require special training, while a little more than 1% was devoted to long-term planning, analysis of the use of mechanical equipment, and the working time of machine operators.

When choosing the most efficient combine, it was necessary to take into account other requirements and restrictions that had little effect on the cost of mechanized work, and ITS specialists had more systemic and non-productive losses of time when choosing forms of operation. The four levels of research, with growth and weight, increased the difference between relative and absolute assessment indicators. The correlation of the criteria showed that the 20 factors involved in the calculation had 20th place in rank, which had a slight effect on the value of the general optimization criterion. Non-comparable absolute values obtained as a result of modeling were converted into relative ones and their influence on the ranking of agro-industrial complex levels was determined. This complicated the results and increased the system error; therefore, the most optimal method for assessing performance was ranking and summation by industry and area.

As a result, it is proposed to have an optimal ratio between fixed assets and working capital, which are prerequisites for increasing the efficiency of ITS and agricultural production in general.

Discussion

The study shows that most of the time on farms is still spent on unproductive use of time and the problems of saving resources that do not require professional training are not taken into account. Separately, we should highlight the need for a more productive and accessible model for the formation of the engineering service of the agro-industrial complex.

Significant shortcomings in the quality of planning and increasing the level of machine use in the economy were revealed when engineering service specialists solved problems that did not correspond to their qualifications (organizational design, analysis, planning) [2].

The increase in the payload of technical equipment with the introduction of a specialized information service had a positive impact on the annual operating time of tractors, such as an increase from 550 hectares to 640 hectares of operating time per season for one combine. Increasing the proportion of qualified engineering and technical workers in the service reduces the need for the services of third-party service companies and the costs of these services.

To determine the number of ITS specialists, a modeling problem with levels of implementation of specialized forms was formed and solved. The model made it possible to reveal existing shortcomings, identify underutilized reserves and create the same prerequisites for the effective operation of ITS of all farms. ITS as an information system with the property of additivity has overall efficiency. The change in unit costs depending on the structure and efficiency of the

service, with an increase in the overall reliability of information channels and the optimal number of control ranks, shifts downward, and with an increase in the information efficiency of the ITS, greater centralization of service management is required by reducing intermediate steps.

This study shows the need for a comprehensive construction of a rational structure of ITS as an information system. At the same time, along with increasing the reliability and capacity of information channels, the specialization of personnel should be increased, which will eliminate intermediate steps and optimally redistribute and combine the functions of engineering and technical personnel. The justification and implementation of an effective model for organizing ITS activities based on an information system made it possible to significantly shorten the implementation phase of new progressive machine complexes and advanced labor techniques [1]. The extensive labor organization of engineers and technicians that exists in real production is the result of the lack of objective criteria and measures of information productivity of production management systems in general.

Conclusion

Thus, the task of modeling ITS comes down to determining the parameters of the service as a dynamic system that best transforms information flows. The output parameters of the model are determined by the timely processing of information by specialists and the entire service as a whole. The general appearance of the model with input and output variables reflects the dynamics of transformation of information from the agricultural engineering service.

As a result, the modern engineering service of the agro-industrial complex of Kazakhstan is characterized by a lot of associated and unproductive resources spent. In particular, only about 1% of time and costs are spent on ITS development. Significant shortcomings in the quality of planning and increasing the level of machine use in the economy were revealed when engineering service specialists solved problems that did not correspond to their qualifications. Although the share of manual labor did not decrease, in some cases, on the contrary, it increased.

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Rezyume: Maqolada matematik model yordamida mashina tizimlari va qishloq xo'jaligi texnologiyalarini baholash usullari taklif etiladi. Qishloq xo'jaligi ishlab chiqarishidagi mavjud matematik modellar umuman muhandislik xizmatining axborot samaradorligining ob'ektiv mezonlari va o'lchovlari yo'qligi natijasidir. Mualliflar ko'p faktorli matematik modeldan foydalangan holda agrosanoat majmuasida (AIC) muhandislik-texnik xizmat (ITS) samaradorligini aniqlash bo'yicha ishlarni amalga oshirdilar. Axborot tizimiga asoslangan ITS modelini modellashtirish yangi ilg'or komplekslar va mashina tizimlarini amalga oshirish bosqichini sezilarli darajada qisqartiradi.

Резюме: В статье предлагаются методы оценки систем машин и аграрных технологии с помощью математической модели. Существующие математические модели в сельскохозяйственном производстве есть результат отсутствия объективных критериев и измерителей информационной производительности инженерной службы в целом. Авторами

проведена работа по определению эффективности инженерно-технической службы (ИТС) в агропромышленном комплексе (АПК) с применением многофакторной математической модели. Моделирование модели ИТС на базе информационной системы позволит существенно сократить фазу внедрения новых прогрессивных комплексов и систем машин.

Kalit so‘zlar: muhandislik xizmatlari, agrosanoat majmuasi, menejment. modellashtirish, matematik model, prognozlash, resurslarni tejash

Ключевые слова: инженерные службы, агропромышленный комплекс, управление. моделирование, математическая модель, прогнозирование, экономия ресурсов,

HISTORY OF DEVELOPMENT OF KURASH AS A NATIONAL SPORT

Allanazarova A.B.

Karakalpak State University named after Berdakh

Summary: *The article studies the history of development of the national sport Kurash as a tradition of national physical activity within the territory of modern Uzbekistan, emphasizes the significance of the national sport Kurash in the positive impact on young people, in strengthening the spiritual and physical health of the nation.*

Key words: *physical training and sports, folk epic, feelings of patriotism, kurash, archaeological findings, custom and tradition, physical training, national patrimony, values, humanity, popularization.*

Introduction. Uzbekistan pays great attention to the development of sport and physical culture. Over the years of independence, the country has created an effective system of training professional athletes, coaches and referees. Accomplishment of these goals will fully contribute to the wide promotion of a healthy lifestyle, education of comprehensively developed youth, further development of physical culture and sports in the country.

Uzbek athletes, achieving high victories at prestigious international competitions, demonstrate to the whole world the high sporting potential of our country. The results achieved by our athletes at the 2024 Olympic and Paralympic Games held in Paris are the most successful for Uzbekistan in the history of the country's independent development. With 13 medals (8-2-3), the republic ranked 13th in the overall medal standings among 206 nations, 1st in Central Asia, 1st in CIS and 4th in Asia.

This shows the world Uzbekistan as a country where sport is developing at an accelerated pace. This is what we are justifiably proud of.

Many sports are practiced in Uzbekistan. The most popular are: athletics, boxing, football, gymnastics, tennis, wrestling, judo, cycling and the national wrestling "Kurash".

The national sports of Uzbekistan are an integral part of the cultural heritage of the Republic of Uzbekistan in the field of physical culture and sport, the basis for fostering feelings of patriotism and love for the Homeland in the population, and the desire to enhance the country's authority in the international arena.

Uzbek national wrestling "Kurash" is one of the most ancient sports and has its own bright, interesting history. In ancient oriental sources, Kurash is mentioned as a spectacular combat sport. The famous Hungarian scientist L. Kun in his book "The General History of Physical Culture and Sports" notes that Kurash has its ancient history [3].

Archaeological finds and historical manuscripts confirm that wrestling has long been an integral part of the Uzbek way of life. Cylindrical Bronze Age pottery found in ancient Bactria (southern Uzbekistan) depicts two wrestlers, one wrestling with the other. Another archaeological find from the same period shows a wrestlers' fight. These unique finds show that Kurash was part of our ancestors' way of life as early as 1.5 thousand years ago. According to the Greek writer Claudius Aelianus (II-III centuries AD) and other historical figures, the daughters of the Sakas tribe, who lived in this area, chose a groom by fighting with young men. An example of this is the conditions of Barchin in the Uzbek folk epic "Alpomish".

In IX-XVI centuries, Kurash was widespread among the Uzbek people. During this period, the popularity of Kurash increased among the Pakhlavon Makhmud and Sadik Polvon tribes. There is also a type of individual wrestling of Uzbek people called belt wrestling. There are many archaeological finds and historical manuscripts associated with it. A statue found in ancient Mesopotamia 5,000 years ago depicts wrestlers competing in belt wrestling. An ancient Chinese manuscript "Tang shu" states that weddings and festivals in the Fergana Valley would not have been held without Kurash competitions. Ahmad Polvon, Khoja Polvon and others became famous in this type of Kurash (late 19th - early 20th century).

Kurash is an Uzbek word that means "achieving a goal by fair means". In those ancient times, it was a combat sport and public physical entertainment at traditional festivals, feasts and weddings. Mentions of it can be found in many ancient literary sources. 2500 years ago the famous ancient Greek philosopher and historian Herodotus in his monumental work "History" mentions Kurash in his descriptions of customs and traditions of the peoples of ancient Uzbekistan. The legendary epic Alpomish, which appeared a thousand years ago, calls Kurash the most beloved and widespread form of combat sports. The great oriental scientist and thinker Avicenna, the founder of modern medicine, who lived in the 10th century, wrote that practicing Kurash is one of the best ways to maintain the health of body and mind. In the 14th century, Amir Timur used Kurash for physical training and self-defense of his soldiers.

The art of wrestling has been known to many peoples since ancient times. Wrestling was especially widespread in Greece and was a regular element of the ancient Olympic Games. Various forms of national wrestling exist in Greece, Italy, Japan, Turkey, Iran, Afghanistan, Russia, Uzbekistan, Georgia, Armenia, Azerbaijan, Kazakhstan and other countries.

For more than three thousand years Kurash did not go beyond Central Asia. The techniques, traditions, rules and philosophy of Kurash have been orally passed down from generation to generation, from fathers to children. No attempts to systematize and generalize knowledge about Kurash were made until 1990.

When the famous Uzbek master of Kurash, Judo and Sambo, Komil Yusupov completed his research. He developed new universal rules of Kurash. They combined Kurash's thousand-year-old traditions of courage and humanity with the demands of the modern world of sport. He introduced weight categories, gestures and terminology based on 13 Uzbek words, the duration of a combat, uniforms for athletes and referees, and everything else without which modern sport cannot be imagined in Kurash.

Thanks to these actions taken by Komil Yusupov to revitalize the historical heritage, it is Uzbekistan that today has the primacy in identifying it among other combat sports, developing certain rules as a sport, and giving it the status of an international sport.

The combat, being a national treasure, embodied centuries-old philosophy, values, respect for the opponent, humanity, fair. That is confirmed by simple rules, let us remind: joint locks and chokeholds, grabs below the waist and any kind of aggression and humiliation are forbidden; wrestling takes place exclusively in a stand-up position, it is forbidden to wrestle in a lying position, if the opponent's body rests on the third point, the wrestling stops.

Kurash is, first of all, a competition of strength and agility with mutual respect of competitors for each other. All this makes Kurash a simple, understandable, spectacular, dynamic and safe sport, accessible to both young men and people of advanced age. And, the terms, for example, "kurash", "halal", "ta'zim", "tukhta", "yonbosh" have naturally entered the international sports lexicon.

During the years of independence, a number of resolutions and concepts were adopted to further develop the national sport of Kurash.

As a result, with the direct support of the state, Kurash is popularized not only in Uzbekistan, but also widely recognized as an international sport [10].

Thus, on September 6, 1998 in Tashkent, with the participation of representatives of 28 countries of Asia, Africa and Europe, the International Kurash Association was established, uniting about 130 national federations. The Association determined the coordination of national and continental federations of kurash wrestling, as well as the inclusion in the Olympic Games program, which is very honorable.

In 2010, The International Kurash Association was recognized by the World Anti-Doping Agency. Along with this, at the 36th General Assembly of the Olympic Council of Asia (2017, Ashgabat, Turkmenistan) for the first time in history the national sport "Kurash" was officially included in the program of the XVIII Summer Asian Games.

Resolution of the President of the Republic of Uzbekistan from November 4, 2020, No. PP-4881 "On measures to develop and further increase the global stature of the national sport of Kurash" was adopted.

Conclusion. Thus, in order to bring to future generations the rich traditions and values of the national sport of Kurash inherited from great ancestors, to enhance the role of Kurash in the international arena as a brand of Uzbek sport, to further strengthen the sense of patriotism among young people by supporting and encouraging their interest in the national sport of Kurash.

A number of activities are being carried out to popularize, develop and establish in the world our national sport Kurash, which embodies national values, in particular courage, bravery, patriotism and humanity, as well as turning Kurash into a pearl of world sports.

At the same time, the growing popularity of Kurash requires the organization of prestigious international competitions, modernization of the existing infrastructure and material and technical base, improvement of the provision of sports equipment and outfit, expansion of their production, as well as further increased attention to the training of qualified personnel, coaches and referees for this sphere.

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Rezyume: *Maqolada kurash milliy sport turining zamonaviy O'zbekiston hududida milliy jismoniy faoliyat an'anasi sifatida rivojlanish tarixi o'rganilib, kurash milliy sport turining yoshlarga ijobiy ta'sir ko'rsatish, millatning ma'naviy va jismoniy salomatligini mustahkamlashdagi ahamiyati ochib berilgan.*

Резюме: *В статье исследуется история развития национального вида спорта "Кураш" как традиции национальной физической активности на территории современного Узбекистана, подчеркивается значение национального вида спорта "Кураш" в положительном воздействии на молодежь, укреплении духовного и физического здоровья нации.*

Kalit so'zlar: *jismoniy tarbiya va sport, xalq eposi, vatanparvarlik tuyg'usi, kurash, arxeologik topilmalar, urf-odat va an'analar, jismoniy tarbiya, milliy meros, qadriyatlar, insonparvarlik, ommalashtirish.*

Ключевые слова: *физкультура и спорт, народный эпос, чувство патриотизма, кураш, археологические находки, обычаи и традиции, физкультура, национальное наследие, ценности, гуманизм, популяризация.*

**FEATURES AND FACTORS OF IMPLEMENTATION OF PUBLIC-PRIVATE
PARTNERSHIP PROJECTS IN THE SERVICE SECTOR**

Aytbaeva G.K.

Karakalpak State University named after Berdakh

Summary: *The article discusses the aspects that need to be paid attention to and the tasks that need to be performed in the implementation of public-private partnership projects in the service sector.*

Key words: *PPP projects, project selection, analysis, social impact, risk, monitoring.*

Today, the implementation of public-private partnership (PPP) projects in the service sector in our country depends on a number of features and factors. The following aspects are important for the success of this process:

1. Regulatory and legal framework, a strong legislative framework is necessary for PPP projects. The government of our country has developed a number of laws and regulatory documents aimed at the development of PPPs, which regulate the participation of the private sector.

2. Selection and analysis of projects, their economic efficiency, social benefit and stability should be taken into account when choosing PPP projects in the service sector. Projects should be related to the possibility of attracting investment.

The selection and analysis of projects is an important factor in the implementation of public-private partnership (PPP) projects in the service sector in the Republic of Uzbekistan. This process includes a number of key aspects: Goals and objectives of projects. Projects must first of all meet the needs of society and the strategic goals of the state. Projects must provide social benefit and economic efficiency.

Economic analysis. To assess the economic efficiency of the planned projects, a cost-benefit analysis should be conducted. In this process, it is important to consider investment, operating costs and expected returns.

Social influence. It is necessary to assess the social impact of projects. This includes aspects such as improving the quality of service, creating new jobs and improving the well-being of the population.

Risk analysis. For each project that is planned to be implemented, potential risks are identified and evaluated. Risk management strategies should be developed to ensure the successful implementation of the project.

Choosing experienced partners. When choosing representatives of the private sector to participate in projects, their experience, financial and technological capabilities should be taken into account. This helps to improve the quality of the project.

Innovative solutions. The possibility of using innovative technologies and solutions in projects should be explored. This helps to improve service quality and ensure efficiency.

Market demand. Implementation of projects requires consideration of market demand and competitive conditions. Projects that meet the needs of the market are more likely to be successful.

Monitoring and evaluation. Monitoring and evaluation mechanisms should be developed to ensure the success of projects. Results and indicators should be defined for each phase of the project.

Political and economic environment. It is necessary to analyze the political and economic environment in which the projects will be implemented. Changing circumstances can affect the success of projects. Taking into account these aspects, it is possible to ensure the successful implementation of PPP projects in the service sector in the Republic of Uzbekistan. The process of selecting and analyzing projects requires a thorough and systematic approach.

3. The participation of the private sector and the role of the private sector in the projects, attracting their financial and technological resources, as well as providing experienced specialists, are important in improving the quality of service. The participation of the private sector plays an important role in the implementation of public-private partnership (PPP) projects in the service sector in the Republic of Uzbekistan. If we stop at this process, the main factors are the following:

Investment attraction, the private sector is important in attracting financial resources, as well as in providing the necessary investments for the project. This will reduce the financial burden of the state and enable faster implementation of projects.

Experienced professionals, the private sector often has experienced professionals in their field. They can help introduce innovative solutions, new technologies and service delivery methodologies. Quality and efficiency, the private sector aims to improve the quality of service delivery and efficient delivery of services. Private companies working in a competitive environment strive to constantly improve their services. Risk sharing, private sector participation in PPP projects creates an opportunity to share risks. Risks can be clearly defined and managed through mutual agreements between the state and the private partner. New technologies and innovations, the private sector can be especially active in introducing new technologies and innovative solutions. This helps to improve the quality of service and reduce costs.

Communicating with the public, the private sector can better communicate with the public and consumers, understand and respond to public needs. This makes the services more flexible. Social responsibility, private companies often undertake social responsibility, which helps to increase the social impact of projects. For example, supporting local communities and responding to their needs. Sustainable development the private sector, with its resources and expertise, also plays an important role in ensuring sustainable development. They support socio-economic development by introducing environmentally friendly technologies.

The participation of the private sector in PPP projects is important for the modernization of the service sector, improving quality and ensuring socio-economic stability. Establishing effective cooperation between the public and private sectors in this process will help to ensure the success of the project.

4. Risk management. Risk management is an important factor in the implementation of public-private partnership (PPP) projects in the service sector in the Republic of Uzbekistan. Effective risk management facilitates project success and efficient use of resources. Key aspects of risk management are: Risk identification is the process of identifying potential risks for each project. This includes economic, financial, social, technological and environmental risks. Risk assessment, in which the identified risks are evaluated, that is, the degree of impact and probability of each risk is taken into account. In this process, the severity of risks and their impact on the project are analyzed. Risk planning, in which risk management strategies are developed. A comprehensive plan is drawn up for each risk, which shows ways to minimize or avoid risks. Risk sharing, where risks are shared between the public and private sectors. This process is carried out based on the resources and capabilities of each party, which helps to manage risks more effectively. Monitoring and control, in which monitoring and control mechanisms should be developed during the risk management process. Risks should be monitored and assessed at each stage of the project. Immediate response, when risks arise in this process, a quick and effective response system must be provided. This helps to deliver the project on time and within the set goals. Learning and improvement, where it is important to study the results of each project and improve risk management strategies. The lessons learned will help improve risk management in future projects. Communication between the team and partners, where open and effective communication between the public and private sectors is important in risk management. This enables rapid joint decision-making when risks arise. Political and economic factors, in this factor, the political and economic environment of the country should be taken into account in risk management. Changing conditions can create risks, so they must be constantly monitored.

These aspects mentioned above help to implement the process of risk management in a more effective and systematic way in the implementation of PPP projects in the service sector in the Republic of Uzbekistan. Effective risk management is important to ensure project success and achieve long-term sustainable development.

5. Social and economic impact. The social impact of the projects, including the creation of new jobs and the improvement of the population's well-being, are also important. Continuous

monitoring of project results is necessary to ensure economic stability. The social and economic impact of the implementation of PPP projects consists of many aspects.

Below are some of these impacts:

social impacts: increased service quality, private sector experience and innovation improves service delivery, leading to higher quality services for the public. Job creation: PPP projects create new jobs, especially in the infrastructure and service sectors. Disadvantaged support means that social services, such as health, education and social protection, can be made more available to disadvantaged groups through projects. Social stability, providing good services, ensures social stability and helps to reduce social conflicts.

Economic effects: attracting investments, PPP projects allow attracting private investment, which helps to develop infrastructure without burdening the state budget. Increase efficiency, where the private sector is often more efficient, leading to lower costs and higher quality of services. The development of the local economy will allow local businesses and enterprises to offer their products and services through PPP projects, which will support economic growth. The improvement of the competitive environment, in which the participation of the private sector increases competition, which leads to further improvements in the quality of services.

Public-private partnership projects in the service sector have the potential for social and economic impact, but successful implementation requires planning, monitoring and compliance.

6. Organizational structure. To implement PPP projects, it is necessary to clearly define organizational structures, responsibilities and powers. This speeds up the work process and increases efficiency. The organizational structure plays an important role in the implementation of public-private partnership (PPP) projects in the service sector. The organizational structure defines the processes, roles and responsibilities necessary for the successful implementation of the project.

Below are the main components and elements of the organizational structure in the implementation of PPP projects: Organizational structure, that is, the project management team is the team responsible for managing the project and includes the project manager and managers. They develop and execute project strategy. The public interest group, residents, community organizations and other stakeholders, should be involved in the project process to participate and express their views.

Technical and expert teams, which are teams of professionals with the technical knowledge and experience required for the project, ensure the quality of service. Representatives of the private sector, these are private companies responsible for project implementation, providing resources and providing services. In the implementation of public-private partnership projects in the service sector, it is important to ensure an effective organizational structure, clear definition of roles and responsibilities, process management and effective communication.

7. Local and international experience It is of particular importance to study the experiences gained from PPP projects in other countries and adapt them to the conditions of Uzbekistan. This is especially useful when introducing innovative solutions and modern technologies. Local and international experiences play an important role in the implementation of public-private partnership (PPP) projects in the service sector. They allow you to learn about innovations, successful strategies and effective methods. The main aspects of local and international experiences were presented, they are:

Local experience. Examples of Uzbekistan: PPP projects are being implemented in Uzbekistan in the fields of healthcare, education and infrastructure. For example, partnerships with private companies have been established to improve school education. Social services: projects to outsource social services to the private sector to help the disadvantaged, which can improve the quality of services and improve the well-being of the population. Infrastructural projects, the introduction of PPP in the development of road construction and transport infrastructure plays an important role in the development of the local economy.

International experience. In Great Britain, the PPP model is widely used in the health and transport sectors. Partnerships with the private sector have been established to improve the quality of

care provided by the NHS. Successful projects in the fields of education, transportation and energy are being implemented in the USA through PPP projects. For example, private investments are being attracted for the development of public transport and road infrastructure. In Australia, there are examples of projects aimed at increasing the social and economic impact of PPPs in the service sector. They include innovative approaches and collaboration. Learning from relevant experiences, lessons learned from both experiences and successful examples will help in planning and implementing PPP projects. Taking into account local conditions is important to take into account local conditions, economic and social characteristics when adopting international experiences.

8. Communication with the public. Taking public opinion into account and establishing a dialogue with the population ensures the acceptance and social stability of projects. It is important to consider these factors for the successful implementation of PPP projects in the service sector in the Republic of Uzbekistan. Through these, it is possible to improve the quality of service and achieve socio-economic development. Communication with the public is important in the implementation of public-private partnership (PPP) projects in the service sector. This process is necessary to ensure the success of the project, involve stakeholders and consider social benefits.

In conclusion, in the implementation of PPP projects, the selection of projects based on risk assessment, studying local and international experiences, social and economic impacts, and most importantly communicating with the public determines the successful future of the project being implemented.

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Rezyume: *Maqolada xizmat ko‘rsatish sohasida davlat-hususiyy sheriklik loyihalarini amalga oshirishda e‘tibor qaratilishi zarur bo‘lgan jihatlar va amalga oshirilishi kerak bo‘lgan vazifalar o‘rganilgan.*

Резюме: *В статье рассмотрены аспекты, на которые необходимо обратить внимание, и задачи, которые необходимо выполнить при реализации проектов государственно-частного партнерства в сфере услуг.*

Kalit so‘zlar: *DXSh loyihalari, loyihalar tanlovi, tahlil, ijtimoiy ta‘sir, risk, monitoring.*

Ключевые слова: *проекты ГЧП, отбор проектов, анализ, социальное воздействие, риск, мониторинг.*

CINEMA AND MUSEUM INTEGRATION

Karamanova G¹., Dauletnazarova G²., Utemuratova Kh¹.

¹*Karakalpak State University named after Berdakh,*

²*Nukus Mining Institute at Navoi State Mining and Technologies University*

Summary: *This article talks about the importance of the integration of cinema with the museum.*

Key words: *film, uzbekfilm, karakalpakfilm, cinematography, culture, actor, documentary films, film festival, theater, museum.*

On December 28, 1895, it was the first time in the world that a short film called "The arrival of the train at La Sota station" was shown to the public at the "Grand Cafe" on the Capuchin Boulevard in Paris. That's why December 28 is celebrated as International Film Day.

The film industry of the Republic of Uzbekistan has a history of more than a century, and has followed its own path of development and occupies an important place in the cultural and spiritual life of our people.

On August 3, 2017, Sh.M. Mirziyoyev the President of the Republic of Uzbekistan, made a speech in the meeting with the representatives of the creative intelligence of Uzbekistan and he pointed out that: "If we are going to introduce Uzbekistan to the whole world, we will do this firstly through film production" [1, 192]. At the same time, our President's opinion about organizing special groups to produce films on the basis of state order dedicated to our great historical figures proves the great attention to the field.

PQ-3176, the decision of the President of the Republic of Uzbekistan "On measures to further promote national cinematography" was adopted on August 7, 2017, [2] and it was highlighted to reconstruct the film studios of "Uzbekfilm", "Karakalpakfilm" and scientific fiction, as well as documentary films, moreover to improve their material and technical base, to equip them with modern technologies, and build new cinemas.

In fact, cinema is one of the main tools for promoting our deep history, our national and general human abilities, and our rich culture, and has many educational opportunities.

Although the first steps towards the development of the cinematography in Karakalpakstan began in the 30s of the 20th century, the first film productions in the place took place in the 1920s. In the 1930s, cinema reached the level where local people could watch it. Film exhibitions were organized in the district centers and in the villages, and mainly chronicle-documentary, propaganda films were screened. There were not our own films, because there were not enough film editors. In 1929-1930, there were only 2 stationary bars and 4 cinematographs.

In 1934, the process of film production in Karakalpakstan continued very slowly. It can be said that 35 movie theaters in Goskino were so passive. Aleksandrovsky, the head of the Roskino department, could not handle his duties properly. New films were not bought, old ones were not renewed, they were stored in warehouses. In December 1934, a cinema hall with sound was opened for the first time. The speakers for the sound cinema were bought from "Ózbekkino". On January 21, 1935, a decision was accepted on the establishment of a special Republican film fund, the budget of it was planned to build cinemas, and to improve cinema buildings and service. Film trest received the name "Karakalpak kino" (Karakalpakfilm). [3]

In 1935, a separate film trest was established in Karakalpakstan. Delivering films were organized also in Shimbay, Shabbaz, Khojeli and Nukus. Moreover, the sound theater was established. The film distribution fund was filled with good and new films. In order to provide better service to the audience, the Kino Trest has taken action on the promotion of film productions in other places of the republic. In the third quarter of 1935, all the villages of the district were equipped with sound film equipments. [4]

By the 1950s, the service of cinemas to the people of villages was greatly improved, and the number of cinemas increased. Cinema mechanics and motorists have been doing exemplary work in cinemas in all regions of our republic. At the same time, movie screenings were improved in "Respo" cinemas in Khojeli, Shimbay, Kungrad region, Nukus. [5]

In 1950, the Department of Cinematography under the Council of Ministers of the Karakalpakstan ASSR organised a number of events to provide cultural services to workers during the spring planting season. 13 moving cinemas have been organized through the republic. The repertoire of the moving cinema groups included works depicting the lifestyle of that time of our country. [6]

The establishment of the Nukus branch of the "Uzbekfilm" film studio In 1970, shows the formation of the Karakalpak national film industry. M. Kayumov, J. Aymurzaev, N. Daukaraev were those who played a significant role in the creation of the film industry in our country.

In the 70s and 80s of the 20th century, 38 cinemas and 413 movie delivering places worked in Karakalpakstan.

In the 1980s, the first great films in the history of Karakalpak tofraphy were released - "Gum-gum", "Nepokornaya", ecological films "Aral sand", "The Year of Snakes", etc. O. Abdirakhmanov's film "Aral sand" was nominated for "The Best Documentary Film" (Makhachkala, 1988), M. Tuychiev's film "Gum-gum" by O. Abdirakhmanov took part in the San Francisco film festival and won awards (1990).

Kuwaitbay Abdireymov, the first Karakalpak film actor, People's Artist of Uzbekistan and Karakalpakstan, candidate of the Berdakh state award, played the role of Zaripbay in the film "Karakalpak Girl" ("Nepokornaya"). Kuwaitbay Abdireymov was born in 1937 in Takhtakupir region. From 1966 to the end of his life, he worked as an actor, director and chairman in the Karakalpak State Academic Musical Theater named after Berdakh. He hadf a close bond with the "Uzbekfilm" and "Kazakhfilm" studios and played a number of main roles in several films. He also played roles in "Mosfilm" and "Kyrgyzfilm". The book about Quwatbay Abdireymov (1937-2014) was published by T.Bayandiyeu in 1987 in Karakalpakstan publishing house.

In 2002, a full-length film "Tank" was filmed in "Karakalpakfilm" with the participation of local actors and the authorship of local cinematographers. This comedy film, written by the People's Writer of Karakalpakstan M. Nizanov, has a special place in Karakalpak cinema. This film has been dubbed into Uzbek and Russian languages and has become a great film that has attracted the attention of many moviegoers. In the film, the traditions of the Karakalpak people are shown with master. M.Nizanov, director T.Kalimbetov, cameraman D.Abdullaev received a State prize called Berdakh in 2004 also, the prize of the competition for the best screenplays of the state joint-stock company "Uzbekkino". Such movies as "Thief", "Neighbors", "Kurort" and "Stubborn" which were created by the group were also successful in the production of the film studio [7].

Toreniyaz Kalimbetov (1954-2019) is a well-known film director, a cultural employee in Uzbekistan was born on January 19, 1954 in Shymbay region. In 1976 he graduated Tashkent Culture Institute. He worked in various main positions in "Kazakhfilm", in the television and radio company of the Republic of Karakalpakstan, in the film studio "Karakalpakfilm" and in the agency "Karakalpakkino", and he made almost 30 documentary films.

"Karakalpakfilm" studio created a film magazine named "Karakalpakstan" including more than 200 documentary, scientific fiction and real life stories[8]. These films have involved all aspects of our country's life. Among them were films dedicated to archaeological monuments and places of pilgrimage in our country. For example, the services of S.P. Tolstoy, the famous archaeologist, who managed the Khorezm archaeological-ethnographic expedition, are mentioned in the film "Ancient Monuments", and the historical and cultural monuments of the country are depicted.

The films "Mizdakhan", "Shılpık", "Asirler guwası Guldirsin", "Altın miyras" were also produced with similar content. In the film "Muqaddes ziyarət orınları" there is historical information about the pilgrimage site of Sultan Vayis Baba, in the film "Hakim Ata" the representative of

medieval Sufism, Ahmet Yassawidi's disciple, the mausoleum of the poet Sulayman Bagirgani (Hakim Ata), full information about his life and work path is given.

In the Decree of the President of the Republic of Uzbekistan No. PP-158 dated September 11, 2023 on the "Uzbekistan-2030" strategy, 100 goals under 5 important directions are included. [9] 1.5 row of the important 1st direction is called "Reforms based on the development of spiritual development and the development of culture" and the 44th goal in it is "Development of national cinematography". In terms of the effectiveness of the goals to be achieved by 2030: in 2024-2030, there will be more than 50 film projects that represent the history of our country, the scientific, cultural and spiritual heritage of our great ancestors film festivals are also broadcast on TV channels; 10 multi-part films and serials about national heroes are set to be released.

From a philosophical point of view, the two lines of development of cinematography: the development of the message structure is shown as the development of the means of expression, while two aspect of the film language consists of the message and expression [10]. The initial forms of this cinematography branch are also rooted in theater. The examples of the museums are the beautiful art collections of the Roman baths, European churches and monasteries. In terms of numbers, movies can also replace the museum. The dynamics of the museum's funds is included.

As mentioned above, the film products of "Uzbekfilm" and "Karakalpakfilm" were planned to be taken place from the museums under certain themes and planned to deliver to the audience with the help of high technology. Documentary films are. Furthermore, It would be appropriate to organize the premieres of movies that express our history, our traditions and cultural heritage, our historical figures, state, science, and art enthusiasts in our museums, or to implement the integration of cinema and museum.

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Rezyume: *Ushbu maqolada kino san'atining muzey bilan integratsiyasining ahamiyati haqida so'z yuritiladi.*

Резюме: *В этой статье рассматривается важность интергации кино с музеем.*

Kalit so'zlar: *kino, O'zbekfilm, Qoraqalpoqfilm, kinematografiya, madaniyat, aktyor, hujjatli filmlar, kinofestival, teatr, muzey.*

Ключевые слова: *кино, Узбекфильм, Каракалпакфильм, кинематография, культура, актер, документальное кино, кинофестиваль, театр, музей.*

MODERN MECHANISMS FOR DEVELOPING THE INTERCONNECTION BETWEEN REPRESENTATIVE AUTHORITY AND CIVIL SOCIETY INSTITUTIONS

Bayriyeva A.Q.

Karakalpak State University named after Berdakh

Summary: *This article analyzes issues related to the development of interaction between representative authority and civil society institutions at the current stages of development.*

Keywords: *Cooperation, representation, authority, civil society, mechanism, model.*

Throughout history, humanity has achieved great results through cooperation, solidarity, and mutual assistance. It is difficult to imagine human life without cooperation and mutual aid. This natural instinct, which urged humans to live together, work in harmony, and, in general, to live, initially served to protect them from natural disasters and predatory animals in the early periods of human existence. In the current stage of social development, this instinct is applied in all areas, and it is precisely on this basis that humanity has reached the level of prosperous life it enjoys today.

The great thinker Abu Nasr Al-Farabi expressed the significant role of mutual cooperation in achieving human happiness with the following thoughts: "A city that unites people who assist each other to achieve true happiness is a virtuous city, and a community that unites people to achieve happiness is a virtuous community" [1].

In this context, it is important to pay attention to the scientific aspects of the relationship between representative authority and civil society institutions. There are various views in scientific research regarding the relationship between representative authority and civil society. However, it can be said that "representation" refers to the representative activities within state authority, while "civil society" is the arena for citizens' participation and involvement in state and societal affairs.

The activities of representative bodies of power and the necessity of cooperation with civil society institutions require attention to certain analyses. Three main aspects of the concept of representation are highlighted:

- Representation as an authorized representative;
- Ordinary representation, having the average characteristics of certain groups;
- Symbolic representation [2].

Deputies are representatives authorized by citizens for a certain period. The parliament itself is a symbol of these people's representatives and, at the same time, the unity of society. The activities of parliament as an institution also imply three meanings. Voting means carrying out one of them. Debates are the most important aspect of parliamentary activity, and it should always be a platform for continuous negotiations.

Based on various characteristics inherent in the essence of representative authority, we can highlight the following main features implemented through representative authority:

- Elections and the expression of people's interests;
- Decision-making through consultation or in a collective manner;
- The unique characteristics of the interconnection between people's representatives and voters.

Only when these qualities are observed as a whole does the representative function of the relevant institutions come into play. Accordingly, it allows the description of representative authority itself as national representative bodies.

In our opinion, the organization of representation refers to the special procedure for forming bodies of representative authority that embody various interests of citizens. This can be organized in different ways, but it is mainly achieved through general, equal, and direct elections by secret ballot. Through elections, national representative bodies manifest their most defining quality - representing the people. The legal basis of state authority in the form of a people's representative body is the

representative mandate, i.e., authority "given" by voters or other participants in the electoral process to trusted representatives.

Political theories also include several normative models developed at various stages of the development of the Western system of representation.

The Trustee Model. Often associated with the name of E. Burke, the proxy model represents representation as a moral obligation: voters choose individuals whom they trust to possess certain abilities and competencies, and it is assumed that representatives act on their behalf. This model includes a purely elitist campaign, forming a specific elite within the structure of representative authority that distributes power resources; it actually compares a person's level of knowledge with a sense of social responsibility, which is why it is criticized. Representation achieved through this model is associated with high moral and intellectual methods.

The Delegate Model of a trustee, on the other hand, views the representative as a means to express the opinions of the voters; in this model, delegates are advised not to adhere to their own opinions and desires. Like the previous one, this model is theoretically constructed and is not applied in political practice.

However, in some principles of designing representative institutions, its essence changes. For example, regular elections, short-term mandates, the right to recall a deputy, the use of referendums in addition to the usual legislative process, and others uniquely transform it. In this case, the meaning of representation lies in the voters' ability to clearly express their interests.

Unlike the initial two models, the mandate model reflects the ongoing practical activity of representation within a party: by winning the election, the party receives a mandate that gives it the right to implement policies in accordance with its pre-election promises. However, this model is also not very precise, as it assumes that voters vote for the party's political program and expect it to be reasonably fulfilled. Thus, representation is linked to the party's success, effectiveness, and its ability to conduct elections at a high level.

There are also other models of representation. For example, some radical theorists propose viewing the representative body as a miniature version of society, a microcosm. From this model's perspective, the extent to which a representative is relevant to representation is connected to the social group that elected them and their experience and knowledge.

This model, which is very vulnerable to criticism, has been tested in some electoral practices (e.g., in the form of quotas). Without considering this collection of models as complete, it can be used as a means of distinguishing the influence of political elite members and mass groups on representative relations.

Civil society is a dynamic and multi-level system capable of developing optimal decisions on socially significant issues, reflecting the democratic interests of the majority of citizens, and expressing and satisfying the needs of people and society through interactions with public associations that reflect self-management.

Based on the above, it can be said that in representative authority, people are recognized as the main source of power. By electing their representatives to state bodies and local state authorities, citizens directly participate in governance. In short, this is a system of relations arising from the expression of the interests of individual citizens, communities, and associations engaged in legitimate activities.

The activities of civil society institutions are based on the necessity to perform the following functions:

- Increasing the level of civic activity among the population;
- Developing the legal culture of citizens;
- Improving democracy;
- Actively involving leaders and influencers from the population in governance;
- Developing vertical and horizontal public relations and strengthening the interactions between the population and political power.

In conclusion, it can be said that in recent decades, the concept of representation in modern democratic theory has significantly expanded, encompassing not only traditional institutional forms (political parties, pressure groups, and other civil society institutions) but also other non-institutional forms of political participation (social movements, informal civic groups, active citizens, etc.). In the context of the crisis of the traditional political representation institution – the political party – these new social groups and citizens have emerged as bright representatives and defenders of their interests. Therefore, in modern democratic theory, democratic representation is defined as a mechanism for citizens to influence the political decision-making process (through political representation and other non-institutional forms of political participation). At the same time, there is notable growth in "non-institutional participation" in almost all Western countries [3]. According to many prominent European scholars [4], this trend reflects the direct influence of citizens on political decision-making [5]. This, in turn, highlights certain questions about the necessity and effectiveness of reforming the institution of representation.

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Rezyume: *Ушбу мақолада тараққиётнинг бугунги босқичларида вакиллик ҳокимияти ва фуқаролик жамияти институтлари ўртасидаги ўзаро алоқадорликни ривожлантиришига оид масалалар tahlil qilinadi.*

Резюме: *В этой статье анализируются вопросы, связанные с развитием взаимодействия представительной власти и институтов гражданского общества на современных этапах развития.*

Kalit so‘zlar: *Ҳамкорлик, вакиллик, ҳокимият, фуқаролик жамияти, механизм, модел.*

Ключевые слова: *сотрудничество, представительство, управление, гражданское общество, механизм, модель.*

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THE ROLE OF WOMEN'S ENTREPRENEURSHIP IN SUSTAINABLE ECONOMIC DEVELOPMENT OF SERVICE ENTERPRISES

Kazakhbaev E.S.

Karakalpak State University name after Berdakh

Summary: *The main objective of the article is to study the role of a female entrepreneur in the conditions of the modern economy. The research methods are a systemic approach, a comparative and retrospective analysis method, and a synthesis method. In the process of the analytical review, two target tasks are solved: the formation of a basic understanding of the concept of "women's entrepreneurship" and the formation of possible ways of further research into the development of women's entrepreneurship in the country.*

Key words: *Entrepreneurship, female entrepreneur, female entrepreneurship, barriers to female entrepreneurship, high-potential female entrepreneurship, development issues, gender specifics of doing business.*

In the modern world, in the conditions of rapid development of science, engineering, and technology, new technologies of innovative nature are rapidly emerging, leading to the transformation of the principles of economic activity. There are already such achievements in the world as knowing about human nature and the way business markets work. At the same time, new products are being created with great frequency, where created products are improved in order to increase competitive advantages and in connection with the emergence of new market needs. New market needs and the sustainable development of organizations can provide the development and creation of new products. In our opinion, such products should be innovative products. Innovative products are products that have technical characteristics that surpass those of competitors, and consumer properties and are oriented to meet both current and future needs at a high level. At the same time, at present, there is no methodological toolkit developed in practice that allows us to determine the characteristics of innovative products and which should be applied in practice when creating these products.

Today's experience has shown that a stable economy is achieved through highly competitive products that form a new product market or fundamentally change the existing market. The advanced development organization, which sells the product on the market, turns out to be, for some time, practically a monopolist in this market, and the product itself is dominant. Based on these conditions, the stability of the organization arises. In order to maintain this stability, organizations need to update their products and not wait for the moment when the break-even point is reached. The break-even point refers to the position of the enterprise in which the enterprise covers only its costs and produces a critical volume of output. The manufacturer does not need to wait for the break-even point to be reached, as the time to create innovative products is practically minimal in specific conditions. In this regard, it is necessary to determine the time lag when the break-even point is reached and by this time to realize the production of innovative products with competitive advantages compared to what was produced earlier. The production of any product is determined by the level of development of production relations and the productive forces achieved in the organization. At the same time, almost every organization seeks to improve the competitiveness of its products. Our research shows that the organization that has set this goal should be guided by the law of product competitiveness management.

Entrepreneurship is a general, blanket term related to starting a business. But its precise definition has long been a matter of debate among scholars and policymakers. "Despite widespread interest in the topic and a broad recognition of its importance to the economy, there remains a lack of consensus about how to specifically define entrepreneurship," the nonpartisan Center for American

Entrepreneurship notes. "'Entrepreneur' is an English derivation of the French word (to undertake), leaving wide latitude for interpretation and application. Howard Stevenson, known as 'the godfather of entrepreneurship studies' at Harvard Business School (HBS), has defined it as the 'pursuit of opportunity beyond resources controlled.' As fellow HBS professor Tom Eisenmann elaborates, "'beyond resources controlled' implies resource constraints. At a new venture's outset, its founders control only their own human, social, and financial capital. Many entrepreneurs bootstrap: they keep expenditures to a bare minimum while investing only their own time and, as necessary, their personal funds. 'The Stanford Center for Professional Development at Stanford University offers a somewhat simpler definition: 'At its most basic level, entrepreneurship refers to an individual or a small group of partners who strike out on an original path to create a new business. An aspiring entrepreneur actively seeks a particular business venture and it is the entrepreneur who assumes the greatest amount of risk associated with the project. As such, this person also stands to benefit most if the project is a success.'". How Entrepreneurs Fuel Economic Growth Innovation and entrepreneurship undeniably contribute to economic growth, making them a particular area of interest for economists and policymakers worldwide. However, some scholars say that the growth created by entrepreneurship can be exaggerated.

For one thing, growth from entrepreneurial activity doesn't occur evenly across an economy. Studies of economic growth have pointed toward an apparent paradox in which the growth in productivity overall in the U.S. has been only modest in recent years, despite the pervasiveness of entrepreneurship, innovation, and innovation ideology. According to studies by the National Bureau of Economic Research (NBER), this is because innovation affects industries very differently, having a large impact in some sectors of the economy but little impact in others. While generally positive, the link between entrepreneurship and improving societal welfare is also complicated, influenced by factors such as regional population, entrepreneurship density, and the specific industry in which the entrepreneurial activity is taking place, according to the scholarly literature. What's more, some studies have suggested that economic growth may be correlated to an increase in overall inequality in certain circumstances. Scholars say that in the U.S. income inequality and economic growth have been linked since the 1970s. The level of economic development of a country can also affect whether entrepreneurship will lead to greater economic growth there. In the 20th century, driven by the decline in manufacturing and the shift toward service businesses, industrialized market economies in later stages of economic development—like the United States and parts of Western Europe, such as Germany and Sweden—were able to benefit greatly from entrepreneurship, the economist and management professor Zoltan Acs has noted. Starting in the 1970s, those countries saw a rise in entrepreneurship, which reversed the previous trend in their economies, when workers favored high-paying jobs with big companies over self-employment. Other factors may be relevant as well. Scholars point out that the U.S., in particular, has benefited from a large and competitive domestic market, a highly developed financial system, and a high level of long-term government support for basic science. For developing countries, on the other hand, entrepreneurship isn't a panacea for growth. A study of 74 economies across a six-year period concluded that less developed countries should not base their economic policy on "generic entrepreneurship" if they desire to stimulate economic growth. The authors argue that focusing on programs that develop human capital, take advantage of economies of scale, and entice foreign capital are more effective in spurring economic growth. Italy may provide an additional example of a country where high levels of self-employment have proved to be inefficient for economic development. Research has shown that Italy has experienced large negative impacts on the growth of its economy because of self-employment. A competitive environment is an environment in which the necessary conditions are created for continuous and unrestricted competition. This environment is typical of a highly competitive market. Its main features are freedom of private property, freedom of economic choice, free pricing, free choice of methods of economic competition. The following factors mainly affect the competitiveness of an enterprise: the level of service of the enterprise during the warranty period and the warranty period of competing products; the level of product promotion in various ways and its effectiveness;

the level of organization of service of the enterprise and its efficiency; reputation of the company and trademarks of the company; change in prices for the company's products depending on demand and supply in the market; an increase in the share of exported products in the total volume of production (which indicates the breadth of the market), etc. The difficult situation in the global economy in 2020 also influenced the dynamics of GDP growth in the country. At the end of 2020, the volume of investments in fixed assets in real terms decreased by 8.2% compared to 2019 and amounted to 202.0 trillion. soums. At the end of 2020, the country's foreign trade turnover amounted to \$ 36.3 billion (13 percent less than in 2019). At the same time, the total export volume amounted to \$ 15.1 billion (13.4% less than in 2019), excluding gold exports -\$ 9.3 billion (30% less than in 2019). The sharp decline in exports was negatively affected by the decline in exports of services (41.7%) as a result of a sharp decline in its composition in terms of energy (79.8%), raw materials (19%), investment goods (2.4%). By the end of 2020, imports of goods and services amounted to \$ 21.2 billion, which is 12.8% less than in the previous year [6]. The implementation of programs for reforming, restructuring and diversifying production, strengthening the material and technical base laid the foundation for the development of industrial production in the country. As a result, in 2020 the volume of industrial production will increase by 0.7% compared to the previous year and will reach 367.1 trillion. soums.

The low growth rates of industrial production were influenced by a 21.9% decrease in the production of mining products (the share in the industry as a whole -9%). The processing industry, which accounted for 83 percent of the industry, grew by 7.1 percent. The share of high-tech industries in the total technological structure of the manufacturing industry is 1.9% (in 2019 -1.5%), medium- and high-tech industries -22.4% (25.4%), medium-low-tech industries -40.1 percentage (36.6 percent) and low-tech industries -35.6 percent (36.5 percent). To achieve an external competitive advantage, a firm must provide a product with a quality advantage, reduce costs, and ensure profitability. This situation increases the firm's influence on the market and allows it to offer goods (services) at a higher price than competitors. For firms to gain the advantage of internal competition, they need to innovate in production and reduce the cost of competitors' goods (services). Based on the methodological approaches used, we have determined the competitive environment in the retail trade of Fergana for 2019-2020 between the countries producing knitwear. The share of children's underwear produced in Uzbekistan, including the Fergana region, is 45-46%. However, the share of Uzbekistan in women's outerwear is the lowest -15-16%, and in men's outerwear -16-18%. 42-52% of women's underwear and outerwear are produced in Turkey. Analysis of the average prices for commercially available knitwear shows that the cheapest of them are produced in Uzbekistan.

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Rezyume: Maqolaning asosiy maqsadi zamonaviy iqtisodiyot sharoitida tadbirkor ayolning rolini o'rganishdir. Tadqiqot usullari tizimli yondashuv, qiyosiy va retrospektiv tahlil usuli va sintez usulidir. Tahliliy tahlil jarayonida ikkita maqsadli vazifa hal etiladi: "ayollar tadbirkorligi"

tushunchasi to'g'risida asosiy tushunchani shakllantirish va mamlakatda ayollar tadbirkorligini rivojlantirish bo'yicha keyingi tadqiqotlarning mumkin bo'lgan yo'llarini shakllantirish.

Резюме: *Основной целью статьи является исследование роли женщины-предпринимателя в условиях современной экономики. Методами исследования являются системный подход, метод сравнительно-ретроспективного анализа, метод синтеза. В процессе аналитического обзора решаются две целевые задачи: формирование базового понимания понятия «женское предпринимательство» и формирование возможных путей дальнейшего исследования развития женского предпринимательства в стране.*

Kalit so'zlar: *Tadbirkorlik, tadbirkor ayol, ayol tadbirkorligi, ayol tadbirkorligidagi to'siqlar, yuqori salohiyatli ayol tadbirkorligi, rivojlanish masalalari, biznes yuritishning gender xususiyatlari.*

Ключевые слова: *Предпринимательство, женщина-предприниматель, женское предпринимательство, барьеры для женского предпринимательства, высокопотенциальное женское предпринимательство, проблемы развития, гендерные особенности ведения бизнеса.*

THE CONCEPT OF "CONVENIENCE INDEX" AND ITS USE IN MODERN GEO-URBAN STUDIES

Jumakhanov Sh.Z., Nematova M.A.

Namangan State University

Summary: *In this article, the content of the concept of "Convenience index" and the use of factors determining comfort in modern geo-urban studies, the factors affecting the organization and development of a comfortable urban environment are studied. In order to assess the comfort level of the Namangan city, the sociological research method was implemented using IT technologies through the docs.google platform. In a sociological research, problems of socio-economic development of Namangan city, which is considered the largest city of Uzbekistan, were identified, and the representative opinions of the respondents were studied and relevant conclusions were drawn.*

Key words: *index, city, comfortable, uncomfortable, Arcadis Sustainable cities, indicator, urban environment, respondent.*

Introduction.

In the conditions of the market economy, cities play an important role in shaping the national economy, culture and social life of the country. Consequently, as the population of cities continues to grow, so do the problems associated with providing a comfortable and sustainable urban environment for residents.

In this regard, it is important to study the concept of "convenience index" in geo-urban studies from an economic geographical point of view. Convenience of the urban environment covers a wide range of aspects, including the quality of infrastructure, availability of services, level of environmental pollution, level of safety and opportunities for social activity. The "Convenience Index" is the level of accessibility and availability of various services, infrastructure and resources for residents in a city. It is an evaluative category, in which factors such as public transport, the quality of the road network, the presence of green spaces, health care facilities, educational institutions, shops and other facilities are taken into account as evaluative criteria. Also, the "convenience index" is the creation of a socio-economic environment that provides a high quality of life for the population, makes the city more attractive for living, working and recreation, and ensures its sustainable economic development.

Therefore, the rapid development of cities is mainly related to the industrial revolution. The construction of many plants and factories, the improvement of the function of cities, and the increase in the demographic load have led to the increase of cities and changes in their configuration. In Uzbekistan, large-scale research work is being carried out on the development and implementation of the urban reconstruction and comfort index.

Goals and tasks of work .

The main *goal of the research work* is to determine the criteria of the concept of "convenience index" in modern geo-urban studies and to make recommendations for the development of urban development strategies based on the analysis of the projects of urban research organizations. To achieve this goal, the following *tasks* are defined in the work:

- criteria and defining the main principles that determine the "convenience index" of cities;
- to study the criteria large megacities for assessing the level of comfort for living in cities;
- consists of developing criteria for assessing the convenience of the Namangan city which is the focus of this research.

Research methodology.

The principles of territoriality, complexity, historicity, ecological and democentrism and methods such as cartographic, system-content, historical-geographical analysis, geographical comparison, statistical analysis were used in this article.

The level of study of the topic.

The theoretical and methodological issues of urban geography and geo-urbanism have been scientifically researched by both foreign and local experts. In particular, scientists such as G.M.Lappo[4], I.M.Mayergoyz[5], R.Murphy, M.Pacione[6], E.N.Pertsik[3], one of the world's largest representatives of the science of geourbanism, studied the formation, functional types, classification, configuration, structure and socio-economic of cities, conducted their own research on development. D.N.Ganchenko and Y.A.Tarzanova[2] evaluated the concept of "comfortable urban environment" from the point of view of the construction industry as a space that meets the needs of citizens at a high level. In this regard, E.A.Razomasova [9] emphasized that the creation of a comfortable urban environment consists in improving, modernizing and improving the quality of living conditions. In this article to assess the comfort level of the Namangan city the questionnaire was conducted using IT technologies through the sociological research method docs.google platform and is evaluated .

The main part.

The human factor is the main criterion that determines the level of comfort in cities, whether it is acceptable or unacceptable. Determining the city's convenience index is based on established criteria, and a special algorithm is created using indicator data. As a result of the calculations, it is determined whether a certain area is suitable or unsuitable for the specified purpose. Conducting this research is important for monitoring the urban environment, identifying its issues, and improving the level of comfort through recommendations.

It takes into account various factors that determine amenities in an urban area.

1) *public transport* - a well-developed public transport network provides residents with convenient access to various parts of the city. In particular, such amenities include metro, buses, trams, bicycle paths, etc.;

2) *infrastructure for pedestrians and cyclists* - creation of safe and convenient pedestrian paths and bicycle paths will help to increase the activity of the population, reduce pollution and reduce the flow of cars;

3) *green areas and recreational parks* - the presence of recreational parks, green areas, botanical gardens, and other green areas allows residents to enjoy nature, enjoy outdoor recreation, and improve the ecological condition of the city;

4) *public recreation and entertainment places* - restaurants, cafes, theaters, cinemas, museums and other cultural and entertainment places create opportunities for communication, recreation and cultural development;

5) *educational institutions* - the existence of schools, lyceums, colleges, universities, libraries and other educational institutions allows the residents of the city to get knowledge and education;

6) *healthcare institutions* - hospitals, polyclinics, pharmacies and other medical institutions provide the population with the opportunity to use healthcare services;

7) *trade infrastructures* - the presence of shops, supermarkets, markets and other trade centers allows the use of goods and services necessary for everyday life;

8) *labor and business infrastructures* - office buildings, business parks, business centers and other objects provide jobs, business development and economic development of the city.

These facilities not only meet the basic needs of the population, but also help to create a sustainable, developed and pleasant urban environment in cities (Figure 1).

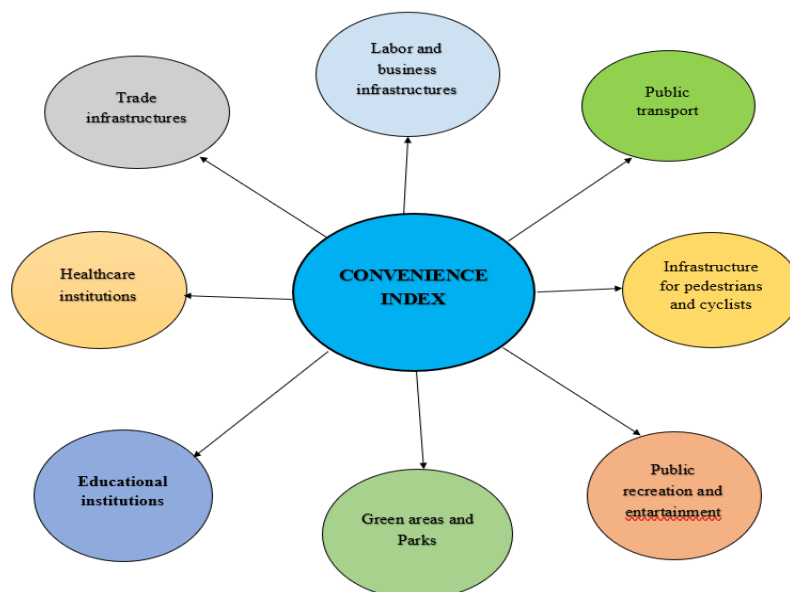


Figure 1. Convenience index of the urban area
Note: The drawing was created by the authors

A comfortable urban environment allows city residents to live a comfortable and quality life, to organize a safe and healthy lifestyle. The level of comfort of the urban environment affects the physical health of the residents, as well as their state of fatigue and stress. In addition, the establishment of green zones in the formation of the “comfort index” of the city is also of great importance. It should be at least 30-50 m² per capita. It takes four trees to produce enough oxygen for one person for a day. In particular, 1 hectare of trees cleans 18 million m³ of air per year on average. The trees on this area absorb 220-280 kg of carbon dioxide from the air in the hot season, trap 70 tons of dust per year, and release 180 tons and 220 kg of oxygen into the atmosphere. Avenues of trees and greenery provide shade and coolness on hot days and retain moisture in the soil. Due to this, the temperature in city parks is slightly cooler (2-4 °C), and air humidity is higher (13-14%) than in roads and avenues. Each square meter of green meadows in the avenues 200 g contributes to the cooling of the air by evaporating water per hour [8].

In addition, greenness in trees and greenery calms a person's psyche, reduces the time it takes to restore labor activity by 60%, increases endurance by 15%, increases concentration of thoughts. Accordingly, it is better not to have parks 2-3 km away, district parks 1.5 km away, children's parks 1 km away, flower gardens, and green avenues 400-500 m away from the residence.

It is also important to expand green zones around cities. These regions help to organize the recreation of city residents, improve the microclimate of the city, and ensure clean air. The scale of these regions should be established according to factors such as the size and function of cities. It is not appropriate to expand existing settlements, build new ones, or place industrial enterprises in these regions. Only recreation and health facilities, tourism, zoological and botanical gardens can be established in them.

Global cities such as Tokyo, New York, London, Vancouver, and Moscow have transformed into green parks due to the increasing focus on greening in many cities. This had a very positive effect on the city's eco-environment [8].

Trees are also important in reducing noise in cities. Between industrial areas and residential areas, established tree groves between residential buildings and busy roads reduce noise by 20%, while wide bushes and tree-lined avenues reduce noise by 10-12 dB. It has been found that constructing residences 200 m away from roads reduces the noise level by 20 dB. For example, air pollution, increased noise levels, poor water quality, and road conditions create multiple issues for the city's population. As a result, it adversely affects the health of permanent residents, resulting in

cardiovascular and respiratory diseases. Proportionately, trees and plants, which are necessary to achieve an ecologically clean environment, will also have negative consequences, as green spaces will decrease due to the construction of infrastructures and the expansion of roads. In order to eliminate these emerging problems, it is necessary to implement continuous monitoring of the urban environment in the city.

Comfort is necessary conditions for a person and their life, for example, the higher the humidity in the air, the stronger the hot temperature affects the person. A relative humidity of 50 percent and an air temperature of 16-18°C create favorable conditions for the human body. Air temperature is 24°C, relative humidity is 44-60 percent, wind speed is 0.7-1 m per second, creating very comfortable conditions for the human body [7].

Clean air, green spaces, quality infrastructure, clean drinking water, wide, clean and smooth streets, quality roads, and institutions that promote an active lifestyle and ensure the health of the population should be taken into account as the main factors that increase the comfort of living in the city. High-quality urban environment, variety and quality of services attract tourists. As a result, the economy of the city will develop and new jobs will be created. Certain obstacles can be encountered in creating a comfortable environment in cities. One of them is reducing the noise level in cities. In order to prevent this problem, it is necessary to implement the following complex measures, which are connected with each other:

- wide use of sound-absorbing devices and materials in urban construction and architecture;
- creating noiseless transport (improving the use of electric cars, bicycles, smart scooters).

Several criteria have been developed to assess the level of living comfort in cities worldwide. Among foreign methods, the following can be distinguished:

The Arcadis Sustainable Cities Index offers a new perspective on quality of life indicators based on three main criteria. Cities around the world are placed in three main columns according to specific indicators, including social, global, and economic ratings:

1). "Social rating" measures social indicators, including the quality of social infrastructure in a city. Europe is the clear leader in this indicator, with Western European cities occupying 15 of the top 20 places. Major Asian cities such as Seoul, Singapore and Tokyo are among the top 10 cities. This ranking shows the ranking of the world's cities by taking into account the evaluation of people and their quality of life.

2). "Global rating" takes into account environmental factors, mainly places cities with an ecologically clean environment at the top and evaluates them as livable. European cities monopolize these ranking positions. According to the 2022 report, cities such as Oslo, Paris, Stockholm, Copenhagen, Berlin, London, Antwerp, and Rotterdam have a high natural environment.

3) "Economic rating" - evaluates the business environment and economic indicators. Cities with high economic potential, a high share of the working population, and high levels of work quality are given a rating. US cities lead the way. But the cities with this rating have a relatively low score in terms of social rating and global rating [10].

The 5th edition of the Arcadis Sustainable Cities Index (Arcadis Sustainable Cities Index) for 2022 is recognized as the most comprehensive and in-depth analysis of urban sustainability and the key to unlocking urban prosperity and improving the quality of life. Arcadis Sustainable Cities Index-2022 ranks 100 cities of the world in these three pillars based on 51 indicators on 26 indicator topics under the three pillars of sustainability: planet, people, and profit. According to the given indices, the total is evaluated on a 360-point system. Depending on the final score, the quality of the urban environment is determined: if the index is from 0 to 180 points, it is considered to have an unfavorable urban environment, and if it is above 180 points, the urban environment is considered favorable. According to the results of 2021, the city of St. Petersburg was evaluated with 256 points. In the evaluation of this city, conclusions are based on 6 criteria [1]. According to the results of the research, the Norwegian city of Oslo ranked first in the Top 5 cities in the ranking of the best cities to live in the world.

The Economist Intelligence Unit's (EIU) Global Liveability Index measures livability, to determine which places around the world have the best quality of life. The main purpose of the livability rating is to determine the difficulties that a person can face in any situation. As a result, cities can be directly compared. Each city is rated according to a comfort rating based on more than 30 qualitative and quantitative indicators [11]. There are five broad categories of factors: stability, healthcare, culture and environment, education and infrastructure, which serve as the main criteria.

Each factor in the city is rated as acceptable, tolerable, inconvenient, unacceptable or intolerable. Quality scores are awarded based on the opinions of in-house analysts and in-town contributors. For quantitative indicators, the ranking is relative based on a range of external data. The evaluation of a total of 173 cities is based on the above indicators. Points are assigned according to the indicators, from 1 to 100 points. Then 1 point - 100 points from unbearable level is considered the most acceptable for living.

In 2019, the Russian Federation approved a project on the methodology of the urban environmental quality index. With his help, for the first time, the situation throughout the country was analyzed. The index revealed that the urban environment is comfortable for residents in 23.5% of Russian cities. 1,100 cities in Russia were studied, and the results of 2020 showed positive changes in 816 cities, with improvements in indicators and indices particularly in 3 criteria. Along with the CIS countries, Russia also evaluates The 6 most populated cities are evaluated based on 6 criteria and 36 indicators. In this scenario, the total score is 360 points, and to classify the urban environment as comfortable, the accumulated score must be 180 points or above. Indicators of cities with an unfavorable living environment are set from 0 to 180 points. Indicators of the city environmental quality index are evaluated according to 6 criteria that are important for city residents. They are as follows:

Criterion I : safety - is to determine the level of security of designated places and identify potential threats to human life and health.

Criterion II : Accessibility – assessment of accessibility and accessibility of the city for all groups of users in the existing space, including people with reduced mobility.

Criterion III : environment and health - allows to assess the current state of the environment in the city, as well as to determine the extent to which the use of city infrastructure meets the goals of preservation and, if necessary, restoration of the city's eco-environment.

Criterion IV : originality and variety - the uniqueness and functional diversity of the urban appearance, planning and architectural variability of buildings within the city.

Criterion V : modernity and relevance of the environment - to assess the city in terms of the opportunities it provides to the population, to determine the extent of the available opportunities and how the city complies with international principles.

Criterion VI : the management efficiency criterion allows assessment of the city government's efforts in creating the necessary conditions for a high-quality urban environment.

The criteria are related to the ability to maximize satisfaction of the city residents' needs in evaluating the urban environment based on specified indicators, therefore, the evaluation criteria of each type of space are considered to be the main needs of the city residents.

The criteria given above were used to assess the convenience of the city of Namangan. The city of Namangan, known as the "City of Flowers" , is becoming more beautiful as a result of the reforms, renovations and comprehensive creative works implemented in New Uzbekistan . Consequently, today the city of Namangan has become one of the most notable, attractive and charming cities. As a result of steady growth, Namangan city is becoming a 'millionaire city'. This, in turn, increases the need for various services and accommodation.

A total of 209 investment projects with a total value of 2.2 trillion soums were implemented in the city of Namangan in 2021-2022. During this period , 156 projects worth 1.1 trillion soums were commissioned. As a result, 7,218 permanent jobs were created. Population of Namangan city increased to 152 thousand people between 2018 and 2023. During this period, more than 300 high-rise buildings were built, and nearly 65,000 residents received new housing. In the city of Namangan, there is a need

for housing for 30,000 residents. The population of Davlatobod and New Namangan districts, which have been added as new districts of the city, is expected to increase by 25,000 people per year in the near future.¹² Therefore, it is necessary to evaluate the comfort of living in the city.

For this purpose, a sociological survey method was carried out using IT technologies through the docs.google platform to assess the comfort level of the city of Namangan. The majority of the respondents who took part in the sociological survey are students, people who come to the city for work, and permanent residents. The main amenities of Namangan city are related to education, housing, administrative offices, medical services, trade, and employment. This caused the population to move from rural areas to urban areas. After all, the city of Namangan holds its place on the scale of the republic today. A total of 218 respondents took part in the survey, 80.0 percent of whom are residents of the Namangan region. The questionnaire mainly focuses on the convenience of living in the city of Namangan level, representative answers were received by the respondents to improve its current and near future situation. Eliminating traffic problems, especially on highways, representative answers were gathered regarding current issues such as regulation of vehicle traffic, road expansion, and repair (specifically, the road connecting Lola-Chorsu-Sardoba). In addition, for the further development of Namangan city, ideas such as the establishment of comfortable housing, roads and recreational areas and the establishment of green spaces were given to the residents. In order to assess the comfort level of the city of Namangan, the importance of the city in the life of the respondents, the convenience and attractiveness of the city were researched through a questionnaire.

The conducted questionnaire asked: “What is the importance of Namangan city in your life?” – to the first question 15.0% of the respondents stated that they are permanent residents in the city, 25.0% live in rentals, and 48.0% come to the city for educational purposes. (Figure 2). The primary respondents are those who come to the city for work and study, including workers and students. 7.0 percent of the respondents came for work, while 2.0 percent came for the purpose of using various services (market, medicine, etc.). The lowest rate is for going to the city for recreation it can be seen that its share is only 1.0 percent. Therefore, the urban environment shows that the comfort level for recreation, recreation or walking is somewhat low.

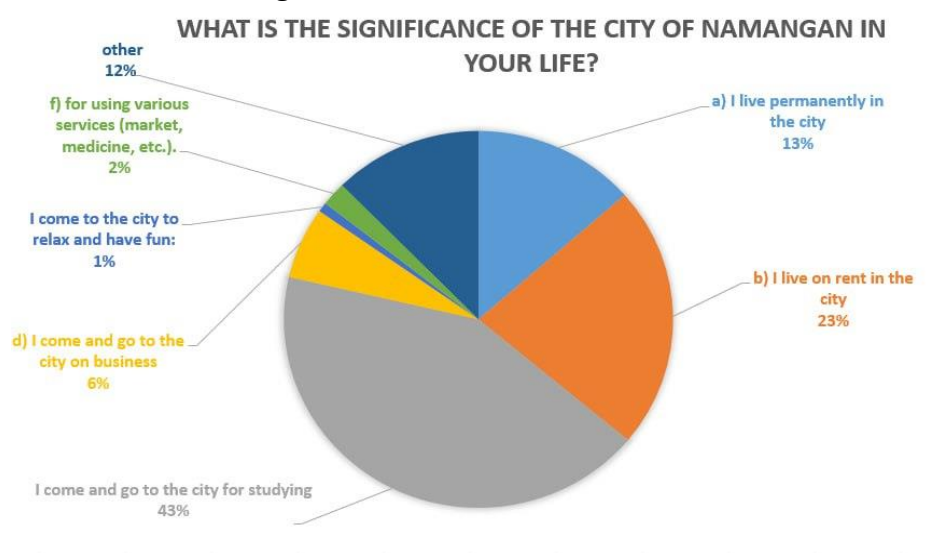


Figure 2. Representative answers of the respondents to the question “What is the importance of Namangan city in your life?”

The second question in the research asked: “What is the convenience and attractiveness of Namangan city?” – the analysis of the results of the question in the content shows that for the majority of participants, the number of technical schools and higher education institutions, as well as lyceums

¹² [Obod bo'layotgan Namangan \(uza.uz\)](http://obod.bo'layotgan.Namangan(uza.uz))

and schools, is one of the main factors that determine the convenience and attractiveness of the city for the participating respondents.

It can be seen that the majority of respondents who took part in the survey are young students. For example, 126 respondents or 56.0 percent cited the city's convenience and attractiveness as the reason for its availability of educational institutions such as university, technical school, lyceum college. At the same time, one of the factors determining the convenience of the city is the availability of quality educational centers. For example, 15.0 percent of the respondents are those who come and go to educational centers in the city. 8.0 percent of total participants indicated the convenience and attractiveness of Namangan city, the location of large amusement parks and the high quality level of service sectors (medicine, household services and public catering, salons). Next up presence of large and multi-product markets – 2.0 percent; location of administrative management offices - 3.0 percent; combination of work and residence almost at the same place - 2.0 percent; the quality of the infrastructure (electricity, heat, water supply, sewerage) system - 2.0 percent indicated that it is the main factor determining the comfort of the city (Figure 3).

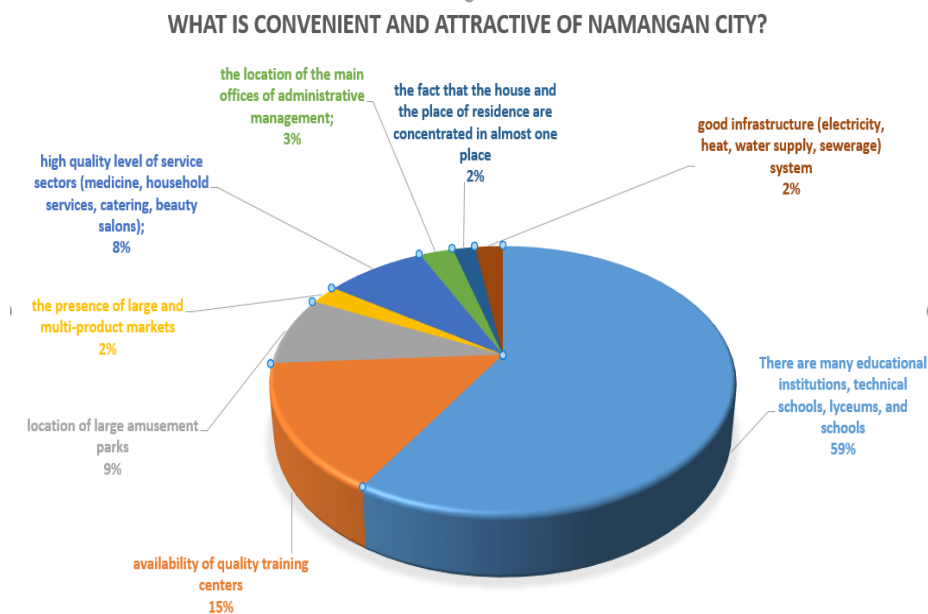


Figure 3. Representative answers of the respondents to the question "What is the convenience and attractiveness of the city of Namangan?"

Question 4 of the sociological questionnaire : " *How do you rate the inconvenience of Namangan city?*" - was named in the content, and the following results were obtained: narrowness of roads and traffic congestion as a result of deficiencies in road projects the share of those who suffer from its existence - 74.0 percent; 4.0 percent of the population who reported the noise of the city and the lack of cool places in the shade; the indicator of the segment of the population that complains that the environmental environment is not positive (city cleanliness, the state of garbage dumps, and landscaping works) is 12.0 percent; those who emphasize that buildings and structures are placed in a disorderly manner - 1.0 percent; those who stated that sewage and water supply were not properly established - 1.0 percent; those who stated that there is not enough parking for cars - 2.0 percent; those who suffer from non-compliance with traffic rules - 4.0 percent; 3.0 percent of the respondents stating that they have other similar problems (Figure 4).

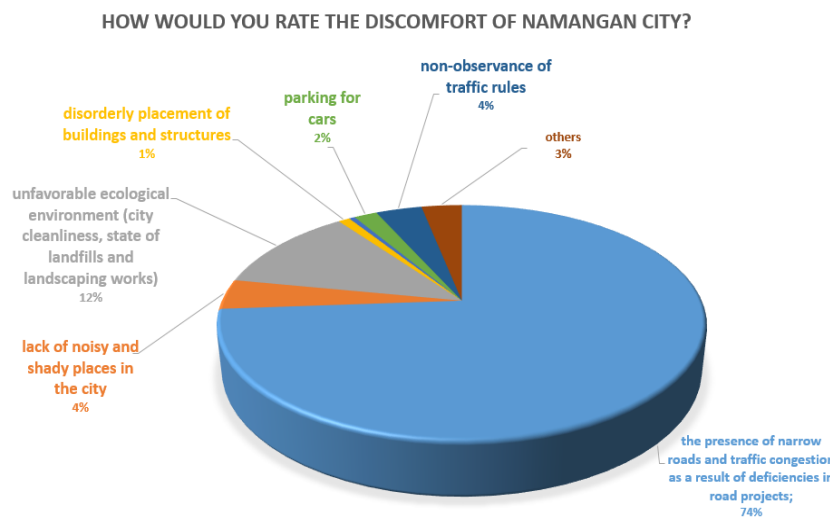


Figure 4. "What(s) do you rate the inconvenience of Namangan city?" - representative answers to the content question

From the above, it can be determined that the narrowness of the highways entering the city and the low traffic index indicate problems such as traffic congestion . As a result, it was found that the movement of vehicles is causing inconvenience. Road construction and repair of roads in the city remain the main urgent problems. According to the analysis of the opinions of the respondents, it was seen that the ecological environment in the city is not stable, and greening works should be carried out. For this, it is necessary to develop special projects and take measures to improve the urban environment.

The participants of the questionnaire were asked to determine which part of the city territory is comfortable for living : " *Which part of the city of Namangan do you think is comfortable to live in?*" - defined the following answers to the question. Respondents noted that the largest and most densely populated areas of the city - Chorsu, Lola, Dostlik, Gozal, Oromgoh dahashi, Davlatobod district are suitable for living . According to the respondents, Chorsu (34.0 percent), Lola (17.0 percent), Dostlik (14.0 percent), Davlatobod (18.0 percent) districts have particularly high indicators. regions. For example, Gozal - 4.0 percent, Oromgoh - 4.0 percent, and 9.0 percent of other regions rated it as comfortable for living.

When determining the urban environment, first of all, the level of provision of water, electricity, gas, and household services determines the preference for living (Fig. 5).

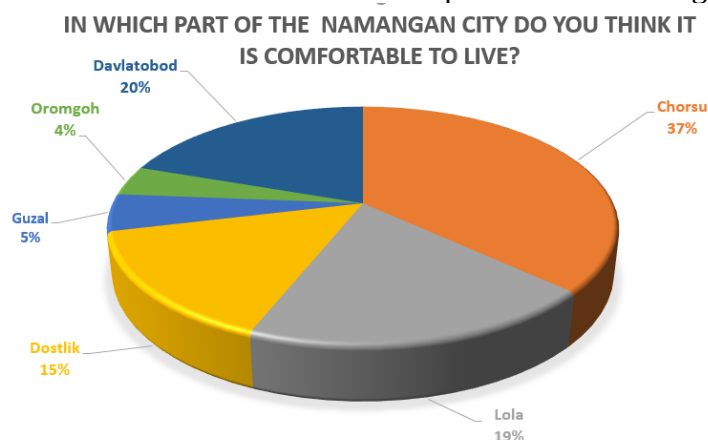


Figure 5. "In which part of the city of Namangan do you think it is comfortable to live?" - representative answers to the question in the content

"How would you rate the comfort level of the city of Namangan on a 5-point scale?" - the opinions of the participants were studied by answering the question. According to it, 35.0 percent of

the respondents noted that it was "less convenient", while 35.0 percent of the participants chose the "comfortable" option. 17.0% of the respondents who took part in the survey considered the very convenient option Namangan city as "very convenient" for living. This shows that the comfort level of the city environment is average.

In addition, the city has a high concentration of cultural centers, health care and other social infrastructures located precisely in the city's territory. Also, the urban environment is provided with quality service areas, water, gas, and electricity in relation to satellite settlements. This, to a certain extent, determines the high comfort level of the city (Figure 6).

Those who consider living in the city inconvenient are 8.0 percent, while those who consider it very inconvenient are 5.0 percent. From this, it can be concluded that the high level of pollution of the city's atmosphere or traffic congestion and inconvenience in the city's road transport caused the bad environment of the city. Question 6 of the questionnaire: "What suggestions or complaints do you have to further improve the environment of Namangan city?" Most of the opinions and suggestions given by the respondents indicated that the city road system should be reconstructed or repaired.

The analysis of the representative opinions of the respondents shows that 22.0% of them suggested that city roads should be repaired, traffic congestion should be prevented and this problem should be reconsidered. 6.0% of them suggested the need to develop new projects aimed at expanding the city's green spaces, planting many ornamental trees, further expanding the flower festival, and improving the city's ecological condition. 16.0 percent of the participants gave different opinions. For example, upgrading the city's infrastructure, re-improving the electricity supply, addressing the problem of drinking water, increasing attention to the architectural and archaeological monuments in the city, building new tourist attractions.

Conclusion. In order to improve the living environment in the city of Namangan by conducting a sociological questionnaire, it is important to determine the priorities for the socio-economic development of all areas, and the following conclusions were drawn in this regard:

- one of the factors determining the comfort of the city environment is its infrastructure and roads. According to the results of the conducted research, it is necessary to reconsider the transport roads of Namangan city and their construction. Because traffic congestion leads to the restriction of movement on roads, it results in an increase in the amount of harmful gases emitted by cars in the city, leading to air pollution. Additionally, improving the public transport network in the city can be cited as a solution to the problem.

- The high territorial concentration of educational institutions in the city of Namangan, the presence of specialized commodity markets, the location of medicine, household services, and administrative management offices in the city territory further increase its "convenience" importance. However, the electricity, heating, water supply, and sewage systems in residences require improvement and revision. Because the demographic capacity of the city before the 90s of the last century is drastically different from its current situation. As a result, the population's demand for housing, communal services and household services will increase. This means that the city's electrical system, drinking water, gas supply and sewage system must be redesigned.

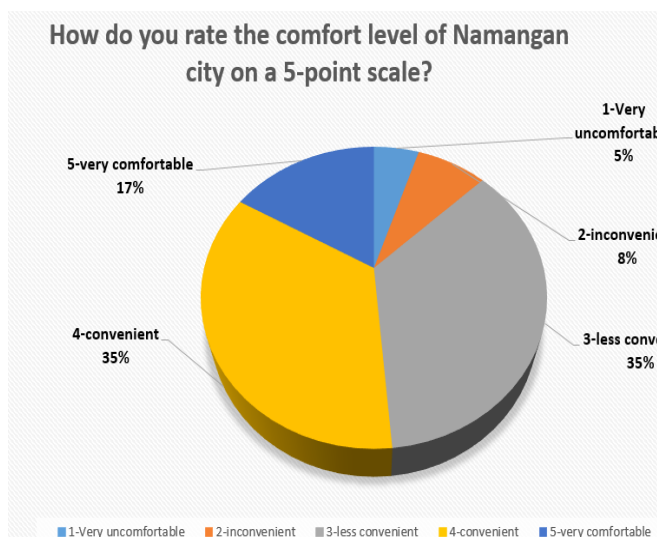


Figure 6. "How would you rate the comfort level of the city of Namangan on a 5-point scale?" representative answers to the question in the content

- the negative ecological impact of the city is related to its limited green spaces. This shows the urgency of large-scale implementation of greening works and creation of an ecologically clean environment. Due to the high population density and frequent traffic in the city, air pollution is at a higher level compared to neighboring settlements. In order to prevent this, it is necessary to increase the green zones, especially the areas of trees and grasses that increase the amount of oxygen in the air.

Such analyzes as above allow to assess the real situation in cities. Many problems have been solved as a result of similar observations conducted in other large cities as well."

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Rezyume: Ushbu maqolada "Qulaylik indeksi" tushunchasining mazmuni va zamonaviy geoshaharshunoslikda qulaylikni belgilovchi omillardan foydalanish, qulay shahar muhitini tashkil etish va rivojlantirishga ta'sir qiluvchi omillar o'rganiladi. Namangan shahrining qulaylik darajasini baholash uchun docs.google platformasi orqali IT texnologiyalaridan foydalangan holda sotsiologik tadqiqot usuli amalga oshirildi. Sotsiologik tadqiqotda O'zbekistonning eng yirik shahri hisoblangan Namangan shahrini ijtimoiy-iqtisodiy rivojlantirish muammolari aniqlanib, respondentlarning vakillik fikrlari o'rganilib, tegishli xulosalar chiqarildi.

Резюме: В данной статье рассматривается значение понятия «Индекс удобства» и использование факторов, определяющих комфортность в современном георурбанизме, факторов, влияющих на организацию и развитие комфортной городской среды. С целью оценки уровня комфорта города Намангана был реализован метод социологического исследования с использованием IT-технологий через платформу docs.google. В ходе социологического исследования были определены проблемы социально-экономического развития города Намангана, который считается крупнейшим городом Узбекистана, изучены репрезентативные мнения респондентов и сделаны соответствующие выводы.

Kalit soʻzlar: indeks, shahar, qulay, noqulay, Arkadis Barqaror shaharlar, koʻrsatkich, shahar muhiti, respondent.

Ключевые слова: индекс, город, комфортный, некомфортный, Аркадис Устойчивые города, индикатор, городская среда, респондент.

**SOME CONSIDERATIONS ON THE FULFILLMENT OF THE REQUIREMENTS FOR
THE CONTRACT FOR THE PROVISION OF MOBILE COMMUNICATION SERVICES
UNDER CIVIL LEGISLATION**

Nizamatdinov K.K.

Karakalpak State University named after Berdakh

Summary: *In the article, some issues related to the fulfillment of civil law requirements for this type of contract are analyzed from a legal point of view. The article also contains the author's opinions on clarifying the subject of the contract for the provision of mobile communication services today.*

Key words: *mobile communication, service, service provision, mobile communication service contract, contract subject, rules and requirements.*

It is known that in order to determine the general rules for concluding a contract for the provision of mobile communication services according to the norms of civil legislation, it is important to analyze the important terms of the contract, the procedure and form of its conclusion. In particular, the telecommunication regulations specify the main requirements for the contract for the provision of mobile communication services, that the contract must be drawn up in accordance with the laws, these requirements, and include the important conditions established by the laws. If certain terms of the contract meet the requirements of regulations or other regulatory legal documents, they can be determined by reference to the relevant provisions of regulatory legal documents, and the operator, provider must familiarize the consumer with the terms of this contract. Specific provisions of the Agreement may be set forth or detailed in the appendices, which are an integral part thereof. The main requirements include the following as the content of the contract: date and place of conclusion of the contract; requisites of the parties to the contract; the date and number of the operator, provider entered into the register of telecommunication operators, providers.

When providing services by the provider, as well as the full name and location of the operator based on the contract for the provision of services, information on the operator's registration, the date of the conclusion of the contract between the operator and the provider, and the validity period is indicated; the subject of the contract; organizational and technical conditions for providing mobile communication services; rights and obligations of the parties; mobile communication service prices (tariffs) and billing procedure; liability of the parties; the procedure for consideration of disputes that may arise between the parties during the execution, modification or cancellation of the contract; validity period of the contract, change and cancellation of its validity period; specifics of relations in ensuring the use of services provided by third parties. The contract may specify other conditions that do not conflict with the law.

Therefore, defining the important terms of the contract should be carried out on the basis of the general rules established for service contracts with basic requirements. First of all, it is important to determine the purpose of the contract for the provision of mobile communication services. The purpose of the contract for the provision of mobile communication services is to satisfy the need of a certain person to exchange information with a certain addressee or to receive information or deliver it to a certain address, and this message will not be known to anyone if this person does not want it. not At the same time, when concluding a contract for the provision of mobile communication services, individuals must transfer data through a certain stable, regularly operating telecommunications network to ensure the appropriate level of service (time, quality, privacy). they intend to.

It should be noted that the purpose of the contract is based on the existence of two constitutional rights for the consumer of mobile communication services: everyone has the right to

"freely collect, store, use information verbally, in writing or otherwise" and the right of distribution" (Article 33 of the Constitution) and the right of everyone to "privacy of letters, telephone conversations, telegraphs and other communications" (Article 31 of the Constitution). The state guarantees the provision and protection of constitutional rights, therefore, the right to receive telecommunication services as one of the legal methods of receiving and transmitting information should be guaranteed and protected. In this case, "the state creates conditions for ensuring the use of the Internet global information network" (Part 3 of Article 33 of the Constitution) [1.].

The constitutional nature of these rights is one of the reasons for the emergence of public law norms in regulatory legal documents regulating the provision of mobile communication services. The system of guarantees to ensure the constitutional rights to receive and transmit information, the confidentiality of correspondence, telephone conversations, telegraph and other correspondence is not only the rules of the civil law institute on the provision of mobile services, but also other areas of law, including administrative and criminal law also includes institutions. Thus, the norms of administrative law provide for the licensing of the activity of providing mobile communication services, the implementation of state control and supervision of the activities of operators, telecommunication providers. The norms of criminal law, for example, establish criminal responsibility for breaching the confidentiality of communication or computer-transmitted correspondence, telephone conversations, telegraph or other correspondence.

The purpose of the contract is closely related to its subject, and its condition is recognized as important according to Article 364 of the Civil Code. The subject of the contract is understood as "actions (or inaction) that the obliged party must perform (or refuse to perform)" [2., 22]. The subject condition is the only condition classified as important for any contract, because it individualizes the subject of performance and expresses the essence of the contract. M.I. Braginsky notes that the condition on the subject is listed as the only condition considered important in FC. In a broad sense, the subject covers the entire set of indicators for which the contract was concluded. It contains information on its subject, in particular, information about the quantity, quality and price of delivered goods, performed works and services [3., 315]. When determining the subject of the contract for the provision of mobile services, it should be taken into account that, like the subject of the contract for the provision of services, it is not only profit (the object of civil law), but also an action that must be performed by the parties [4., 116].

As for the subject of the contract for the provision of services, E. D. Sheshe stated that the subject of the contract in the contractual obligations in this regard is actions in the form of a service, the beneficial effect of which does not have a clear result and is considered indispensable [5., 182].

The definition of the contract for the provision of mobile communication services and its subject matter are defined in a special document (main requirements) at the regulatory level, according to which the contract for the provision and reception of mobile communication services concluded between the consumer and the operator, provider is a procurement agreement, according to which the operator, provider must provide (provide) mobile communication services on behalf of the consumer, and the consumer is obliged to pay for these services (if unless otherwise stipulated in the contract).

The subject of the contract is the provision of certain types and volumes of mobile communication services of certain quality. However, these definitions seem to need some clarification, taking into account the general characteristics of the contract for the provision of mobile communication services and its subject matter. Since mobile communication services are provided by operators, telecommunications providers, specific features are first of all manifested in their contractual actions. First, the executive performs certain actions related to the object of special influence - information, secondly, these actions are expressed in the spatial movement of information to a specific destination, thirdly, the object moves through telecommunication networks and complete fourthly, in addition to active, the performer is given active passive tasks: changing the content of information and not disclosing it.

Therefore, the object of influence under the contract is unique. Information can also be the subject of other service contracts, for example, in the contract for the provision of information services. However, the contract for the provision of mobile communication services also specifies specific actions to be performed with the object of influence: data is transferred only to a specific address in space, the performer does not affect its content. An important feature of the contract is the obligation of the executor to transmit information through the telecommunications network. For this, the executive must have the right to use a part of the telecommunications network and ensure interaction with persons who have the right to use other parts of the network. This means the emergence of a system of specific obligations functionally related to the obligation to provide mobile communication services.

In order to determine the specific features of the subject of the contract for the provision of mobile communication services, it is necessary to include actions that the operator, telecommunications provider should refrain from (changing the content of information and disclosing it).

Violation of passive obligations means that poor quality services are provided or not provided at all. All legal entities must observe the confidentiality of correspondence, but for the operator, telecommunications provider, this obligation arises from the contract for the provision of mobile communication services and has a contractual (civil) character.

In connection with the appointment of an executor with passive duties, the following note occurs. As mentioned above, service can exist not only in the form of inactivity, but also in the form of actions [6., 177]. If we consider the example of mobile communication service, in some cases it is observed that the service is expressed in a combination of movement and inactivity. Some researchers argue that this is not specific to mobile communication services. Thus, for example, O. V. Kim notes that there may be services that require the performer to refrain from certain actions [7., 11]. However, inactivity of the performer cannot be an independent content of the service, it can only accompany certain active tasks.

Studying the content of the subject of the contract for the provision of mobile communication services requires solving the issue of the result of the mobile communication service (its beneficial effect). There is a debate in the scientific literature about whether there is an outcome of the service, if it exists, what this outcome represents, and whether the performer should guarantee the achievement of this outcome. M.V. Krotov said that the executive cannot guarantee the result of the service [8., 538]. O.G. Shablova believes that in some cases, the achievement of an intangible result of the service is included in the subject of the contract, which is especially evident in the field of professional services, for which the presumption of achievement of an intangible result should be applied [9., 184]. O.V. Kim classifies obligations to provide services depending on the nature and form of the achieved result. The result of material services (characterized by a tangible or materialized result) is covered by the subject of the obligation. Obligations to provide intangible services (there are no tangible results) can be manifested in the form of the following types of obligations: the beneficial effect of the service, the object of which may or may not include the beneficial effect of the service at the discretion of the parties, and the essence of the contract [10., 12] the subject excludes the achievement of a beneficial effect. If we talk about obligations to provide mobile communication services, the client expects a very clear result - if the service is two-way, data transmission, reception or data exchange. If there is no such result, then the service cannot be said to have been provided. In addition, the transfer of information must be completed with its delivery to the recipient.

In this sense, the word "transmission" should be used (from the sender to the addressee). The result of mobile communication service is intangible. The result of the mobile communication service should not be confused with the object of influence that can be reflected in physical form. After all, the result of the mobile communication service is not the data itself, but the delivery of the data. Therefore, the subject of the service contract covers the result of the service.

Summarizing the above, the subject of the contract for the provision of mobile communication services includes actions of the executor to transmit information to a specific addressee through telecommunication networks or to exchange information without changing their content and observing the confidentiality of communication. takes

The definition of this subject can be formed taking into account the specifics of the mobile communication service and the specific features of the subject of the contract for the provision of mobile communication services. In our opinion, the subject of the contract for the provision of mobile communication services, unless otherwise specified by law, is the operator, telecommunication provider, in the actions of the operator, telecommunication provider, on the movement of information in space through telecommunication networks, without changing the content of information and disclosing it. is a service expressed in (activity).

Taking into account the comparison of the subject of the contract for the provision of mobile communication services with the subject of the contract for the provision of services specified in Article 703 of the Civil Code, the following features of the contract for the provision of mobile communication services can be noted:

1) the contract for the provision of services includes actions of the executive on the provision of services, actions on the provision of mobile communication services under the contract for the provision of mobile services; despite the fact that the mobile communication service is also a service, it has its own characteristics that significantly distinguish it from other services;

2) the subject of the contract for the provision of services includes the actions of the performer, an important feature of the subject of the contract for the provision of mobile communication services, in addition to the implementation of certain actions, is the avoidance of certain actions (changing information and its disclosed content);

3) the subject of the contract for the provision of services is considered only actions, achieving a certain result is not always included in the subject of the contract for the provision of services, the achievement of an executive result under the contract for the provision of mobile communication services - the delivery of information to the recipient or the exchange of this information should provide.

Consideration of other conditions that are objectively (due to the law) related to the sentence of the important conditions of the contract for the provision of mobile communication services, as well as the provision of services regulated by the norms of Chapter 38 of the FC of this contract it is necessary to compare with the important terms of the contract.

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Rezyume: Maqolada mobil aloqa xizmatlarini ko'rsatish shartnomasini tuzishda mazkur turdagi shartnomaga qo'yiladigan fuqarolik qonunchiligi talablarining bajarilishi yuzasidan ayrim masalalar huquqiy jihatdan tahlil qilingan. Maqolada shuningdek bugungi kunda mobil aloqa xizmatlari ko'rsatish shartnomasi predmetini aniqlashtirish yuzasidan mualliflik fikr-mulohalar bildirilgan.

Резюме: В статье с юридической точки зрения анализируются некоторые вопросы, связанные с исполнением гражданско-правовых требований к данному виду договора. В статье также содержатся авторские мнения по разъяснению предмета договора оказания услуг мобильной связи на сегодняшний день.

Kalit so'zlar: mobil aloqa, xizmat, xizmat ko'rsatish, mobil aloqa xizmatini ko'rsatish shartnomasi, shartnoma predmeti, qoidalar va talablar.

Ключевые слова: мобильная связь, услуга, оказание услуг, договор оказания услуг мобильной связи, предмет договора, правила и требования.

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TROPES IN KUNKHOJA'S LYRICS

Tokymbetova G.A.

Karakalpak State University named after Berdakh

Summary: *In this article, the creativity of Kunkhoja Ibrayim uli from our 19th century classical poets is studied in detail. Scientific studies on the problem of artistic description means or artistic description methods in poet's poetry are analyzed. In Kunkhoja's lyrics, the importance of metaphor, metonymy, synecdoche, symbol, and allegory in giving the beautiful poetic uniqueness of the resin, and increasing the impact of the composition is described with the help of lyrical examples.*

Key words: *lyricism, poetics, poetic skill, problem of realism, written data, metaphor, metonymy, synecdoche, symbols and allegories.*

In the science of Karakalpak literary studies, the history of our literature is studied, but there are still ways to pay attention to it. In particular, one of our classical resins of the 19th century is the creation of Kunkhoja Ibrayim ul. There is almost no research on the poet except for the works learned as a literary heritage. Other representatives of this period, the contemporaries of Kunkhoja poet Berdak Gargabay uli, Ajiniyaz Kosibay uli, Utesh Alshinbay uli, whose creation is to a certain extent learned on the basis of the latest scientific innovations. For example, for the anniversaries of Berdak poet, his creativity is being studied not only from the point of view of literature, but also from the philosophical, linguistic, and pedagogical aspects. And Ajiniyaz's lyrics were learned in a deeper way. In this direction, we can mention the work of scientist B. Genjemuratov «A'jiniyaz lirikasi'ni'n' poetikasi'» ("Poetics of Ajiniyaz's lyrics") Nukus, 1997. Also, the work of writer S.Matekeev «O'teshtin' shayi'rli'q sheberligi» ("Utesh's poetic mastery" (Nukus, 2009) on the creation of Utesh poet is well known. If we look at it from this point of view, it is time to learn the creativity of Kunkhoja in the basis of the literary achievements and theoretical achievements. The reason is that poet together with Berdak, Ajiniyaz, is one of the founders of the written literature of the 19th century. We will take a step forward in learning the history of Karakalpak literature in a new direction by learning the lyrics of Kunkhoja Ibrayim Uli.

The problem of artistic descriptive tools or artistic descriptive methods in the poetry of Kunkhoja poet is one of the new topics that have been left aside from detailed research. However, we can say that, apart from the research of B. Ismailov [1, 61], which was specifically focused on poet creativity, it was mentioned generally in some works and given in other articles. N. Daukaraev, K. Ayimbetov, and O. Kojurov were the first to study Kunkhoja's works in a scientific direction. The first article about Kunkhoja's works was written by N. Daukaraev, K. Ayimbetov, and O. Kojurov in the article «Qaraqalpaq a'debiyati'ni'n' tu'rleri» ("Types of Karakalpak Literature"). In 1965, B. Ismailov defended his candidate's thesis after conducting extensive work on this topic. In his monograph, he carried out extensive scientific research on the chapters «Kirisiv», «Ku'nxoja qaraqalpaq klassik poeziyasi'ni'n' ko'rnekli wa'kili», Ku'nxoja tvorchestvosi'n izertlewidin' ha'zirgi jag'dayi'», «Ku'nxojani'n' o'miri haqqi'nda mag'li'wmatlar», «Ku'nxoja jasag'an da'wirdin' tariyx'i'y a'debiy xarakteristikasi'», «Juwmaq» ("Introduction", "The wonderful representative of the classical poetry of Karakalpak - Kunkhoja", "The current state of research on Kunkhoja's creativity", "Information about the life of Kunkhoja", "Historical literary characteristics of the era that Kunkhoja lived ", "Conclusion").

N. Japakov writes a scientific article «Realistik shi'g'arma xali'qqa xi'zmet yetedi» ("Realistic works serve the people") in his work «Revolyuciyag'a shekemgi qaraqalpaq a'debiyati'nda realizm ma'selesi» ("The problem of realism in the Karakalpak literature until the revolution") (Nukus, 1972) on Kunkhoja's works. (Volume II, Book I, N., 1972, p. 18-87).

Valuable opinions are given about that Kunkhojan is great poet, his skill in realistically portraying the realities of life. The well-known writer, academician H. Hamidov writes «Ku'nxojani'n' do'retiwshiliginde jazba da'reklerdin' tutqan orni'» ("The place of written documents in Kunkhoja's writings") in his work «Shi'g'i's tillerindegi jazba da'rekler» ("Written data in Eastern languages") (Nukus, "Bilim", 1991, p. 118-145). The doctor of philological sciences K. Kuranbaev wrote in the direction of literary relations in his work «Kewil kewilden suw isher» (Nukus, 1991). The doctor of Pedagogical Sciences, professor O. Aleuov expresses scientific opinions about the views of the Enlightenment of Kunkhoja in his monograph «Qaraqalpaqstanda ta'lim-ta'rbiyali'q oylardi'n' qa'liplesiwi ha'm rawajlani'wi'» ("Formation and development of educational ideas in Karakalpakstan") (N., "Bilim", 1993, p. 301-321). The opinions of K. Mambetov and K. Maksetov were published in the press. In 1989, Kunkhoja's collection of poems called "El menen" was published based on selected works, and 46 poems were included in it. We should look at the diversity of the works written in the past and use them with a critical point of view. For example: professor K. Maksetov says that the poem "Umitpaspan" was not written by Kunkhoja. And in recent times, some features of Kunkhoja's works is discussed in the work of the Doctor of Philological Sciences, Professor K. Jarimbetov «XIX a'sir qaraqalpaq lirikasi'ni'n' janrlı'q qa'siyetleri ha'm rawajlani'w tariyxı'» ("Genre features and history of development of Karakalpak lyrics of the XIX century") (Nukus, 2004), and in K. Turdibayev's work «Didaktikali'q shi'g'armalar-ruwxı'y bayli'g'i'mi'z» ("Didactic works - our spiritual wealth") (Nukus, 2009). Also, in 2009, the Department of Karakalpak Literature of KSU held a scientific theoretical conference dedicated to the 210th anniversary of Kunkhoja, and a number of researchers made presentations. Among them, the article of the candidate of philological sciences P. Allambergenova «Ku'nxoja poeziyasi'nda Maqti'mquli' da'stu'rleri» (ideya, tematika, problematika) ("Maktimkuli traditions in Kunkhoja's poetry" (idea, theme, problems)), doctor of philological sciences T. Keruenov's article «Ku'nxojani'n' do'retiwshiliginde mifologiyali'q elementlerdin' qollani'li'wi'» ("Use of mythological elements in the creativity of Kunkhoja") were published in the bulletin of KSU No. 4(5), Nukus, 2009. Therefore, poet's creativity is being learned in today's literary science.

"Artistic descriptive means are not only a poetic decoration of the work, but also a realistic tool for concretizing the idea of the work" [2, 321]

The typicality of the characters, the importance of the aesthetic ideal analyzed by the author, the nationalism of the work, the skill of the writer in achieving the unity of form and content are the true radiance of the work. The impressive power of enlightenment and aesthetic education of the work is also related to skillful use of artistic descriptive means. In general, all the words in the work are descriptive means, but the ones that explain the changing meaning are especially important. They are learned as artistic descriptive tools.

Metaphor (Greek *metarhora* - to move) is a variable tool that is widely used. "Metaphor refers to the similarity between an object or a thing (similar and what is being compared)". The differences, characteristics, and signs of the similar thing are moved to one what is being compared". [3, 328-29]

Metaphors are also very important in drawing natural scenes.

For example:

Jadi'rap jazi' bolmasa,

Shuaqli' kogal qi'lmasa

O'z waqti'nda jawmasa,

Qara jamg'i'r nege kerek? [4, 95].

The fact that metaphors depict such natural phenomena by moving human emotions to itself is considered one of the unique features of this tool. The object of comparison chosen here is the «jadi'rawı'» (brighting) of summer, which is figuratively moved to the word without any element of comparison. There are several types of metaphors: open metaphors, closed metaphors, epithet metaphors, etc.

Metaphors are close to similes by their nature. By comparing two objects, a metaphor, also simile reveals the descriptive object as figurative and real. That's why, in some scientific works, there are opinions in which metaphors are called "hidden similes" and "short similes". But there are differences between similes and metaphors. There must be at least two elements in any simile - the thing that is being compared and the thing that is similar, metaphors have only one of these elements. In addition, simile is often used in a literal sense, while in metaphor it is used in a variable sense.

Metonymy, like a metaphor, is an artistic mean, in which an event or phenomena, object is renamed with another name. Metonymies are used in Kunkhoja poet's works to convey various situations of the lyrical hero, as well as the intentions of the lyrical characters. For example,

«Ashi'qti'n' joli'nda **ishleri qaynap,**
Qarli' suwi'qlarda janlari'n qi'ynap,
Qi'z keler dep turar **ko'zleri jaynap,**
Telmirip turarsan' jigirma beste». [5, 57]

If we take the poem and read it in a simple way, i.e., without loading imagery on it, we have to understand it that the twenty-five-year-old man (guy) boils like a pot, his eyes open like flowers, or brightens. And, it can't be an objective situation. Therefore, in explaining and describing the situation of the lyrical hero at the age of 25, he imposed a figurative meaning on the words used from the similarity of phenomena and created a wonderful example of metonymy. By the metonymy «*ishleri qaynap*», the lyrical hero was artistically re-named that he is active and up-and-coming in his 25s, full of energy. And, the metonymy "*ko'zleri jaynap*" is used to describe the overflowing of the inner trials due to joy and happiness. Also, in resin poetry, metonymy is used to interpret another meaning based on renaming color or something similar to its sign. For example:

«Ha'm qaraysan' ali'stag'i',
Kiyati'rg'an qarag'a,
Jerkenbeysen' keyin basi'p tag'i' da,
Shi'day almay qani' aqqan jarag'a»

In the example, the metonymy "qara" literally means color. But his "*kiyati'rg'an*" gave life to him. Therefore, it's known that a person or another living creature can be seen from afar in black. Taking into account this sign of similarity, the resin loaded the meaning of "man" to the word "black". In Kunkhoja's lyrics, we often use colorful types of metonymies like this. Metonymies in the poet lyrics require learning specially. This helps to learn the beautiful word world of the resin.

To sum up, metaphors, metonymy, synecdoche, symbols and allegories appear in the lyrics of poet Kunkhoja as proof that poet knew the value of beautiful words and was able to coloring them.

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5. in that book, p 57.

Rezyume: *Ushbu maqolada XIX asr mumtoz adabiyoti shoirlaridan Ko'nxo'ja Ibrohim o'g'lining ijodi har taraflama tadqiq qilingan. Shoir she'riyatidagi badiiy san'atlar uslubi masalasi ilmiy tadqiqotlar misolida berilgan. Ko'nxo'ja she'riyatida metafora, metonimiya, sinekdoxa, simvol va allegoriyalar shoirning poetik hususiyatini aniqlashda, qo'shiqning tasirshangligini orttirishdagi ahamiyatli belgilar lirik misollar yordamida tasvirlangan.*

Резюме: В данной статье подробно рассматривается творчество Кунходжи Ибраима ули, одного из поэтов-классиков литературы XIX века. Анализируются научные исследования по проблеме средств художественного стиля в поэзии поэта. В поэзии Кунходжи на лирических примерах описывается значение метафоры, метонимии, синекдохи, символа и аллегории в придании прекрасного поэтического характера поэту, а также существенных признаков повышения воздействия композиции.

Kalit so‘zlar: lirika, poetika, shoir mahorati, realizm masalasi, yozma manbalar, metafora, metonimiya, sinekdoxa, simvol va allegoriyalar.

Ключевая слова: лиризм, поэтика, поэтическое мастерство, вопрос о реализме, письменные источники, метафора, метонимия, синекдоха, символы и аллегории.

METHODS AND APPROACHES TO TEACHING THE KAZAKH LANGUAGE: A STUDY ON CHILDREN AND ADULTS

Botabayev K.

Tashkent information technologiue university Nukus branch

Summary: *This study explores various methods and approaches used in teaching the Kazakh language to both children and adults. The research investigates the effectiveness of language teaching strategies, particularly in multilingual societies, and examines how modern technologies and interactive methods influence learning outcomes. Key challenges and factors affecting the successful acquisition of the Kazakh language are identified, and recommendations for improving the teaching process are provided.*

Key words: *Kazakh language teaching, teaching methods, language acquisition, children, adults, language education, pedagogical approaches, bilingual education, language learning strategies, second language acquisition (SLA).*

Introduction

Kazakh, as the state language of Kazakhstan, holds a central place in the country's educational and social landscape. In a society where multiple languages are spoken, fostering proficiency in Kazakh is crucial for both children and adults. The teaching of Kazakh has garnered attention due to the increasing emphasis on preserving national identity while promoting multilingualism. This study aims to evaluate the effectiveness of current teaching methods for the Kazakh language, considering the different learning needs of children and adults. The research also addresses the question of how interactive methods and the integration of technology can enhance language acquisition and retention.

With the rise of globalization and digitalization, language learning methodologies are evolving. Traditionally, language teaching focused on grammar and vocabulary memorization; however, newer methods emphasize communication skills and cultural immersion. In the context of Kazakhstan, where Russian and other languages are widely spoken, the challenge lies in making Kazakh both accessible and appealing to learners of different age groups and backgrounds. This study seeks to examine how diverse teaching strategies can meet these challenges and provide practical recommendations for educators and policymakers.

Methods

The research utilized a combination of qualitative and quantitative methods to gather comprehensive data on Kazakh language teaching. A literature review was conducted to examine previous studies on language acquisition in multilingual contexts, with a focus on Central Asia and Kazakhstan. Primary data were collected through classroom observations, interviews with teachers of the Kazakh language, and surveys administered to both adult learners and children studying Kazakh in various educational settings.

To assess the effectiveness of different teaching methods, several Kazakh language courses were analyzed: formal school programs, extracurricular language classes for children, and adult language courses. The study also included the use of digital tools such as language apps, online courses, and interactive learning platforms, assessing their impact on learners' progress and engagement.

The sample group consisted of 150 participants, divided into two categories: 80 children between the ages of 7 and 14, and 70 adult learners ranging in age from 25 to 50. Both groups were monitored over a 12-month period to evaluate their progress, motivation levels, and feedback regarding the teaching methods they experienced. Data were analyzed using descriptive statistics and content analysis to draw conclusions on the strengths and weaknesses of each approach.

Results

The study found significant differences in the learning preferences and outcomes between children and adults. For children, the most effective methods were those that incorporated game-based

learning, multimedia resources, and active participation through language immersion. Methods such as storytelling, songs, and interactive games helped to engage children and make language learning enjoyable. Children exposed to these interactive methods demonstrated higher retention rates of vocabulary and grammar, as well as improved speaking skills in comparison to those taught through traditional methods.

For adults, structured lessons with a clear focus on grammar, syntax, and practical conversation proved to be more effective. Adult learners expressed a preference for personalized lessons that catered to their specific needs, whether for professional, social, or personal purposes. Adults also benefited from blended learning approaches, combining in-person instruction with online resources. Apps designed for language learning, such as Duolingo or Memrise, were found to enhance self-study and allowed for more flexibility in learning schedules, which was particularly important for adult learners with work and family commitments.

The research also revealed that the use of digital tools and online platforms significantly boosted the learning process for both groups. The incorporation of video lessons, interactive quizzes, and language-learning apps allowed learners to practice outside the classroom, enhancing their language proficiency. However, a major challenge for both groups was the lack of a Kazakh-speaking environment outside of class, which limited opportunities for real-world practice.

Discussion

The results of this study highlight the importance of adapting teaching methods to the specific needs of different age groups. While traditional grammar-focused instruction may work well for adults, children thrive in learning environments that are dynamic, interactive, and fun. Teachers working with children should prioritize immersive and playful methods to sustain interest and encourage active participation in the learning process.

For adults, a more structured approach, complemented by self-study tools and flexible learning options, is key to maintaining motivation and achieving fluency. However, the challenge of creating a Kazakh-speaking environment remains, particularly in urban areas where Russian is predominantly spoken. This calls for more community-based initiatives, such as conversation clubs or immersive language experiences, to provide learners with practical opportunities to use the language in real-life situations.

Moreover, the integration of technology in language learning offers numerous benefits. Online platforms provide access to learning resources that are easily customizable and scalable, allowing learners to progress at their own pace. Digital tools also facilitate consistent practice, which is crucial for language retention. However, the success of these tools depends on the availability of quality content tailored to the Kazakh language and the specific needs of learners.

Another factor to consider is the psychological aspect of language learning. Adults, in particular, may experience anxiety or frustration when learning a new language, especially if they are expected to achieve fluency quickly. Thus, educators should focus on creating a supportive and encouraging learning environment where learners feel comfortable making mistakes and gradually building their language skills.

Conclusion

Teaching the Kazakh language to children and adults requires tailored approaches that take into account the learners' age, motivation, and prior language experience. For children, interactive and multimedia-based methods that integrate language with play and creativity are essential for fostering a positive learning experience. For adults, structured, goal-oriented lessons combined with flexible, technology-enhanced self-study options yield the best results.

The findings of this study suggest that a blended learning model, incorporating both in-person and online instruction, offers significant advantages for both children and adults. The incorporation of digital tools into the language-learning process should be expanded, with a focus on developing high-quality Kazakh-language content. Furthermore, efforts to create more immersive Kazakh-speaking environments, both in educational settings and in the wider community, are essential to ensure sustained language use and fluency.

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Rezyume: Ushbu tadqiqotda qozoq tilini bolalarga ham, kattalarga ham o'rgatishda qo'llaniladigan turli usullar va yondashuvlar o'rganiladi. Tadqiqot, xususan, ko'p tilli jamiyatlarda til o'rgatish strategiyalarining samaradorligini o'rganadi va zamonaviy texnologiyalar va interfaol usullarning ta'lim natijalariga qanday ta'sir qilishini o'rganadi. Qozoq tilini muvaffaqiyatli o'zlashtirishga ta'sir etuvchi asosiy muammolar va omillar aniqlanib, o'qitish jarayonini takomillashtirish bo'yicha tavsiyalar berilgan.

Резюме: В этом исследовании изучаются различные методы и подходы, используемые при обучении казахскому языку как детей, так и взрослых. В исследовании изучается эффективность стратегий обучения языку, особенно в многоязычных обществах, и изучается, как современные технологии и интерактивные методы влияют на результаты обучения. Определены основные проблемы и факторы, влияющие на успешное усвоение казахского языка, и даны рекомендации по улучшению процесса обучения.

Kalit so'zlar: qozoq tilini o'qitish, o'qitish usullari, tilni o'zlashtirish, bolalar, kattalar, til ta'limi, pedagogik yondashuvlar, ikki tilli ta'lim, til o'rganish strategiyalari, ikkinchi tilni o'zlashtirish (SLA).

Ключевые слова: обучение казахскому языку, методы обучения, усвоение языка, дети, взрослые, языковое образование, педагогические подходы, двуязычное образование, стратегии изучения языка, усвоение второго языка (SLA).

USING INNOVATIVE TECHNOLOGIES IN TEACHING FOREIGN LANGUAGES: THE CASE OF THE ENGLISH LANGUAGE

Mambetkarimov B.

Nukus "Temurbeklar maktabi" military academic lyceum

Summary: *The integration of innovative technologies in teaching English as a foreign language (EFL) has significantly altered traditional pedagogical approaches, offering new ways to enhance learning outcomes. This paper explores the role of digital tools, artificial intelligence, virtual and augmented reality, and online platforms in EFL education. Through a review of relevant literature and case studies, the article highlights how these technologies improve language proficiency, engagement, and cultural competence among learners. The discussion also addresses the challenges associated with implementing these technologies, including the digital divide and the need for teacher training.*

Keywords: *digital tools, applications, artificial intelligence, virtual and augmented reality, and online platforms, the digital divide, teacher training, pedagogical integration*

The digital revolution has ushered in profound changes across various sectors, including education. One area where this impact is particularly evident is in the teaching of foreign languages. English, as a global lingua franca, has been at the forefront of this transformation. Traditional methods of teaching English as a foreign language (EFL) relied heavily on direct instruction, repetition, and face-to-face interactions. However, with the advent of innovative technologies, these methods are being complemented or even replaced by more interactive, engaging, and personalized approaches.

This paper examines the integration of innovative technologies in EFL education. It discusses the various tools and platforms that have been developed to aid in language learning, evaluates their effectiveness, and considers the challenges involved in their implementation. By focusing on the example of English, this paper aims to provide insights into how technology can enhance the learning experience and improve language acquisition outcomes.

Language learning applications such as Duolingo, Memrise, and Babbel have revolutionized the way people learn English. These apps offer a gamified learning experience that includes interactive exercises, quizzes, and challenges designed to test various language skills, including vocabulary, grammar, and pronunciation. The gamification element, characterized by points, levels, and rewards, is instrumental in maintaining learner engagement and motivation [8].

For instance, Duolingo uses a spaced repetition system (SRS) that helps learners retain new vocabulary by revisiting it at carefully timed intervals. Research suggests that SRS is highly effective in promoting long-term retention of language material [13]. Additionally, these apps offer immediate feedback, allowing learners to correct their mistakes in real-time, which is crucial for effective language acquisition.

Massive Open Online Courses (MOOCs) and online learning platforms like Coursera, edX, and FutureLearn have made English language education more accessible. These platforms offer courses from prestigious universities and institutions, providing learners with high-quality instructional materials, including video lectures, quizzes, and peer-reviewed assignments. These courses cater to different proficiency levels and learning goals, making them suitable for a broad audience [1]. Moreover, the social learning aspect of these platforms, facilitated through forums and discussion boards, allows learners to interact with peers from around the world, thereby enhancing their language skills through practice and exposure to diverse dialects and cultural contexts. This collaborative approach reflects the communicative nature of language use in real-life situations, further reinforcing the learning experience.

Artificial intelligence (AI) has emerged as a powerful tool in personalizing language education. Adaptive learning systems like Knewton and Smart Sparrow use AI to create personalized learning paths for students. These systems assess a learner's strengths and weaknesses through

ongoing assessments and adapt the content to meet their specific needs. This ensures that learners are continuously challenged at an appropriate level, which is crucial for effective learning [12]. AI-driven platforms are also adept at providing tailored feedback. For example, tools like Grammarly and Write & Improve offer instant feedback on writing tasks, analyzing grammar, vocabulary, style, and tone. Unlike traditional grammar checkers, these AI-powered tools can understand context, allowing for more accurate and relevant feedback. This immediate, personalized feedback helps learners understand and correct their mistakes, thereby improving their writing skills over time [2].

AI also powers chatbots and virtual assistants that simulate conversations with native speakers. These tools provide learners with opportunities to practice speaking in a controlled environment, which is especially beneficial for those who may not have access to native speakers. By engaging in these simulated conversations, learners can improve their fluency and pronunciation, while also gaining confidence in using the language in real-life situations [5].

Virtual Reality (VR) is increasingly being recognized for its potential in language education. VR environments can immerse learners in a virtual English-speaking world, where they can interact with objects, characters, and scenarios in English. For example, platforms like Mondly VR allow users to practice conversations in a simulated environment that mimics real-world interactions [10]. The immersive nature of VR reduces the anxiety often associated with speaking a foreign language, as learners can practice in a low-stakes environment. This immersive experience is particularly valuable for building speaking and listening skills, as it provides contextualized learning opportunities that are both engaging and effective.

Augmented Reality (AR), which overlays digital information onto the real world, offers unique opportunities for contextual learning. For example, AR applications like Google Translate allow users to translate text in real-time by simply pointing their smartphone camera at the text. This technology can be used in everyday contexts, such as reading signs or menus, reinforcing vocabulary and comprehension skills [3]. In more structured learning environments, AR can be used to create interactive lessons that make abstract concepts more tangible. For instance, teachers can use AR to visualize grammar structures or vocabulary, making the learning process more engaging and effective.

Innovative technologies have had a significant impact on vocabulary acquisition, a critical component of language learning. Spaced repetition systems (SRS), used by apps like Anki and Quizlet, have been shown to enhance vocabulary retention by scheduling review sessions at optimal intervals for long-term memory [9]. Additionally, the contextualized learning opportunities provided by VR and AR help learners to understand and remember new words more effectively.

AI-powered writing assistants have transformed the way learners approach grammar and writing. Tools like Grammarly provide detailed feedback on grammar, syntax, and style, helping learners to refine their writing skills. Studies have shown that the use of these tools leads to improvements in both the accuracy and complexity of learners' writing [7]. Moreover, the immediate feedback provided by these tools is essential for reinforcing grammatical rules and promoting learning. The development of listening and speaking skills has also been greatly enhanced by innovative technologies. Digital platforms and apps that include voice recognition technology allow learners to practice pronunciation and receive feedback in real-time. For example, Rosetta Stone uses speech recognition technology to help learners improve their pronunciation by comparing their speech to that of native speakers [5]. Additionally, VR and AI-powered conversation practice tools offer learners the opportunity to engage in simulated conversations, which helps to build fluency and confidence in speaking English. These technologies provide a safe and supportive environment for learners to practice their speaking skills, which is crucial for developing communicative competence.

Despite the many benefits of using innovative technologies in language education, there are challenges that must be addressed. One of the most significant challenges is the digital divide, which refers to the gap between those who have access to technology and those who do not. In many parts of the world, students may lack access to the necessary devices or internet connectivity to benefit from these technologies [11]. This disparity can exacerbate existing inequalities in education and

limit the reach of technological innovations. Another challenge is the need for teacher training and the effective integration of technology into the curriculum. Teachers must be equipped with the skills and knowledge to use these technologies effectively in the classroom. This requires ongoing professional development and support, as well as a shift in pedagogical approaches to accommodate the new tools and methods made possible by technology [6].

Finally, it is important to strike a balance between technology and traditional teaching methods. While innovative technologies offer many advantages, they should not completely replace traditional methods of instruction. Instead, they should be used to complement and enhance existing pedagogical practices. This hybrid approach ensures that learners benefit from the best of both worlds – the personalization and engagement offered by technology, and the structured guidance provided by traditional teaching methods [4].

The integration of innovative technologies in teaching English as a foreign language offers numerous benefits, including enhanced language proficiency, increased learner engagement, and improved access to high-quality education. However, to fully realize these benefits, it is essential to address the challenges associated with the digital divide, teacher training, and the effective integration of technology into the curriculum. As technology continues to evolve, it is likely that its role in language education will expand, offering even more opportunities for improving language learning outcomes.

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Rezyume: *Ingliz tilini chet tili (EFL) sifatida o'qitishda innovatsion texnologiyalar integratsiyasi an'anaviy pedagogik yondashuvlarni sezilarli darajada o'zgartirib, ta'lim natijalarini oshirishning yangi usullarini taklif qildi. Ushbu maqola EFL ta'limida raqamli vositalar, sun'iy intellekt, virtual va kengaytirilgan haqiqat va onlayn platformalarning rolini o'rganadi. Maqolada*

tegishli adabiyotlar va amaliy tadqiqotlarni ko'rib chiqish orqali ushbu texnologiyalar o'quvchilar o'rtasida tilni bilish, faollik va madaniy kompetentsiyani qanday yaxshilashiga urg'u beradi. Muhokama, shuningdek, ushbu texnologiyalarni joriy etish bilan bog'liq muammolar, jumladan, raqamli tafovut va o'qituvchilar malakasini oshirish zaruriyatini ko'rib chiqadi.

Резюме: Интеграция инновационных технологий в преподавании английского языка как иностранного (EFL) существенно изменила традиционные педагогические подходы, предложив новые способы улучшения результатов обучения. В этой статье исследуется роль цифровых инструментов, искусственного интеллекта, виртуальной и дополненной реальности, а также онлайн-платформ в образовании EFL. Благодаря обзору соответствующей литературы и тематических исследований в статье показано, как эти технологии улучшают знание языка, вовлеченность и культурную компетентность учащихся. В ходе дискуссии также рассматриваются проблемы, связанные с внедрением этих технологий, включая цифровой разрыв и необходимость подготовки учителей.

Kalit so'zlar: raqamli vositalar, ilovalar, sun'iy intellekt, virtual va kengaytirilgan haqiqat va onlayn platformalar, raqamli tafovut, o'qituvchilar malakasini oshirish, pedagogik integratsiya

Ключевые слова: цифровые инструменты, приложения, искусственный интеллект, виртуальная и дополненная реальность, онлайн-платформы, цифровой разрыв, подготовка учителей, педагогическая интеграция.

ARTISTIC CHARACTERISTICS OF K. GURBANNEPESOV'S POETRY

Berdiboyev U.S.

Karakalpak State University named after Berdakh

Summary: *The article analyzes the uniqueness of poetic interpretation in the poetry of modern Turkmen poet K. Gurbannepesov. In it, the link formed between the expression of emotion and the nature of the creator, the variable ratio of image intensity and the size of imagination, the methods of artistic discourse and poetic logic are observed. It makes the centralization of perception, perception and observation necessary, in which the materialization of the imagination - the definition of the edge of meaning is raised to the level of the main criterion, the analysis of the psyche and the independence of expression characteristic of the poet's work, and the methods of creating the state and mood in the lyrics are emphasized.*

Key words: *Turkmen poetry, artistry, characteristic, aesthetic value, expression, image, psyche, creative nature, poetic interpretation, intuition, philosophy, logic, style.*

National writer of Turkmenistan, laureate of the state award named after Makhtymkuli, K. Gurbannepesov, is dominated by traditional interpretation. In the work of the poet, the strengthening of the link between poetry and perception is a guarantee of the formation of a logical connection, in which the transfer of expression and image to each other materializes the way of thinking. Analytical competence is prioritized in literary interpretation, which combines feeling and observation, image and expression, tone and mood. In it, the ability to use metaphors describes the uniqueness of the choice of ideas. The presence of a social tone and a logical emphasis always determines the spirit of creativity. It is important that the creator does not try to cover the subtle secrets of the mood that occupies the human consciousness, but to generalize the originality of the interpretation, therefore, updating the poetic idea makes it possible to create the features of the author's style of expression and artistic skills:

Bugra chopan işıkladı,
Aqja tamung ishiginden.
Ogulgengli bixabardı,
Eli titrep, gezi petrep,
Jıklap duran ashıgundan¹.

In his poetry collections "Aji Gunler, Suiji Gunler" (1983) and "Shahiring Gozi" (1987), the problem and poetic interpretation complement each other. In stylistic research, the situation, mood, landscape, attitude and perception are always different in the nature of the creator, and the common aspects stick together in the nature of imagination. The appearance, view, symbol, word and idea are actually connect the factors of creation of artistic integrity, the research of literary heritage in the framework of psychological analysis might enable evaluating the author's work. Purpose, scope, originality, objectivity and consistency move from the concept of creativity to the perception of philosophy. In it, the artistic-aesthetic interpretation becomes much deeper:

Etmish yabı etmish erden,
Öz ugruna otlashıp yör.
Edil bəgul ısgan yalı,
Gürtich bilen ogshashıp yör...¹

In the poet's poetic interpretation, there are three semiotic centers that determine the integrity of the word-idea-interpretation: form marches, meaning change and stylistic originality! The development of imagery and independence of expression unites the cells of the poetic text, in which the ideological-aesthetic project of the mental state is drawn. The accuracy of the image size, the

¹ Қурбаннепесов. К. Ажи гүнлер, суйжи гүнлер. –Ашгабат: Магарыф, 1983. – Б. 5.

¹ Кўрсатилган адабиёт, - Б. 8.

naturalness of the scale of expression, and the coherence of observation are nourished by artistic convention. Complete melody and musical rhythm define artistic expression. It summarizes the logic emanating from the psychology of the text and the philosophy of perception-intuition-creative which unites in the literary interpretation. As much as it is a complex process to feel the chain of meaning, it is equally difficult to develop a lyrical experience that is built up in emotional tension. The image of the moment and the imagination consists of exaggeration to the playfulness of expression! The necessity, interest and experience complement each other in human perception. It is the poet who organizes the skill of using alliteration, the ability to reform the word alphabet, and the skill of deepening the image in literary discussion.

Philosophical tone determines the combination of spirituality, meaning and interpretation in the work of the poet. The high sense of literary pleasure, the tendency to poetic research of observation and the desire to expand the boundaries of artistic communication determine the status of methodological research. Therefore, "the main factor that determines the aesthetic value of a lyrical work is the degree to which the mood of the poet is described in it. In this type of works, it is not what is described, but how it is described that is more important. That is why the lyric is not a description of events or the scale of actions, but experiences. At the same time, a lyrical work is not only an aesthetic creation consisting of a mood scene, but also a movement dynamic of poetic thinking"¹. In the poem, the game of form, which has become a whole music, and the glimmer of the melody, which has risen to the climax, are combined. It explains the level of transition from a vital belief to an aesthetic task, shows the way of moving from a sign to a symbol, from a symbol to an image, from an image to an idea, from an idea to a generalization. The nature of the creator always seeks to analyze the conflict of mind and spirit, materialization of imagination depends on subtle observation and lively observation.

The word, which is the material of our literature, differs in its content. After all, most of the independent words in our language refer to things, events, signs, situations or actions in reality. As soon as one of these words is spoken, a general idea is formed in our mind about what it means - an event, a sign, a state or an action². Each word creates a stable image of meaning, and in the current case, the link between individuality and generalization plays a decisive role. A poetic idea defines a vivid expression in an image. The process of moving from action to state is based on content alternation. Allusion, characterization, contrastive image tools provide a solid foundation for the integration of tools, philosophy, and logic in literary interpretation. Artistic brevity and the philosophical observation that competes with it are reflected in the artistic discourse. The degree of transition from general vision to intuition determines the status of creativity. Pursuit of methodological research is actually a true philosophy of art, in which analysis and interpretation, expression and image, tradition and experience are centered. The power of words and meaning formalizes the poetic spirit of the text, provides philosophical depth in the observation.

In general, in the poetry of K. Gurbannepesov, the creator's worldview regulates the ability to analyze, interpret and verify the psyche. The path to the desire to understand the existence and essence of human beings with the personality of the poet. The need to explore the mysteries, to increase the effect of artistic power and to experiment with various expression styles determines the uniqueness of the author's style of expression. The philosophy of art actually goes from the nature of the creator to the spirit of the time, the spirit of the time stabilizes the aesthetic criteria. In it, the task of perceiving the depth of the problems occupying the consciousness of mankind, defining the analysis of the psyche as the subject of the image became a priority. The desire to cover the needs of a person's philosophy drives the creative nature. In it, the sincerity of the expression of feelings gives rise to a bubble expression, and draws the scene of the situation to the main place.

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Rezyume: Maqolada zamonaviy turkman shoiri K.Gurbannepesov she'riyatida poetik talqin o'ziga xosligi tahlillanadi. Unda tuyg'u namoyishi va ijodkor fitrati o'rtasida hosil bo'ladigan rishta, tasvir shiddati va tasavvur o'lchami o'zgaruvi nisbati, badiiy nutq tadriji va poetik mantiq vujudga kelish usullari xususida mushohada yuritiladi. Tahlil malakasi aslida kuzatish, ko'rsatma, anglash, tuyish va mushohada markazlashuvini ehtiyoj qilib qo'yadi, unda tasavvurni moddiylashtirish – tag ma'no qirrasini aniqlash asosiy mezon darajasiga ko'tariladi, shoir ijodiga xos ruhiyat tahlili hamda ifoda mustaqilligi, lirikada holat va kayfiyatni hosil qilish taomillariga urg'u beriladi.

Резюме: В статье анализируется своеобразие поэтической интерпретации в поэзии современного туркменского поэта Б. Гурбаннепесова. В нем наблюдается связь между выражением чувств и характером творца, соотношением интенсивности образа и изменением размера изображения, приемами художественного дискурса и поэтической логикой. Аналитическая компетентность фактически требует наблюдения, руководства, понимания, чувства и наблюдения, при которых материализация воображения - определение грани смысла поднимается до уровня основного критерия, анализа психики и самостоятельности выражения, свойственных творчеству поэта. Подчеркивается, а также выделяются способы создания настроения и состояния в текстах песен.

Kalit so'zlar: turkman she'riyati, badiiylik, xususiyat, estetik qiymat, ifoda, tasvir, ruhiyat, ijodkor fitrati, poetik talqin, idrok sezgisi, falsafa, mantiq, uslub.

Ключевые слова: туркменская поэзия, художественность, характеристика, эстетическая ценность, экспрессия, образ, психика, творческая натура, поэтическая интерпретация, интуиция, философия, логика, стиль.

HONOR, DIGNITY, AND REPUTATION CONCEPTS

Sarsenbaev A.M.

Karakalpak State University named after Berdakh

Summary: *In this article, you can become familiar with and gain information about the concepts of honor, dignity, and reputation, the opinions of foreign scholars, and the author's thoughts.*

Key words: *Honor, dignity, reputation, dignity and worth, glory, moral character, conscience, kindness, duty, responsibility, social obligation, inseparability, public duty, compliance with reality.*

Honor, dignity, and reputation are currently inseparable treasures that express a person's highest spiritual values. The historical-legal analysis of foreign legal monuments shows that these concepts emerged in ancient times. In human society, when it comes to the hierarchy of needs, honor, dignity, and reputation occupy some of the top positions after biological needs, which, in turn, ensures the safety of the individual as an organism. Honor and dignity are related to spiritual intangible treasures, and stopping and preventing assaults on them is a distinctive feature of the rule of law in the context of democratizing society.

The privileges under consideration currently reflect specific social relations between the individual and society. For this reason, they hold significant social importance and are enshrined in the norms of international, criminal, criminal procedural, civil, administrative, and other areas of law, reinforced by appropriate protective mechanisms.

Thus, citizens are guaranteed respect for their inviolable rights: in the broadest sense of the word, dignity, as well as the honor and dignity that provide special protection against assaults on their individual aspects. However, given their uniqueness, the absence of definitions in legislation, and the lack of unity among scholars on these issues, it seems appropriate for the dissertation author to address these categories in a separate section.

The idea of protecting honor, dignity, and reputation is reflected in the entire system of norms of the Special Part of the Criminal Code of the Republic of Uzbekistan, establishing liability for attacks on these privileges, as well as outlining the principles of criminal law, its goals, and tasks.

The creation of guarantees that ensure the protection of citizens' most important intangible goods, including honor and dignity, is a condition for the implementation of the humanitarian principle in practice, emphasizing the value of these treasures.

To thoroughly study the concepts of "honor," "dignity," and "reputation," they need to be examined from the perspectives of philosophy, psychology, sociology, ethics, pedagogy, and jurisprudence. However, in this paragraph, these concepts will be studied to a degree that allows for legal understanding. In this regard, the dissertation author primarily relies on research conducted in the aforementioned fields.

In ethics and philosophy, the concepts of freedom, honor, and dignity are among the most ambiguous and multifaceted in their expressions. These concepts have been studied since ancient times, appearing in the ethics of Socrates, Aristotle, Plato, and Xenophon. Socrates emphasizes the importance of honor in human life in the dialogue "Gorgias," stating, "Therefore, Callicles, a moderate man — just, brave, and pious, as you and I know, will undoubtedly be an impeccable good person, and a good person will always do good and proper things, and thus he will be blessed and happy, while a bad person does evil deeds and is unhappy." [1, 2014] Aristotle, in his work "Nicomachean Ethics," emphasizes that "...the greatness of the soul is related to great honor." [2, 2013]. It should be noted that the concept of "honor" has also been discussed in the works of A.I. Herzen [3, 76], A. Schopenhauer [4, 1992], G. Hegel [5, 122-126], J. Eckstein [6, 9], and others.

The primary basis of honor and dignity is always the belief in the unchangeability of a person's moral character, which leads to the assumption that a single bad action will result in all subsequent actions having the same bad character under similar circumstances [7, 128].

It should be emphasized in the legal understanding of the categories being examined that the legal condition for protecting honor, dignity, and reputation is the right of each individual to them.

Many scholars define the right to respect for honor and dignity, emphasizing that this property is "inseparable" from the individual. It is evident that "inseparability" primarily indicates that an individual cannot be left without moral evaluation in society, and that the connection between the individual and their essence is as inseparable as the bond between a person and their shadow. At the same time, it is impossible to conceive of evaluation without its object. The inner aspect of honor and dignity is an intrinsic part of the individual. Therefore, in this sense, honor and dignity are included in the concept of the individual and are considered one of its most important moral qualities, alongside virtues such as conscience, kindness, duty, and responsibility. These qualities form the framework of moral values in human and societal culture.

The characteristics and qualities of the individual are shaped by society, existing social relations, moral principles, and norms. In a modern state, real conditions have been created to develop the re-evaluation of human moral values in the direction of humanitarianism and democracy.

The second criterion for assessing an individual's character and their activities is the fulfillment of the individual's social duties, legal and moral obligations. The most important obligations of citizens are defined in the Constitution of the Republic of Uzbekistan, laws, and other regulatory documents, as well as in moral norms and social rules.

The Constitution of the Republic of Uzbekistan clearly defines the duties of individuals and citizens. These include: The rights and freedoms of individuals in the Republic of Uzbekistan are recognized and guaranteed in accordance with the universally recognized norms of international law and this Constitution. Human rights and freedoms are applicable to everyone from the moment of their birth. (Article 19, Part 1)

The rights and freedoms of individuals enshrined in the Constitution and laws are inviolable, and no one has the right to deprive them of these rights or to restrict them without a court decision. (Article 20, Part 2)

The concept of duty, along with public recognition and dignity, has been included in the notion of honor by scholars such as A.F. Shishkin, E.G. Fedorenko, and others. A deep understanding of public duty and its conscientious fulfillment, in their view, serves as the foundation and measure of human honor. Fulfilling public duty comes with the recognition of an individual's activities by society, which, in turn, enhances their self-respect and understanding of personal dignity. E.G. Fedorenko concluded that, alongside these concepts, the notion of honor also encompasses the understanding of being proud of one's honor.

It has been established above that fulfilling one's social duty is one of the bases and measures for the public evaluation of an individual and their dignity. Duty, as one of the foundations and measures of social evaluation, functions simultaneously as an independent moral category in Marxist-Leninist philosophy and regulates a specific area of human behavior as a moral norm, which is not always covered by other norms[8,111]. In our opinion, the concepts of honor and duty are interrelated, as the latter signifies a moral necessity that has been established as a subjective principle of actions, indicating that duty is part of the subjective foundation of honor.

Regarding the awareness of being proud of one's honor, it cannot be included in the concept of honor, as the emergence and development of this awareness are conditioned by the very existence of honor: if there is no honor, then an individual cannot have and may not even have the consciousness of pride in it.

Taking the above definitions into account, it should be concluded that in the legal understanding, honor is a blessing based on positive public evaluation, secured by law, conditioned by the individual's behavior, and accepted by the moral norms, rules, and requirements of society, regardless of the individual's social status.

From a moral perspective, dignity expresses the idea of each individual being valued as a person with the highest moral qualities. In other words, dignity in ethics determines an individual's special moral relationship towards themselves and their recognition by society as the highest value.

Dignity manifests itself through the actions that correspond to these virtues and are realized in accordance with the individual's demands. On the other hand, an individual's dignity requires other members of society to respect them, acknowledge their rights and opportunities, and maintain high expectations of them[9,85].

In our opinion, dignity, like honor, possesses both objective and subjective characteristics, reflecting various aspects of an individual's moral, legal, and social values.

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Rezyume: *Ushbu maqolada siz Sha'n, qadr-qimmat va obro' tushunchasi, chet el o'limlarining fikirlari va avtor firkiirlari haqqida tanishishingiz va malumot olishingiz mumkin.*

Резюме: *В этой статье вы можете ознакомиться и получить информацию о концепции чести, достоинства и престижа, мнениях об иностранных смертях и авторских идеях.*

Kalit so'zlar: *Sha'n, qadr-qimmat, obro' va qadr-qimmat, shon-sharaf, axloqiy xarakter, vijdon, mehr-oqibat, burch, mas'uliyat, ijtimoiy burch, ajralmaslik, jamoat burchi, haqiqatga muvofiqlik.*

Ключевые слова: *честь, достоинство, достоинство и достоинство, слава, нравственный характер, совесть, доброта, долг, ответственность, социальный долг, неотчуждаемость, общественный долг, соответствие действительности.*

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THE IMPORTANCE OF USING INTERACTION THEORY IN TEACHING ENGLISH IN SECONDARY SCHOOL

Ibraimova G.A.

Nukus State Pedagogical Institute named after Ajiniyaz

Summary: *English teachers of secondary schools have a special combination of opportunities and problems. At this age, language acquisition is very important, thus teachers need to use good teaching techniques to help pupils learn. The application of interaction theory shows up as a useful framework for teaching languages in this situation. The purpose of this article is to examine the value of using interaction theory in the classroom when teaching English to secondary school pupils, emphasizing both its potential advantages and useful applications. Teachers can establish a stimulating and participatory learning environment that supports young learners' language development and communication abilities by comprehending and putting this theory into practice.*

Key words: *Interaction theory, English language learning, pair and group-work, collaborative projects, language exchanges, interactive technology, integration communicative, learning environment, language acquisition, social interaction.*

Introduction. A well-known theoretical framework that emphasizes the critical role that social interaction plays in language development and acquisition is called interaction theory, or interactionism. This theory holds that learning a language is a social process that happens via meaningful interactions with others, such as teachers, peers, and family members, rather than an individual attempt. This article examines the main ideas of interaction theory and how secondary school pupils' English language education can be influenced by them [3.253].

The idea that social interaction is the primary factor influencing language development is a cornerstone of interaction theory. According to interactionists, learners can practice and improve their language skills in real-world situations by interacting and communicating with others. Social interactions give Pupils the chance to ask questions, have meaningful conversations, and get feedback—all of which help them become more fluent in the language.

Lev Vygotsky's Zone of Proximal Development (ZPD) hypothesis is fundamental to interaction theory. The difference between what Pupils can do on their own and what they can do with help from more experienced people is represented by the ZPD [6.30]. When it comes to helping children learn a language, teachers are essential in scaffolding their learning by giving them the tools and resources they need to succeed. In order to help pupils acquire a language, scaffolding can involve modeling language use, posing thoughtful questions, and providing constructive criticism. Important elements of interactionist theory also include language input and output. Exposure to rich language input—such as reading a variety of books and hearing to real conversations—benefits learners by improving their vocabulary and understanding. Giving kids the chance to produce language through speaking and writing exercises is equally vital. Pupils improve their English fluency and communicative skills by using the language in real-world situations.

Another fundamental tenet of interaction theory is the negotiation of meaning, which emphasizes the significance of elucidating and clearing up miscommunications throughout interactions. Pupils improve their communication abilities, show that they understand, and guarantee clear communication through bargaining. Interaction approaches are also in line with collaborative learning, which promotes peer interaction and shared knowledge development. By encouraging collaboration, teamwork, and active participation in educational tasks, collaborative activities help children improve their social and language development [8.35].

Using interaction theory in the teaching of English can assist pupils and teachers in a number of ways. Beyond conventional teaching techniques, Interaction Theory provides a comprehensive approach to language acquisition by highlighting the significance of social interaction in language learning. Teachers can design dynamic and engaging learning environments that encourage pupil participation, teamwork, and meaningful communication by incorporating Interaction Theory into their pedagogical approaches [1.150].

There are some examples showing how Interaction Theory can be used to teach English:

1. Group and Pair Work: Teachers can use Interaction Theory-based pair and group work activities in language classrooms. Pupils can, for instance, participate in role-plays in which they act out real-life situations, including placing an order at a restaurant or going on a job interview. Pupils practice language skills in a relevant context by interacting with their peers in these simulated circumstances, which improves their fluency and confidence in using the language.

2. Debates and Discussions: Instructors can host debates and discussions on hot-button issues of the day or subjects pertaining to literature, culture, or international affairs. Teachers foster critical thinking, reasoning abilities, and the capacity to communicate ideas clearly in English by allowing pupils to voice their perspectives, support them, and participate in civil discourse.

3. Collaborative Projects: Assigning cooperative projects that call for pupils to design, organize, and deliver a project on a particular subject helps pupils develop their communication and cooperation abilities. As an example, pupils could combine language study with creativity and research by making multimedia presentations about cultural customs or environmental challenges.

4. Language Exchanges: Pupils can interact with peers from diverse cultural backgrounds through language exchange programs or partnerships with foreign institutions. Through collaborative projects, video conversations, or written Interaction, pupils can hone their language abilities while learning about various cultures and viewpoints.

5. Interactive Technology Integration: Immersive language learning experiences can be produced by utilizing interactive technology, such as educational apps, online language learning platforms, or virtual reality simulations. For instance, pupils can practice their vocabulary through language learning applications, partake in virtual language immersion programs, or contribute to online language forums.

6. Real-Life Simulations: Teachers can create realistic simulations, such as a fictitious travel firm in which pupils act out roles as clients and agents, honing vocabulary associated with tourism and travel. Pupils gain practical language experience and feel more equipped for English-language interactions in the real world with this hands-on approach.

7. Peer Review and Correction: Using peer review sessions to have pupils evaluate and offer helpful critique on each other's speaking or writing projects is in line with the ideas of interaction theory. In addition to promoting active participation, this enhances teaching-based learning as pupils assess and analyze language usage.

In the context of teaching English, these examples show how Interaction Theory can be used in a variety of instructional activities to support language learning, communication abilities, cultural awareness, and cooperative learning.

Teachers can establish a language-rich atmosphere that mimics real-life communication circumstances by giving pupils opportunity to participate in meaningful and realistic conversations in English. Pupils get the opportunity to practice using the language in context through talks, debates, conversations, and cooperative activities, which speeds up language acquisition and improves fluency. Additionally, interaction theory can help pupils improve their English communication abilities. Pupils can experience articulating their ideas, negotiating meaning, and sharing viewpoints with peers through interactive activities like role-plays, group discussions, and pair work. In addition to improving pupils' accuracy and fluency, this practical method of teaching language also gives them more self-assurance when it comes to effectively communicating in English.

An important factor in raising pupil interest and involvement in the language learning process is the use of interactive teaching techniques. Teachers can create dynamic and interesting learning

experiences that catch pupils' attention and encourage active involvement by adding games, simulations, multimedia tools, and real-life chores into their courses. This engaging method of teaching English keeps pupils' interest in the language and cultivates a positive outlook on language learning. Furthermore, through interactions with peers from different backgrounds, interaction theory fosters empathy and cultural understanding. Through participation in diverse discourse, pupils are exposed to a range of viewpoints, ideologies, and practices, which cultivates a deeper understanding of cultural plurality [2.201].

In addition to enhancing pupils' language learning opportunities, this cross-cultural interaction fosters a more accepting and inclusive learning atmosphere in the classroom. Furthermore, the development of critical social skills like cooperation, active listening, negotiation, and dispute resolution is facilitated by interactive teaching techniques. Pupils gain skills in interpersonal dynamics, effective communication, and teamwork in a supportive learning environment through collaborative activities. These social skills are crucial for pupils' personal and professional development in addition to being beneficial for language learning. Furthermore, Interaction Theory emphasizes how crucial error correction and feedback are to language development. Teachers can give pupils rapid feedback through interactive conversations and exchanges, which helps them recognize and effectively fix grammatical problems. Over time, this ongoing feedback loop will help pupils become more proficient and accurate language users, which will improve their language development. Interactive teaching methods also help Pupils develop their critical thinking, information analysis, and cooperative problem-solving skills. Pupils gain higher-order thinking abilities through conversations, debates, and problem-solving exercises. These abilities are crucial for both academic performance and lifetime learning. Teachers can help pupils develop critical thinking and problem-solving skills by assigning interactive assignments that demand them to use their language skills in relevant circumstances.

Finally, individualized learning experiences are made possible by a pupil-centered teaching strategy that is supported by interaction theory. Teachers can customize education to match each pupil's unique learning requirements and preferences by offering chances for pupil-led projects, conversations, and presentations. Through the promotion of autonomy, independence, and self-direction, this pupil-centered approach gives pupils the tools they need to take charge of their education and actively engage in the process of learning a language.

It is clear that there are several advantages for both teachers and pupils when incorporating Interaction Theory into English language teaching methods. Teachers can improve pupils' entire language learning experience by designing interactive learning environments that support language acquisition, communication skills, cultural awareness, social skills, critical thinking, and individualized learning experiences. By means of significant exchanges, cooperative exercises, and genuine communication assignments, educators can enable learners to develop into self-assured and competent English language speakers, fully prepared for accomplishment in scholastic, occupational, and social settings.

Conclusion. In conclusion, Interaction theory highlights the significance of social Interaction, communication, and teamwork in language learning, providing insightful ideas and practical methods for teaching English. Teachers can create meaningful and engaging learning experiences that support pupils' language acquisition, cultural understanding, and development of communication skills by implementing interactive activities like debates, collaborative projects, language exchanges, interactive technology integration, real-life simulations, and peer feedback sessions. Teachers can empower pupils to actively engage with the language, practice real-world communication scenarios, and create a supportive learning environment that promotes linguistic proficiency and intercultural competence in the English language classroom by implementing the principles of Interaction Theory.

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Rezyume: O'rta maktabda ingliz tili o'qituvchilari imkoniyatlar va muammolarning o'ziga xos kombinatsiyasiga duch kelishadi. Bu yoshda tilni o'zlashtirish juda muhim, shuning uchun o'qituvchilar o'quvchilarga o'rganishga yordam berish uchun yaxshi o'qitish usullaridan foydalanishlari kerak. O'zaro ta'sir nazariyasini qo'llash ushbu vaziyatda tillarni o'qitish uchun foydali asos bo'lib chiqadi. Ushbu maqolaning maqsadi o'rta maktab o'quvchilariga ingliz tilini o'rgatishda sinfdagi o'zaro ta'sir nazariyasidan foydalanishning ahamiyatini ko'rib chiqish, uning potentsial foydalari va foydali ilovalarini ta'kidlashdir. O'qituvchilar ushbu nazariyani tushunish va amalda qo'llash orqali yosh o'quvchilarning til rivojlanishi va muloqot qobiliyatini qo'llab-quvvatlaydigan rag'batlantiruvchi va ishtirok etishga asoslangan o'quv muhitini yaratishi mumkin.

Резюме: Учителя английского языка в средней школе сталкиваются с особым сочетанием возможностей и проблем. В этом возрасте овладение языком очень важно, поэтому учителям необходимо использовать хорошие методы обучения, чтобы помочь учащимся учиться. Применение теории взаимодействия оказывается полезной основой для преподавания языков в этой ситуации. Цель этой статьи - рассмотреть ценность использования теории взаимодействия в классе при обучении английскому языку учащихся младших классов средней школы, подчеркнув как ее потенциальные преимущества, так и полезные приложения. Преподаватели могут создать стимулирующую и основанную на участии среду обучения, которая поддерживает языковое развитие и коммуникативные способности молодых учащихся, постигая и применяя эту теорию на практике.

Kalit so'zlar: o'zaro ta'sir nazariyasi, ingliz tilini o'rganish, juftlik va guruh ishlari, hamkorlikdagi loyihalar, til almashinuvi, interaktiv texnologiyalar, integratsiya aloqasi, ijtimoiy o'zaro ta'sir.

Ключевые слова: Теория взаимодействия, изучение английского языка, парная и групповая работа, совместные проекты, языковые обмены, интерактивные технологии, интеграционная коммуникация, среда обучения, овладение языком, социальное взаимодействие.

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**STUDY ON THE EXAMPLE OF ARTISTIC AND HISTORICAL WORKS OF
COLLABORATIVE EDUCATIONAL TECHNOLOGY**

Bekbagambetova J.R.

Nukus State Pedagogical Institute named after Ajiniyaz

Summary: *The article will talk about one of the 4K models that serve for the effectiveness of Education - collaborative education. Also, on the example of the courage of the Great Commander Amir Temur, the issues of cooperation in his works and training based on the development of collaborative skills is spoken in students.*

Key words: *collaborative education, 4K model, cooperation, teaching methods, artistic-historical works, communicative, creative thinking, critical thinking, principle, corporate education.*

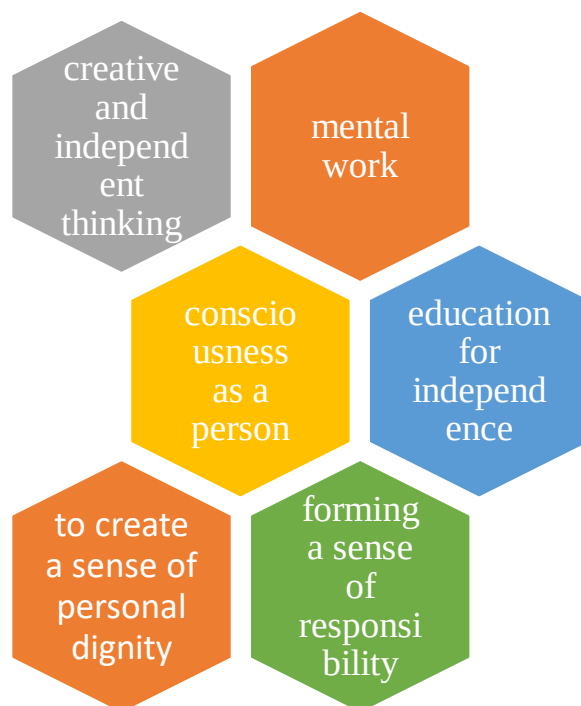
Introduction. According to the view of President of our country Shavkat Mirziyoyev: "Modern knowledge is the most important condition for the sustainable and fast development of the country to educate harmonious, purposeful and bright young people who have skills, who can take responsibility for the worthy future of the country".[2] From these remarks of the head of our state, it is not difficult to realize that educating young people with modern knowledge on the basis of the formation of new skills characteristic of the 21st century in them should constitute the main task of modern education today.

Educational advanced countries such as Singapore, China, England, Finland, Estonia focus on developing the principle of 4K in students. In the education of countries that ranked high in international rankings, such as PISA, PIRLS, students included "4K": special emphasis was placed on skills such as creative thinking, collaborating, communicativeness, critical thinking, and therefore they are achieving great results in international rankings. Researcher R.M.Carneiro, D.D.Heckman has highlighted the increasing number of evidence that 4K model skills emphasize their importance in different fields and disciplines-these are skills, behaviors, and personal qualities; it helps people to act well in their environment-get along with others, work hard, and can help them melt into your goals.

The 4K model is a person's personal, which will be useful in any activity. In particular, 4K theory was first developed in the United States in the 1950s. According to this theory, everyone should have such qualities in order to succeed in school, work and life. Collaborative "collaborative working" educational technology (Cooperative learning) in the 4K model is one of the approaches aimed at developing students' communication skills, using paired or group learning, the case emphasizes collaborative language learning. Educational technology "working in cooperation" (Cooperative learning) - for the first time to the field of pedagogy by J.Lancaster and introduced by A. Bell in the 18th century, they open a school in England where lessons are taught on the basis of this method.

Later, the educational technology of "working in cooperation" (Cooperative learning) was widely studied by other scientists. Supporters of this approach R. Olsen and S. Kagan defined that "Cooperative learning technology" (Cooperative learning) is a group educational activity, which is carried out with the exchange of information between students in groups. [11; 1] According to M. Garcia, "One of the positive aspects of this approach is that when students work together, they learn from their partners and enjoy working together with their friends" (10: 1-19) Collaborative work - a unique feature of educational technology is that during the pedagogically structured training, the process of socialization takes place, which is considered an important condition for learning science.

The main idea of cooperative education is not only to complete educational tasks together, but also to study and learn cooperatively. As a result of cooperative learning, the following feelings appear in each student. **(Figure 1)**



From time immemorial, the Uzbek and Karakalpak people have gained special attention in the development of science and education with their artistic and historical works. For example; When thinking about the Renaissance - the period of cultural growth from the second half of the 14th century to the beginning of the 16th century, one should first of all take into account the historical situation of those times. At the end of the 14th century, when Amir Temur had just entered the political scene, the conflict between leadership and local political power in the country reached its peak because of the long-lasting colonial oppression of the Mongols.

As a result of long-lasting conflicts and wars in Movarunnahr and Khorasan, cities and villages were destroyed, water structures were destroyed, economic life and culture of the country were irreparably damaged, most of the scientists, scholars, artisans and craftsmen were wiped out, spirituality was given a strong blow. History had created in those travels a great man who would become a medicine for the troubles of the nation. Islam Karimov, the first president of the Republic of Uzbekistan, said: "This period, which lasted about a century and a half, was an extremely difficult period for all-from ordinary citizens who had dependence in every possible way, to most major political figures and religious leaders. Society to freedom and progress he had a fist on the Savior, the leader, who embodied his interests. By fate, Amir Temur took to the field as such a savior and leader.[1;182]

Amir Temur had established a partnership with the people he had multiplied in doing the great things he had done. For example: Khoja Bahuddin, founder of the Amirtemur Naqshbandi sect, and his devotion to the teaching he created was extremely strong. Amir Temur has established cooperation with the following prolific intellectual scribes in the implementation of great works;

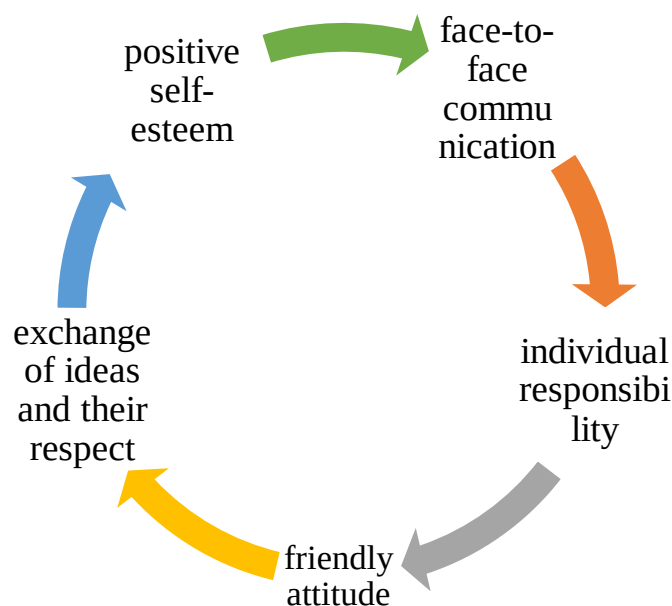
- Xoja Shamsuddin Kulol,
- Sayyid Amir Kulol,
- MavlonoZaynuddin
- Abu Bakr Toybodiy,
- Mir Sayyid Baraka

He considered them great religious scientists, his spiritual mentors, his teachings, which have always had unprecedented power, and used them to create and strengthen the system of a great state. Scientific sources write that Amir Timur, what I achieved in the kingdom, and the conquest of fortified spaces are all thanks to the blessing of Sheikh Shamsuddin Al-Fahuri, the wisdom of Sheikh

Zainuddin Al-Khawafi, and that all the blessings I found were obtained only with the help of Sayyid Baraka.

Amir Timur sincerely treated the Islamic leaders - Sayyids, sheikhs, Khojas. His attitude to Islam and faith in the people of Sufism found expression in his works "Tuzuki" and related "biographies", in the books of Nizamiddin Shami, Sharafiddin Ali Yazdi "Zafarnoma", Ibn Arabshah "the history of Amirtemur" and other scientific sources.[8;57]

The issue of colloboracia - (cooperation) was also expressed in the folk epics of Karakalpak. For example; the main character of the saga gathered forty girls and became a guide to them - through the image of Guloyim, we can see the signs of cooperation (colloboracia) closely. That is, **(Figure 2)**



Conclusion. In conclusion, it can be said that the effective use of the method of teaching cooperation on the example of artistic and historical works leads to the following results:

- enriches the learner's learning process;
- provides students with cognitive (education to expand the range of knowledge about the environment, develop cognitive needs) information;
- inspires students to learn the material;
- the formation of students' own personal knowledge and worldviews expands opportunities;
- increases the efficiency of bilateral information sharing;
- provides students with the necessary knowledge so that they can prepare for an independent life. The effective use of the 4K model is more significant not only by the comprehensive development of the younger generation, the owners of our future, but also by the focus on the formation in them of the skills necessary for successful adaptation to modern society.

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Rezyume: *Maqolada ta'lim samaradorligi uchun xizmat qiluvchi 4K modelining biri-kolloborativ ta'lim haqida so'z etiladi. Shuningdek, buyuk sarkarda Amir Temurning jasorati va uning asarlari misolida o'quvchilarda hamkorlik ko'nikmalarini rivojlantirish bayon etiladi.*

Резюме: *В данной статье рассмотрены вопросы коллоборативной обучении одной из 4К-моделей эффективного образования, а также использования коллоборативного обучения на примере произведениях о мужествах полководца Великого Амира Темура*

Kalit so'zlar: *kolloborativ ta'lim, 4K modeli, hamkorlik, o'qitish usullari, badiiy-tarixiy asarlar, kommunikativ, ijodiy fikrlash, tanqidiy fikrlash, printsipial, korporativ ta'lim.*

Ключевые слова: *коллоборативное обучение, модель 4К, сотрудничество, методы обучения, художественно-исторические произведения, коммуникативное, творческое мышление, критическое мышление, принцип, корпоративное образование.*

ASSESSMENT TECHNIQUES: EVALUATE METHODS FOR ASSESSING STUDENT PROGRESS IN LANGUAGE SKILLS EFFECTIVELY

Kurbanbaev Dj.A¹, Bakhtiyarov O.Kh².

¹Karakalpak State University named after Berdakh,

²51st school of the Ellikqala District of the Republic of Karakalpakstan

Summary: The article discusses the importance of assessing student progress in language skills to help educators tailor their instruction and support diverse learning needs. It outlines two primary types of assessment: formative and summative. Formative assessments, such as quizzes and peer reviews, provide ongoing feedback that allows teachers to identify specific areas where students may struggle, facilitating targeted interventions. In contrast, summative assessments, like standardized tests and final projects, offer a comprehensive evaluation of language acquisition at the end of a learning period.

Key words: Formative assessment, summative assessment, feedback, targeted intervention, technology in assessments, self-assessment, blended assessment strategy

Abstract. Assessing student progress in language skills is crucial for educators to tailor instruction and support diverse learning needs. Effective assessment techniques encompass formative and summative methods, each contributing uniquely to understanding student proficiency. Formative assessments, such as quizzes, peer reviews, and portfolio assessments, provide real-time feedback, encouraging ongoing improvement (Black & Wiliam, 1998). These assessments help identify specific areas where students struggle, allowing for targeted intervention (Hattie & Timperley, 2007). Conversely, summative assessments, including standardized tests and final projects, offer a comprehensive view of language acquisition at the end of a learning period (Glickman et al., 2014). Combining these approaches promotes a holistic understanding of student progress. Additionally, incorporating technology in assessments—through digital platforms that facilitate interactive quizzes or language apps—can enhance engagement and provide immediate feedback. Furthermore, utilizing self-assessment techniques empowers students to reflect on their own learning journey (Boud & Falchikov, 2006). Ultimately, a blended assessment strategy that integrates both traditional and innovative methods ensures a more accurate evaluation of language skills while fostering an environment conducive to continuous growth.

Types of Assessment

Assessments in education can be categorized in various ways based on their purpose, format, and timing. One primary type is *formative assessment*, which occurs during the learning process and focuses on monitoring student progress while providing ongoing feedback (Black & Wiliam, 1998). This type of assessment enhances learning by identifying areas where students may struggle and allowing for timely interventions through quizzes, discussions, or observations. Conversely, *summative assessments* are conducted at the end of an instructional unit or course to evaluate student learning against a standard or benchmark. These assessments often take the form of final exams or standardized tests and serve to summarize what students have learned over a period (Gulikers et al., 2004).

Another important category is *diagnostic assessment*, which helps identify students' strengths and weaknesses before instruction begins. By utilizing pre-tests or skills inventories, educators can tailor their teaching strategies to meet individual needs effectively. Norm-referenced assessments compare a student's performance to that of their peers and are useful for identifying relative standing among learners; examples include standardized tests like the SAT and ACT. In contrast, *criterion-referenced assessments* measure student performance against a fixed set of criteria or standards rather than comparing them to other students; these assessments help determine whether learners have acquired specific skills (Popham, 2009).

Performance-based assessments require students to demonstrate their knowledge through real-world tasks rather than merely recalling information. Such assessments emphasize application over rote memorization and may include presentations or experiments that allow for authentic demonstrations of understanding. *Authentic assessments* further extend this idea by incorporating tasks that reflect real-world challenges; they aim to assess students' abilities in practical contexts through projects that solve actual problems or simulations.

Self-assessment encourages students to evaluate their own work and gauge their progress within the learning process. This reflective practice fosters self-regulation and critical thinking skills as learners become more aware of their strengths and areas for improvement. Similarly, peer assessment involves students assessing each other's work based on established criteria; this collaboration promotes interaction among peers while enhancing critical thinking abilities.

Standardized tests are designed to be administered consistently across different populations of test-takers; they play a significant role in large-scale educational accountability measures. Each type of assessment serves distinct educational purposes at various stages of the teaching-learning process. By employing a combination of these diverse assessment types—formative for ongoing feedback, summative for final evaluations, diagnostic for tailored instruction—educators can enhance understanding and improve outcomes for both teachers and students alike.

Use of Rubrics in Assessment

Rubrics are essential tools in educational assessment, serving to establish clear criteria for both formative and summative evaluations. By providing detailed descriptions of performance levels for various assignments, rubrics enhance transparency and consistency in grading (Brookhart, 2013). *For formative assessments*, rubrics guide students in understanding expectations and areas for improvement, fostering a growth mindset. This clarity allows educators to give constructive feedback that is targeted and actionable. *In summative assessments*, rubrics ensure that evaluations are objective and aligned with learning outcomes, thereby reducing subjectivity in grading (Andrade & Du, 2005). The use of rubrics not only aids teachers in assessing student work but also empowers students to self-assess their progress against defined criteria. This dual function enhances the learning experience by promoting self-reflection and encouraging learners to take ownership of their educational journey. Moreover, the consistent application of rubric criteria across different assignments contributes to fairness in assessment practices. Overall, the integration of rubrics into educational frameworks significantly improves the quality of feedback provided to students while maintaining a high standard of assessment integrity.

Technology-Enhanced Language Assessments

Technology-enhanced language assessments have revolutionized the way educators evaluate language proficiency, integrating innovative tools and platforms that facilitate diverse and engaging assessment methods. For instance, language learning apps like Duolingo and Babbel utilize gamification techniques to create interactive quizzes that not only assess vocabulary and grammar but also enhance learner motivation (Wang, 2020). These applications provide instant feedback, allowing learners to identify their strengths and weaknesses in real-time.

Furthermore, platforms such as Quizlet enable teachers to design customized quizzes that cater to specific learning objectives, offering features like flashcards and matching games to reinforce vocabulary acquisition (Khalid et al., 2021). The flexibility of these tools allows for formative assessments that can be seamlessly integrated into the learning process, fostering a more personalized experience for students. Moreover, online testing environments like Proficiency.com offer comprehensive assessments that simulate real-world language use through listening, speaking, reading, and writing components. This holistic approach not only provides a more accurate representation of a learner's abilities but also prepares them for actual communication scenarios (Hernandez & Johnson, 2022). The use of technology in language assessment is further enhanced by data analytics capabilities; many platforms track student progress over time and generate detailed reports that inform instruction (Wang, 2020). This data-driven approach allows educators to tailor their teaching strategies based on individual learner needs. Additionally, technology facilitates remote

assessments through video conferencing tools like Zoom or Microsoft Teams, enabling oral proficiency tests in a virtual environment without compromising the integrity of the assessment process. These advancements demonstrate how technology not only enhances the efficiency of language assessments but also increases accessibility for learners worldwide. In general, the integration of various technological tools—ranging from mobile apps to online testing platforms—has brought about significant improvements in the assessment landscape for language learners. By leveraging these innovative methods, educators can create dynamic and personalized learning experiences that foster greater engagement and success in language acquisition.

Conclusion. The integration of technology in language assessment has revolutionized the way educators approach teaching and evaluating language skills. Platforms like Quizlet and Proficiency.com provide tailored assessments that align with specific learning objectives, enriching the educational experience through interactive tools such as flashcards and games. This adaptability not only supports vocabulary acquisition but also encourages ongoing formative assessments that seamlessly blend into the learning process. The holistic evaluation methods these platforms employ—incorporating listening, speaking, reading, and writing—further enhance learners' preparedness for real-world communication, ensuring a comprehensive understanding of language use.

Moreover, the implementation of data analytics allows for a more personalized teaching approach by tracking student progress and generating insightful reports. Educators can leverage this information to modify their instructional strategies according to individual learner needs, thereby fostering a more inclusive learning environment. The ability to conduct remote assessments via video conferencing tools also underscores the importance of accessibility in modern language education.

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Rezyume: Maqolada o'qituvchilarning o'qishlarini moslashtirish va turli xil ta'lim ehtiyojlarini qondirishga yordam berish uchun talabalarning til ko'nikmalarini o'zlashtirishdagi yutuqlarini baholashning ahamiyati muhokama qilinadi. Maqolada baholashning ikkita asosiy turi tasvirlangan: shakllantirish va umumlashtirish. Viktorinalar va ekspert baholari kabi shakllantiruvchi baholashlar o'qituvchilarga maqsadli aralashuvni rag'batlantirish orqali talabalar qiyinchiliklarga duch kelishi mumkin bo'lgan aniq sohalarini aniqlash imkonini beruvchi doimiy fikr-mulohazalarni taqdim etadi. Bundan farqli o'laroq, standartlashtirilgan testlar va yakuniy loyihalar kabi yakuniy baholar o'quv davri oxirida tilni o'zlashtirishni har tomonlama baholaydi.

Резюме: В статье обсуждается важность оценки прогресса учащихся в овладении языковыми навыками, чтобы помочь преподавателям адаптировать их обучение и удовлетворить разнообразные потребности в обучении. В статье описываются два основных типа оценки: формирующая и обобщающая. Формирующие оценки, такие как викторины и экспертные оценки, обеспечивают постоянную обратную связь, которая позволяет учителям выявлять конкретные области, в которых учащиеся могут испытывать трудности, способствуя целенаправленному вмешательству. В отличие от этого, итоговые оценки, такие как стандартизированные тесты и итоговые проекты, дают всестороннюю оценку усвоения языка в конце периода обучения.

Kalit so'zlar: shakllantiruvchi baholash, yakuniy baholash, fikr-mulohazalar, maqsadli aralashuv, baholash texnologiyasi, o'z-o'zini baholash, aralash baholash strategiyasi.

Ключевые слова: Формирующая оценка, итоговая оценка, обратная связь, целенаправленное вмешательство, технология оценки, самооценка, стратегия смешанной оценки.

**THE ROLE OF SPEAKING SKILL IN DEVELOPING PROFESSIONAL COMPETENCE
OF MEDICAL STUDENTS OF HIGHER EDUCATIONAL INSTITUTIONS IN THEIR
LANGUAGE PROFICIENCY OF ENGLISH**

Dastenova F.A.

Karakalpak State University named after Berdakh

Summary: *The article deals with importance of speaking skills in the English language for medical students of higher educational institutions. The article discusses problems encountered by students during learning English and several suggestions are given for teachers of English in order to help learners overcome these challenges. The article also describes new pedagogical technologies which can be used at the English classes of medical students for improving speaking skill.*

Key words: *medical students, professional competence, speaking skill, authentic materials, ESP, English teachers.*

Introduction. The aim of module programs of medical institutions on the subject of “Foreign language in medicine” is to form communicative competence in medical students’ daily life, scientific and professional fields by practicing English and learning medical terms. There can be a lot of obstacles which can be met by learners and one of them is the need for teaching speaking. In the medical field we are perhaps more fortunate than teachers in other ESP courses, because whereas some sciences, such as the so- called hard sciences, are removed from the world of everyday life, medicine is a discipline which is concerned not only with laboratory research and hypothetical reasoning, but also has to do with people [1: 62]. So it is important to adopt a flexible approach in language learning programs that concerns mostly activities devoted to enhancing oral speech.

Literature review. To enable medical students to interact and speak English fluently, teachers have to involve them and raise their motivation to discuss scientific or medical issues in relation to their field of study or interest [2: 5].

Authentic materials are considered to be a best option for such activities as they set up simulation of students’ learning the language. The materials may include videos about complaints of a patient and watchers are to guess the diagnosis, listening to medical news from radio programs and discussing them, realia from the clinical practice rooms such as specimens of plants or animals, and machines or tools which are described by learners, applying instructions of medicines by which students in groups retell content, descriptions, pharmacological characteristics, what diseases they are used for, how to use, dosage, side effects, contraindication, over dosage, photos from medical journals, radios or magazines to be described by students.

In the case of speaking, medical students showed their inability to engage in spontaneous communication. Their failure is undoubtedly due to the lack of English use and the fewer or the rare opportunities of the language, which over time, makes learners not only unable to speak, but fear the fact of speaking too [3: 4]. In order to avoid these problems English teachers need to use less native language and try to make participants speak more English even though they make mistakes. Another way to raise successful conversation among learners is organizing English speaking parties or weeks. Learning scenarios of role plays by heart provides opportunities for habit of speaking English.

Methodology. Enhancing English knowledge among medical students is carried out using modern methods and standards. Based on programs and other regulatory documents governing educational process of the institutes, it is advisable to establish the level of English literacy teaching staff, taking into account the requirements of generally recognized international standards of the Council of Europe “Common European competence of professional foreign language: learning, teaching and assessment” (CEFR-Common European Framework of Reference). According to the requirements and criteria for language acquisition, there are four indicators of the level of proficiency in a foreign language, namely: listening, speaking, reading and writing [4]. At the same time, the so-called “English for specific purposes” (ESP), which involves the use of English in a special direction

and in various fields of science, that is, professional English. Specifics of the ESP program is intended for representatives of various professional fields, the purpose of which is to focus on mastering foreign languages with an emphasis not on the grammatical aspects of the language structure, but on mastering the language itself, from the point of view

in terms of specialization and profession [5]. This direction is especially effective for representatives of the medical field for their effective use of English in further improving their professional skills.

Results and discussions. The activities presented in this article take an active part in motivating the representatives of medical career to communicate in English perfectly which is essential for their training and upcoming medical careers. Designing authentic materials integrates language and content in a way that allows students to learn both at the same time. Creating atmosphere of English lessons without any tension and with good mood is viewed as an action to help language learners to avoid their fear of speaking in society.

Conclusion. To conclude, adopting language learning programs, real world scenarios and generating the environment of English can go in line with future doctors' particular need. Making changes in the lesson plans with different speaking tasks frequently draws students' attention and interest in learning the language as modern teaching requires utilizing up-to-date methods of teaching.

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5. https://en.wikipedia.org/wiki/English_for_specific_purposes

Rezyume: *Maqolada oliy o'quv yurtlari tibbiyot yo'nalishi talabalari uchun ingliz tilida so'zlashuv ko'nikmalari muhimligi haqida so'z boradi. Maqolada ingliz tilini o'rganish jarayonida talabalar duch keladigan muammolar muhokama qilinadi va ingliz tili o'qituvchilariga o'quvchilarga ushbu qiyinchiliklarni engishga yordam berish uchun bir nechta takliflar berilgan. Maqolada, shuningdek, tibbiyot talabalarining ingliz tili darslarida gapirish ko'nikmasini oshirishda qo'llanilishi mumkin bo'lgan yangi pedagogik texnologiyalar haqida so'z boradi.*

Резюме: *В статье рассматривается важность навыков разговорной речи на английском языке для студентов-медиков высших учебных заведений. В статье обсуждаются проблемы, с которыми сталкиваются студенты во время изучения английского языка, и даются несколько советов учителям английского языка, которые помогут учащимся преодолеть эти проблемы. Также в статье описаны новые педагогические технологии, которые можно использовать на занятиях по английскому языку студентов-медиков для совершенствования разговорной речи.*

Kalit so'zlar: *tibbiyot talabalari, kasbiy kompetentsiya, so'zlashuv mahorati, autentik materiallar, ESP, ingliz tili o'qituvchilari.*

Ключевые слова: *студенты-медики, профессиональная компетентность, разговорная речь, аутентичные материалы, программы изучения языка, ESP, преподаватели английского языка.*

IMPLEMENTATION OF DATA JOURNALISM ON KARAKALPAKSTAN TELEVISION CHANNELS

Allambergenova P.

Journalism and Mass Communications University

Summary: This article explores the emergence of data journalism as a contemporary trend in global journalism, focusing on its manifestation in the television channels of the sovereign Republic of Karakalpakstan in Uzbekistan.

Keywords: data journalism, audience, analysis, longread, chart, graph, trend, television, screen.

Enter. Today, there has been a shift in the audience's demand for mainstream news outlets and it requires media to present the information in a visually appealing manner, utilizing modern technology effectively. "Data journalism enables the visual representation of vast amounts of information, allowing viewers to grasp it quickly" [1,257].

The evolution of news journalism on television began in 1952 when the CBS TV channel utilized a computer from UNIVAC I to analyze the results of presidential elections and votes garnered by each candidate [2]. In fact, computer technology has become an integral tool in preparing material in a new format.

Methods section. Methods in data journalism differ significantly from traditional journalism, particularly in how numbers are presented. In data journalism, numbers are central and are presented in a format that allows them to "speak" to the viewer. Comparative information is easily understood at a glance, such as in the table provided in Figure 1.



Figure 1.

Data journalism is unique in that it presents numbers in a specific format. This approach is a result of utilizing computer techniques for analysis [3].

In contemporary journalism, computers and the internet serve not only as sources of information but also as tools for creating material in a new format. To enhance the effectiveness of data journalism, practitioners should prioritize information that is relevant to their audience.

Data journalism focuses on working with facts and figures. While numbers may not always be the primary focus, they are crucial for reflecting truth. Through analysis of numbers, one can assess achievements and shortcomings, engage in reasoning and discussion, draw conclusions, and plan future actions.

When determining the data presented in statistical records, experts select the region, sector, and stratum from which the survey or report will be derived. This selection process is crucial as it forms the basis for the analysis conducted by journalists. However, it's important to note that the coverage may not always reflect the entire country's situation on a given topic. Therefore, journalists have the freedom to conduct their own analysis, study specific aspects, conduct independent surveys, and create analytical presentations.

One effective way to present information is through infographics, which convey information, knowledge, and data in a graphical form. Infographics are a part of longread, a recognized trend in contemporary journalism. "Longread" is a technology for transmitting information that is considered one of the most convenient and effective forms of covering current topics [2,127]. Infographics have the ability to not only convey a large amount of information but also to illustrate the relationships and differences between objects and facts in both time and space [2,131].

After gathering all the necessary information for a story, it is crucial to analyze and process it thoroughly. Rushing this step can lead to many mistakes. The most labor-intensive processes in data journalism are data cleaning and organization.

Results. A data journalist is a professional who collects and analyzes large datasets to write news and articles based on them. They search for data in open reports from public services and non-profit organizations, as well as in statistics from private services, analytical agencies, databases, and other sources.

The primary task of a data journalist is to study the data and present it visually through graphs, tables, or individual web pages that are understandable to the audience. This means presenting a large amount of complex information in formats that ordinary readers can comprehend. Ultimately, this information should be visualized in the form of a compelling story that is both interesting and understandable to the viewer.

Data journalism is not limited to articles filled with statistics or stories dominated by numbers; it can also include infographics, although not exclusively [4]. The integration of numbers and infographics can create complexity, but experts offer several tips to prevent complications:

Stage 1. Data collection.

Stage 2. Data preparation and analysis.

Stage 3. Information Presentation [5].

Certainly, it is necessary to find words, pictures and characters suitable for the direction of the prepared material.

The diversity of mass communication media and the rise of citizen journalism have significantly impacted the delivery of news, reducing the influence of traditional print and broadcast media.

Data journalism helps bridge this gap by enabling the transfer of large amounts of digital data from governments, public organizations, and companies in accessible ways. This use of data enhances connections between people, organizations, and governments, ensuring that information is supported by evidence [6].

What makes data journalism distinctive is its use of graphics and direct access to information, making it easily understandable to the audience. Additionally, data journalism is characterized by the unique presentation of data, collecting, revising, and presenting it in innovative ways [6].

While it can be challenging to convey a complete story in a short amount of information, data journalism allows for a broader perspective, enabling even short pieces of information to express important features. Implementing data journalism techniques not only broadens the types of news distribution but also makes presentations shorter and more effective. There are many methods and forms of news gathering and editing, but it requires professional skills that match the design of data journalism and adapt to the demands of fast-changing times [7].

News presented graphically helps audiences fully comprehend events and evokes strong emotional responses. Consequently, many organizations and companies seek personnel capable of working with data and creating infographics. Data journalism is considered the future of journalism.

With advancements in data analysis technology, journalism plays a crucial role in covering topics in depth and conveying news creatively. This new approach is particularly evident in investigative journalism, visual representation of information, and the practical use of information [8].

Debate. In a variety of contexts, ranging from everyday social issues to the coverage of profound social processes, this method facilitates the comprehensive coverage of events, including minute details, and the anticipation of their outcomes. Before delving into specific examples, we provide a brief contextual overview. The Republic of Karakalpakstan is an autonomous republic within Uzbekistan, a sovereign state. This status is officially recognized in the Constitution of Uzbekistan. Nukus is the capital city, with a population exceeding 3 million. In terms of land area, it constitutes one third of Uzbekistan. The official language is Karakalpak. The Republic of Karakalpakstan has 5 television channels, including 1 state-owned channel and 4 private channels. Let us now return to our direct analysis.

In non-state television channels of Karakalpakstan, there is a prevailing method of presenting important events in a simple, straightforward, and sequential manner, often following a set “pattern”. However, contemporary world journalism tends to convey news through storytelling. For example, in the February 27, 2024 issue of Amudarya TV’s “ATV News” program, the reporter provided a behind-the-scenes look: “According to the report of the secretary of the first sector, Otabek Ollayorov, the head of the first sector is conducting systematic work on the socio-economic development of the region. In 2023, together with the head of the sector and the district people's council, 54 mobile receptions were held according to plan and schedule to address citizen's issues and organize meetings with young people. The responsible officials reviewed and studied 358 appeals during these mobile receptions, and most of them were resolved positively.

... Assistant District Prosecutor Sanjar Abdullaev reported on the work done in Sector 2, highlighting 485 citizens, including 194 young people and 95 women, were employed by the employment assistance center according to the employment program. Additionally, 7 job fairs were organized in Sector 2 during the past period, involving 176 citizens, out of which 73 were granted work permits.

The report of the secretary of the 3rd sector, Muhridin Rakhimov, mentioned that 37 citizens have studied in various fields since the beginning of the year in educational centers to support and develop small businesses, family entrepreneurship, handicrafts, and home economics. Their employment is fully ensured, with 7 in tailoring, 5 in cooking, 11 in construction, 6 in car maintenance, 5 in information technology, 2 in welding, and 3 in hairdressing.

Islam Yusupov, the deputy head of the district tax inspectorate, reported on the works being carried out in Sector 4, including the provision of wheelchairs for adults to 12 citizens with disabilities, electric wheelchairs to 5 citizens, strollers to 2 children with disabilities, hearing aids to 2 citizens, crutches to 7 citizens, and walking sticks to 12 citizens, ensuring they are fully provided with means of rehabilitation” [9]. (In the picture, only the participants of the meeting are given in different angles and plans).

In the February 28, 2024 issue of Tortkol TV’s “TTV News” program, the reporter stated that 3,563 unemployed citizens who sought employment and job assistance from the district employment department were registered for 2024, with 230 citizens permanently employed in January. Among them, 173 were women and 253 were young people. Additionally, 1,282 unemployed citizens are planned to be re-trained in the district in 2024, with 54 of them already undergoing training in January. Among those trained, 47 were women and 11 were young people. Furthermore, 55 citizens were involved in temporary public works in January [10], he said.

However, the presentation of digital information in this segment followed a simple pattern. The interviewees' information was also presented in a traditional manner. For example, in the following video of the program, veterinarian Sevil Saporov's statement about the district's efforts against infectious diseases was read from a paper. This approach, although somewhat redundant, highlights the need for more effective use of data journalism elements in broadcasting, especially in

an era where technology is prevalent and audiences expect more dynamic content. Data journalism is predominantly used in news programs of the “Karakalpakstan” TV channel, particularly in the program “Xabar”. For instance, in the March 4, 2024 issue, a segment prepared about the Karaozak tribe effectively utilized data journalism by presenting detailed numbers[11].



The provided slides illustrate the effective use of data journalism elements. Data journalism relies on data as a tool to uncover journalistic stories and their sources. Its development is closely tied to advancements in technologies for storing and processing large amounts of data, as well as the increasing openness of information sources. Data journalism intersects with fields such as computer science, design, and statistics.

In conclusion, data journalism offers an innovative and effective approach to reporting, fundamentally changing the way stories are told. By leveraging data, journalists enhance accountability, empower readers, and elevate journalistic standards. In today's digital age, where information is abundant, data journalism is a powerful tool for bringing stories to life and covering current issues. It is reshaping the way traditional journalism communicates and processes information by integrating data analysis techniques.

As we navigate this new information age, the role and influence of journalism are undergoing significant changes. Digital media and information transmission technologies are becoming increasingly popular, necessitating the introduction of mobile platforms and social networks in regional TV channels as a new method for developing and presenting news content.

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Rezyume: Ushbu maqolada global jurnalistikaning zamonaviy tendentsiyasi sifatida data jurnalistikaning paydo bo'lishi o'rganilib, uning O'zbekistondagi suveren Qoraqalpog'iston Respublikasi telekanallarida namoyon bo'lishiga e'tibor qaratiladi.

Резюме: В этой статье рассматривается возникновение журналистики данных как современного направления в мировой журналистике, уделяя особое внимание его проявлению на телеканалах суверенной Республики Каракалпакстан в Узбекистане.

Kalit so'zlar: ma'lumotlar jurnalistikasi, auditoriya, tahlil, longread, diagramma, grafik, trend, televizor, ekran.

Ключевые слова: журналистика данных, аудитория, анализ, лонгрид, диаграмма, график, тенденция, телевидение, экран.

HOW TO TEACH SENTENCE STRUCTURES OF THE GERMAN LANGUAGE TO PUPILS

Jumaniyazova G.T.

teacher of secondary school #5. Taxiatah, Karakalpakstan

Summary: *In the article the author shares her experience of teaching sentence structures of the German language to school pupils, using a variety of techniques.*

Key words: *sentence structure, subordinate clauses, main clauses, visual aids.*

Teaching the structure of German sentences to pupils requires an approach that breaks down the complexity of German grammar into manageable and comprehensible segments. German, with its flexible word order and specific rules for sentence construction, necessitates a strategic teaching method to help students grasp its nuances. Here is an article outlining effective methods and strategies for teaching the structure of German sentences, supplemented with relevant quotes from authoritative sources.

Understanding German Sentence Structure

German sentence structure can be broadly categorized into main clauses (*Hauptsätze*) and subordinate clauses (*Nebensätze*). Each has distinct rules governing word order. The main clause typically follows a Subject-Verb-Object (SVO) order, whereas the subordinate clause often uses a Subject-Object-Verb (SOV) structure.

1. Main Clauses

In German main clauses, the verb generally occupies the second position. This rule applies regardless of whether the sentence starts with the subject or another element (e.g., an adverb or a prepositional phrase). For example:

- Subject-first: "*Ich lese ein Buch.*" (*I am reading a book.*)
- Element-first: "*Morgen gehe ich zur Schule.*" (*Tomorrow, I am going to school.*)

"The verb-second rule is a defining characteristic of German main clauses, providing a fixed point in an otherwise flexible word order" [1.123.]

2. Subordinate Clauses

Subordinate clauses begin with a subordinating conjunction (e.g., "*dass*," "*weil*," "*obwohl*") and place the conjugated verb at the end of the clause. For example:

- "*Ich denke, dass er kommt.*" (*I think that he is coming.*)
- "*Sie bleibt zu Hause, weil sie krank ist.*" (*She stays at home because she is sick.*)

"In subordinate clauses, the conjugated verb is placed at the end, a rule that helps to distinguish these clauses from main clauses and maintain clarity in complex sentences" [2.211.] It proves the fact that English sentence structures differs from German ones.

Here are: teaching strategies:

1. Start with Simple Sentences

Begin with simple SVO sentences to build a foundation. Use clear, context-based examples to illustrate the subject, verb, and object positions. Practice these structures through repetition and exercises:

- Example: "*Der Hund (S) jagt (V) die Katze (O).*" (*The dog chases the cat.*)

2. Introduce Sentence Elements

Gradually introduce additional sentence elements such as time, manner, and place (TMP). Emphasize how these elements can be positioned at the beginning of the sentence for emphasis, with the verb still in the second position:

- Example: "*Heute (T) geht (V) er (S) ins Kino (P).*" (*Today, he is going to the cinema.*)

Ed Swick highlights the importance of these elements: "Understanding the role of time, manner, and place in sentence structure helps students form more natural and varied sentences" [3.34.] Therefore, teaching adverbs of place and their positions a must-have thing for us.

3. Use Visual Aids

Visual aids, like sentence diagrams and color-coded charts, can help students visualize sentence structure. Highlight the position of the verb in main and subordinate clauses:

- Example Chart:

- Main Clause: [Subject] - [Verb] - [Object]

- Subordinate Clause: [Subordinating Conjunction] - [Subject] - [Object] - [Verb]

4. Practice with Subordinate Clauses

Introduce subordinate clauses by combining them with main clauses. Start with common conjunctions and practice forming complex sentences. Provide exercises that require students to identify and place verbs correctly:

- Example: *"Ich weiß, dass er kommen wird."* (I know that he will come.)

5. Interactive Activities

Engage students with interactive activities such as sentence-building games, role-playing, and writing exercises. These activities reinforce their understanding and make learning enjoyable. For instance, use sentence strips that students can rearrange to form correct sentences.

6. Reinforce with Consistent Practice

Consistent practice through homework assignments, quizzes, and in-class exercises is crucial. Encourage students to write their sentences and correct mistakes collaboratively to foster a supportive learning environment.

Common Challenges and Solutions

1. Verb Positioning Confusion: Students often struggle with placing the verb in the correct position. Reinforce the rule through repetition and visual aids.

2. Subordinate Clause Complexity: The verb-final rule in subordinate clauses can be challenging. Simplify by initially using conjunctions like *"dass"* and gradually introduce more complex ones.

3. Word Order Variability: The flexible word order in German can confuse students. Focus on core rules and gradually introduce variations.

Conclusion

Teaching the structure of German sentences requires a clear, step-by-step approach that builds from simple to complex. By using visual aids, interactive activities, and consistent practice, students can master the rules of German sentence construction. Understanding these structures not only enhances their language skills but also boosts their confidence in using German effectively.

According to the quotation which summarises well: "Effective teaching of German grammar involves breaking down complex rules into understandable parts, using a variety of teaching aids and methods to cater to different learning styles" [4.45]

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Rezyume: Maqolada muallif nemis tilidagi jumla tuzilmalarini turli xil usullardan foydalangan holda maktab o'quvchilariga o'rgatish tajribasi bilan o'rtoqlashadi.

Резюме: В статье автор делится опытом обучения школьников предложениям немецкого языка с использованием различных методов.

Kalit so'zlar so'zlar: gap tuzilishi, ergash gaplar, bosh gaplar, ko'rgazmali qurollar.

Ключевые слова: структура предложения, придаточные предложения, главные предложения, наглядные пособия.

STRUCTURAL ANALYSIS OF HAND/QOL SOMATISMS IN PHRASEOLOGICAL UNITS

Nurillaev Kh.K.

Karakalpak State University named after Berdakh

Summary: *This paper investigates the meaning of hand somatisms in linguistic and cultural contexts using a structural study of phraseological components. Through an analysis of several colloquial idioms that integrate images connected to hands, we reveal the symbolic and metaphorical connotations behind these statements. The research sheds insight on the ways in which hand somatisms mirror human experiences, social conventions, and cultural values, eventually advancing our knowledge of language as a window into culture and cognition.*

Key words: *Structural analysis, hand somatisms, phraseological units, syntax, metaphorical significance, idiomatic expressions, cross-linguistic variations, cultural meaning, communication, human experience.*

Introduction. Idioms, collocations, and fixed phrases are examples of phraseological units, which are essential parts of language that use succinct forms to communicate complex meanings. In this context, somatisms—expressions that make reference to body parts—are important because they frequently capture cultural values and ideas. Because of the hand's many functions in communication and expression, hand somatisms stand out among them. The objective of this article is to examine the structural features of hand somatisms in different languages, with an emphasis on their cultural importance and metaphorical ramifications.

Theoretical part - Somatism refers to the use of bodily terms to describe and understand language and meaning. In this context, "hand somatism" would involve how hand-related terms and concepts are used in language. Expressions that use bodily parts to communicate meanings other than their literal interpretations are referred to as somatisms. They are common in all languages and frequently represent common cultural norms and human experiences (Kövecses, 2005). [3]

Karakalpak linguist B. T. Yusupova states that phraseological units are a special kind of world since they are composed of "brief ethical rules in the form of a will to show a way of life" [1.87].

Phraseology and Cultural Context: The study of permanent terms in language is known as phraseology, and it frequently sheds light on society norms and attitudes. (Baker, 1992) [2.74]. A deeper understanding of phraseological units as they interact with culture may be achieved by seeing them through the prism of somatisms.

Hand somatisms are a metaphor for interpersonal interactions, activity, and agency. They frequently depict both concrete deeds and abstract ideas like assistance, command, and dialogue.

Examples of Hand-Related Phraseological Units

1. "To lend a hand": this phrase signifies offering assistance or support.
2. "To have one's hands tied": this expression indicates being unable to act due to constraints.
3. "Hands down": used to denote something that is indisputably true or easily won.
4. "To have a hand in": To be involved in something.
5. -"To wash one's hands of": To disassociate oneself from a responsibility.
6. "To throw up one's hands": To express frustration or helplessness.

According to Lakoff and Johnson (1980), hand somatisms usually use metaphorical use, in which the actual act of using hands translates into abstract ideas. Prepositional phrases or verb constructions emphasizing agency and action are frequently used in the syntax. [4.57]

Lexical Analysis - Lexical Items: Words related to the hand (e.g., "hand," "finger," "grip") often carry metaphorical meanings. For example, "to lend a hand" means to help someone.

- Polysemy: Many hand-related terms can have multiple meanings. For instance, "hand" can refer to the physical body part, as well as a unit of measurement or a way to indicate participation (e.g., "raise your hand").

Metaphorical Usage - The hand is frequently used in idiomatic expressions and metaphors:

- Control and Power: Phrases like "to have the upper hand" imply dominance or control.
- Assistance: Expressions such as "give a helping hand" indicate support.
- Creation and Craftsmanship: Terms like "hand-made" emphasize skill and artistry.

Gesture and Communication - Hands play a crucial role in non-verbal communication. Gestures can reinforce or contradict spoken language, enhancing meaning.

- Deixis: Hand gestures often serve as deictic expressions, pointing to objects or indicating direction.

Cultural Variations - Different cultures have unique gestures and meanings associated with hand movements. Understanding these can provide insights into cultural norms and values.

- For example, the thumbs-up gesture can mean approval in some cultures but may be offensive in others.

Syntax and Grammar - Certain languages may have specific grammatical structures that incorporate hand-related terms. For example, in sign languages, hand shapes and movements are integral to forming words and sentences.

Semantic Fields - The semantic field related to hands includes various domains such as action (e.g., "grasp," "hold"), emotion (e.g., "touch," "caress"), and social interaction (e.g., "shake hands").

Cultural Implications of Hand Somatisms: Individualism and collaboration are two cultural characteristics that are frequently captured by hand somatisms. For example, in many cultures, "to shake hands" denotes agreement and trust, reflecting societal conventions around social contact.

Case Studies: - Western Cultures: Phrases like "to give a helping hand" emphasize community support.

- Eastern Cultures: In some Asian contexts, expressions involving hands may denote respect and hierarchy.

Comparative Analysis: Both English and Karakalpak cultures utilize hand somatisms to express cooperation and assistance. For instance, "to lend a hand" in English parallels the Karakalpak phrase "qol sozdi, qol uzatti" (járdem berdi, kómeklesti), both conveying the notion of offering help.

Cultural context influences the interpretation of hand somatisms. In Western cultures, hand-related expressions often emphasize individual agency, while Eastern cultures may focus more on collective action and harmony.

For example: "To have a hand in" signifies involvement or participation in an activity or decision-making process. It illustrates how the metaphor of "hand" extends beyond physicality to encompass influence and agency.

"To wash one's hands of" - This phrase conveys disassociation from responsibility or involvement in a situation. It reflects cultural attitudes toward accountability and moral responsibility.

Conclusion: Hand somatisms have a vital part in language as a reflection of human experience and cultural values, as revealed by the structural study of these words in phraseological units. We may learn about the common values that influence cross-cultural communication by comprehending these phrases. Subsequent investigations may go more into the development of hand somatisms in modern language usage, particularly in digital correspondence.

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Rezyume: Ushbu maqolada frazeologik birliklardagi HAND/QOL somatizmlarining tarkibiy-semantik tahlili olib boriladi. Frazeologik birliklar esa strukturaviy-semantik tasnifi nuqtai nazaridan tahlil qilinadi.

Резюме: В данной статье проводится структурно-семантический анализ соматизмов HAND/QOL во фразеологических единицах. А фразеологизмы анализируются с точки зрения структурно-семантической классификации.

Kalit so'zlar: struktur tahlil, qo'l somatizmlari, frazeologik birliklar, sintaksis, metaforik ma'no, idiomatik iboralar, tillararo variatsiyalar, madaniy ma'no, muloqot, inson tajribasi.

Ключевые слова: Структурный анализ, ручные соматизмы, фразеологизмы, синтаксис, метафорическое значение, идиоматические выражения, межъязыковые вариации, культурное значение, коммуникация, человеческий опыт.

**ORGANIZATIONAL-METHODICAL ASPECTS OF EDUCATION OF STUDENTS
BASED ON VALUES**

Asamatdinova J.P., Bekbergenov A.A.

Karakalpak State University named after Berdakh

Summary: *The article considers that the formation of students' communicative culture in the context of interethnic communication is aimed at the communicative development of the individual as a subject of life, his involvement in joint creative activities and communication with other participants in this process. Also, there are shown that the educational and educational potential of the higher educational institution, the openness of the educational system in the society, the humanistic orientation of the process of training students, and the theoretical and practical foundations of education aimed at expanding their creative and social capabilities.*

Key words: *education, training, integration, ability, psychology, culture, tolerance, respect, tradition, behavior, communication, competence, language, speech, personality.*

In the process of social and political integration and globalization, the idea of inter-ethnic and inter-religious tolerance is of great importance in ensuring peace and stability among peoples, nations, and states. The educational system is recognized as an important factor in educating young people in the spirit of tolerance, and based on the internationalization of the educational process in developed countries, priority is given to the training of tolerant, creative and competitive personnel in socio-economic and intercultural relations.

In the process of globalization of education, research institutes in countries such as the USA, Great Britain, Russia, Germany, and South Korea conduct scientific research aimed at educating young people in the spirit of tolerance, developing a set of knowledge and skills based on national and universal values, and organizing spiritual and educational work in the education system.

The purpose of our experimental work is to test the pedagogical conditions that help students develop the culture of interethnic communication based on the axiological approach. The purpose of the identification phase of the research was to determine the main level of development of the culture of interethnic communication of our youth.

It is recommended to start the development of communicative culture with a detailed diagnosis. Below are the criteria for evaluating the level of development of communicative culture [1; 145]:

- level of communicative openness;
- the presence of motivation to communicate;
- student's communicative ability in the context of international communication;
- level of language and speech culture;
- level of general culture;
- communication control;
- empathy;
- reflection.

Initially, in the theoretical part of our research, the pedagogical and psychological conditions for the formation of communicative culture were determined.

The effectiveness of forming students' communicative culture is ensured by the following pedagogical conditions:

- the organization of an integral educational space of a higher education institution is considered as a process that includes students' movement from the information stage to the acquisition of the level of communicative culture, characterized by interpersonal communicative flexibility in the process of personal development of students;
- determining the goal of developing students' communicative culture;

- organization of a comprehensive educational area of oligoh, which helps in the formation of communicative knowledge, skills and qualifications;
- directing the content of educational work to the formation of communicative culture;
- systematic, person-oriented, competence-based, cultural, activity-based approaches to the educational process of students in order to form a communicative culture of students.

The purpose of forming the communicative culture of students in the conditions of interethnic communication is to develop the personality of young people in moral, emotional, behavioral and professional aspects. The process of formation of communicative culture represents the purposeful psychological effect that occurs in the process of communication between teachers and students, formal and informal groups. One of the conditions for the formation of the communicative culture of students is the creation of a holistic educational space of the school.

Communicative culture of students in the conditions of international communication is most effectively formed in the conditions of higher education based on the psychodidactic principle, which mainly consists of combining didactic and psychological content based on the principle of generalization, developing innovative dialogic methods of its implementation. The main principle of creating an integrated psychodidactic content is generalization, which includes getting into the essence of the educational discipline in order to highlight the main thing and subordinate the entire content of extracurricular activities to this main thing. The structural and logical analysis of each educational topic is replaced by the overall structure of the training outside the entire audience.

As noted by our scientists, "psycho-didactics creates wide opportunities for improving the professional training of students of a pedagogical educational institution by including the psychological means of organizing the higher school educational process together with didactic and methodological tools in its content." [3; 67].

The formation of communicative culture of students in the conditions of international communication is aimed at the communicative development of the individual as a subject of life activity, his involvement in joint creative activities and communication with other participants of this process. The cultural environment of a higher education institution is a space for the cultural development of the student community, which forms the culture of communication, interpersonal relations, attitude to things and one's activities, values, moral principles, etc.

The educational and educational potential of the higher education institution for the formation of communicative culture of its students in the conditions of inter-ethnic communication implies the openness of the educational system in society, the humanistic direction of the process of training students, and the expansion of their creative and social opportunities.

The purpose of the formative program was to implement the pedagogical and psychological conditions for the formation of students' communicative culture.

At the identification stage of the research, we identified the weaknesses of the basic level of students' communicative culture, which we paid special attention to in the implementation of the formation program. The program is based on psychodidactic principles. The psychodidactic principle of building the educational content of a higher education institution includes the following: determining the general purpose of non-auditory classes (developing the teacher's communicative culture), choosing psychological (pedagogical communication psychology) and didactic (content, teaching methods) content; linking the two based on a common goal (Table 1).

Table 1

Program for the implementation of pedagogical conditions for the formation of international communicative culture of students

№	Components	Psychological content	Didactic content
1	Purposeful	Development of communicative culture of students; knowing and setting the goals of education and professional activity	
2	Organizational	Acquiring the skills of organizing and engaging students in various types of communicative activities	

3	Knowledgeable	Psychological-pedagogical knowledge in the field of communication psychology, developmental psychology, psychodidactics of pedagogical communication
4	Motivational-regulating	The presence of positive human goals aimed at developing the personality of the subject of training in professional activities
5	Active	The ability to develop communicative actions manifested in the style of pedagogical communication, to create a safe, developing educational environment
6	Evaluating	Development of self-esteem of educational and professional activities and behavior in communication situations
7	Efficient	Effectiveness of implementation of international communication activities

The goal of forming the communicative culture of students in the conditions of interethnic communication determines its psychological and didactic content, which requires certain methods, means and forms of encouraging and organizing the process of forming communicative culture.

Students of applied psychology are most successfully analyzed by students in the process of dialogue between teachers, tutors and students of "Pedagogical and psychological conflictology" and "Destructive psychology" based on the curriculum.

In the process of studying the lesson "Pedagogical and psychological conflictology", students will gain an understanding of the conflicts that arise in interpersonal communication, the management process and the factors that cause them, as well as the ways of solving them, the didactic systems and models of higher education, the important features of development education for students. Psychodidactics is designed to combine the knowledge of theoretical psychological-pedagogical, didactic, methodological and individual lessons, which is the development of the technology of mastering the relevant educational lessons, and in the future, education through the educational subject.

The psychodidactic approach is based on pedagogical engineering, that is, "the process of designing, building and creating [2; 134].

The learning process of classroom and non-auditory activities is aimed at developing the following competencies or their components:

- ready to use knowledge of various theories of education, upbringing and development, high school and basic educational programs for students, students and tutors.

As a result of mastering these extracurricular activities, the student will understand:

Reminder!

- the main types of inter-ethnic interaction;
- features of various psychological and pedagogical concepts, didactic systems and educational technologies;
- the features of the implementation of developmental educational ideas in a higher educational institution.

To have the opportunity:

- establishing the relationship between the psychological concept and the didactic model;
- analysing the relationship between individual elements of the didactic system;
- comparing different didactic systems;
- arguing for their civil position;
- to determine the development characteristics of students in different didactic systems;
- effectively organizing of the audience and outside the audience in the educational process.

Acquiring skills:

- international communication;

- resolving conflict situations;
- effective communication technologies in various situations of international communication;
- analysis of didactic systems.

As a conclusion of the scientific analysis, it can be said that a comparative analysis of the obtained results was carried out in order to determine the effectiveness of the proposed program based on the results of the psychodidactic experiment, and statistically significant dynamics of the components of communicative culture were obtained. The results of the control diagnostic study confirmed our author's initial hypothesis and showed the effectiveness of the developed program on the formation of communicative culture of students in the context of the psychodidactic content of the higher educational institution. Taking into account that the problem of forming the communicative culture of students in international communication is multifaceted and the above research cannot reveal all its aspects, it is promising to study the issues of forming the communicative culture of students in non-auditory classes and in the process of pedagogical practice.

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Rezyume: maqolada talabalarining millatlararo muloqot sharoitida kommunikativ madaniyatini shakllantirish hayotiy faoliyat sub'ekti sifatida shaxsning kommunikativ rivojlanishiga, uni birgalikdagi ijodiy faoliyatga jalb qilishga va ushbu jarayonning boshqa ishtirokchilari bilan muloqotga qaratilgan. Shuningdek oliy ta'lim muassasining ta'lim va tarbiyaviy salohiyati ta'lim tizimining jamiyatdagi ochiqqligini, talabalarni tayyorlash jarayonining insonparvarlik yo'nalishini, ularning ijodiy va ijtimoiy imkoniyatlarini kengaytirishga qaratilgan tarbiyaning nazariy va amaliy asoslari ko'rsatilgan.

Резюме: В статье рассматривается, что формирование коммуникативной культуры студентов в условиях межэтнического общения направлено на коммуникативное развитие личности как субъекта жизни, его вовлечение в совместную творческую деятельность и общение с другими участниками этого процесса. Также показаны образовательно-воспитательный потенциал высшего учебного заведения, открытость образовательной системы в обществе, гуманистическая направленность процесса обучения студентов, теоретические и практические основы образования, направленные на расширение их творческих способностей. и социальные возможности.

Kalit so'zlar: ta'lim, tarbiya, integratsiya, qadiriya, psixologiya, madaniyat, bag'rikenglik, hurmat, an'ana, xulq-atvor, muloqot, kompetentsiya, til, nutq, shaxs.

Ключевые слова: образование, воспитание, интеграция, способность психология, культура, толерантность, уважение, традиции, поведение, коммуникация, компетентность, язык, речь, личность.

THE HISTORY OF THE DEVELOPMENT OF PUBLIC CIVIL SERVICE IN OUR COUNTRY

Seitniyazov K.P.

Independent applicant of the Karakalpak State University

Summary: *This article analyzes the emergence, formation, and development of public civil service in our country, divided into distinct stages.*

Keywords: *state and law, public service, public civil service, stages of historical development.*

One of the primary functions of any state is to protect the interests of society, ensure its welfare, security, and development, and to serve the people. For this very purpose, government institutions are established, and various tasks are assigned within the framework of the law, with authority exercised by qualified personnel.

All social relations within this process constitute a unique institution of public service, and the legal regulation of this sector plays a crucial role in the development of society.

In our country, the emergence and development of civil service as a distinct type of public service is directly related to the history of the earliest forms of statehood. The rise of ancient statehood, the emergence of legal norms in social relations, the development of state governance forms, the establishment of competent state bodies, institutions, and organizations to fulfill state functions, and the assignment of specific authoritative tasks to certain individuals all led to the formation of the initial forms of public service.

Therefore, throughout the history of every country, the emergence of statehood, governance traditions, political systems, and many other factors have, in turn, influenced the development of public service, leading to the emergence and unique evolution of various types of public services.

The fact that various states that significantly contributed to human civilization existed in the territory of Uzbekistan naturally indicates that public service, including civil service, existed in some form.

Of course, the history of statehood, governance forms, and political systems, as well as other socio-economic phenomena in our country, have been extensively studied by historians, political scientists, and legal scholars, both local and foreign. However, the history of the development, stages, and evolution of civil service has been less studied.

From our perspective, studying the development of civil service from the earliest state unions to the present day is essential to uncover the legal nature and unique aspects of civil service.

Among scholars, there are various approaches to dividing the history of the emergence of the state and law in Uzbekistan into periods. For instance, B.A. Daumenov divides the history of the emergence of the state and law in our country into the following eight periods:

1. The emergence of the state and law in Uzbekistan;
2. The first state unions and law;
3. The state and law in ancient times;
4. The state and law in the early Middle Ages;
5. The state and law in the developed Middle Ages;
6. The law of Amir Temur and the Temurid state;
7. The state and law in the first half of the 16th-19th centuries;
8. The state and law in the second half of the 19th century [1].

The political scientist F. Ravshanov, in connection with the topic, periodized the development of national traditions and values regarding the selection of personnel for public service as follows:

- **the first period** - from ancient times to the 8th century - is the period of the practical formation of state governance, governance skills, and the system of selecting leaders and officials.

- **the second period** - from the 9th to the 16th century - is the period of development, flourishing, and the emergence of scientific theories and teachings related to the national system of state governance, governance skills, and leadership selection.

- **the third period** - from the 17th century to the first quarter of the 20th century - is the period of stagnation and decline of the practical and scientific traditions of the national system of state governance, governance skills, and leadership.

- **the fourth period** - the 20th century, from 1925 to 1990 - is the period of the complete rejection of the national system through the transition to communist totalitarian methods of governance and leadership, leading to the eradication of national governance traditions.

- **the fifth period** - the end of the 20th century to the 21st century - is the period of reformation of the governance system, restoration of national roots, and enrichment with global practices under the conditions of national independence and based on the "Uzbek model" of statehood [2].

Some scholars have pointed out that periodizing the history of socio-political processes from the perspective of state and societal governance, public service traditions, and the selection and appointment to positions is a complex issue [3].

Therefore, it would be appropriate to study the history of the emergence and development of the early forms and manifestations of civil service in line with the history of statehood, divided into three stages.

The first stage, from the 7th century BC to the 8th century AD, can be considered the period in which the early forms of civil service began to manifest in unique ways in the states from ancient Khorezm and Bactria to the Arab Caliphate.

In particular, the "Avesta," the primary source regulating social life during this period, provides information about the earliest signs of political power. For instance, scientific literature mentions the titles of zantupati-district head, dahyupati -provincial governor, military leaders - sastars, and Kavi - king[4]. These facts indicate that in ancient times, local state authority was exercised by the respective leaders and their assistants, who served as state officials.

The second stage, encompasses the period from the 8th century to the mid-19th century, during which the territories of Central Asia were governed by states such as the Arab Caliphate, Samanids, Ghaznavids, Khorezmshahs, Timurids, and three Khanates. During this period, Islamic law served as the primary source for regulating socio-economic relations in society and state life.

Therefore, during this period, state governance was in the form of an absolute monarchy, and the nature of carrying out public service was almost the same, with only differences in names, forms, and authorities.

For example, during the Samanid era, nine ministries were established, and the first state administrative institutions began operating. Local administrative bodies were set up in the provinces, and a good command of Arabic and Persian was required to enter public service.

During the era of Amir Temur, governance was divided between two institutions: the dargoh (court) and the diwans (ministries). The Dargoh - was the highest state institution, headed by the supreme ruler, Amir Temur himself. The Dargoh's operations, as well as its connection with the ministries and local government bodies, were managed by the supreme diwan "Devoni Buzruk", headed by the diwanbegi. One of the important positions within the Dargoh was the Arzbegi, who was responsible for bringing complaints, petitions, and suggestions from the public to the attention of the supreme ruler. Other positions in state institutions included the tavochi (military recruiter), chief Hojib, head of official ceremonies, treasurer, khansalar, qushchi, qushbegi, secretaries, musicians, poets, physicians, and janitors[5].

In the Khiva Khanate, state governance existed in both vertical and horizontal forms. Secular, religious, military, judicial, and financial governance were all carried out based on the principle of autocratic rule. During the reign of Khiva's ruler Abulgazikhan, an administrative reform was conducted, and the central governance system of the khanate was completely reorganized. The court established 32 central administrative positions, including 2 shaykh al-Islam, 1 mutawalli, 1 naib, 4

atalik, 4 inoq, 4 mirob, 4 biy, 1 parvonachi, 2 aka, 2 arbob, 4 chigatay-inoq, 1 wazir (minister, also known as mehtar), and 1 qushbegi[6].

Specifically, in the Khiva Khanate, the Mirob was an official responsible for controlling water distribution and irrigation networks. The main irrigation channel, or canal, was supervised by the Mirobboshi (chief water controller), who managed the primary irrigation channels (ariqs). The distribution of water from the main canals to village ariqs was overseen by the «Arbob», and from the village ariqs to the main ariqs and intakes, it was managed by the «Juybons». The mirobboshi received a salary from the state treasury for his services[7], indicating that the Mirobs were state civil servants responsible for the authority of the state in water management.

The third stage, from the second half of the 19th century to 1991, includes two sub-stages: the period from 1860 to 1917 and the period from 1917 to 1991, covering the time up until Uzbekistan's independence.

One of the characteristics of this period is that the Roman-German legal system began to be introduced in the Turkestan region, marking the emergence of distinct types of public service.

Specifically, during the period from 1865 to 1916, the Russian Empire developed 10 regulations and legal drafts to manage the Turkestan region[8]. One of the first normative documents to serve as the legal basis for governing the Turkestan region, exercising state authority, and organizing public service was the "Temporary Regulation on the Administration of the Turkestan Region," adopted on August 6, 1865.

Under this Temporary Regulation, a "Military-People" governance system was established in the Turkestan region. The region was divided into departments, each managed by a department head, who also served as the department's military commandant. Local administrators were appointed from Russian officials to oversee the local population [9].

The Turkestan General-Governorship was administratively divided into provinces (oblasts), districts (uyezds), sections, volosts (rural districts), and villages. To implement state power in these administrative units, military, administrative, and management institutions were established. The heads of the higher state bodies were Russians, while a system was created for electing lower-level officials from among the local population.

In the district and city governments, the head of the district, who combined administrative and police authority, was in charge. The district head's office consisted of assistants and a chancery, with the district head being appointed by the governor-general. The district head's assistants, as well as district judicial officers, police chiefs, and police judicial officers, were appointed only by the military governor [10]. This situation indicates that during the Russian Empire's period in the Turkestan region, the employees who exercised the powers of state authorities carried out both military and civil services simultaneously.

By 1917, with the rise of Soviet power in Russia and the adoption of socialism as the path for the development of the state and society, not only did the main ideas in society change, but the content of legal norms also transformed, marking a distinct historical period for public service, including state civil service.

After the establishment of Soviet rule, all legal documents related to public service from the Russian Empire were abolished. The Communist Party acted as the guiding and directing force for the Soviet state and society as a whole. One of the most important tasks of party organs was to organize the selection, training, and placement of leadership cadres in state and administrative bodies, as well as in the national economy and other sectors of society.

The nomenclature principle of cadre formation encompassed the entire administrative system of the former Soviet Union. This meant that candidates for positions were initially considered at party committees at the district, provincial, republican, and USSR levels, and then recommended, confirmed, or rejected. This applied to positions ranging from collective farm brigade leaders, university rectors, and enterprise directors to ministers and the chairman of the USSR Council of Ministers. During this period, appointments to key positions were made not by the decision of the organization or department head, but rather by the decision of party organs or with their approval.

Although there was no special law regulating public service in detail, there were normative documents regulating the activities of special services, such as law enforcement agencies and the military [11].

During the Soviet period, the separation of powers took place in Uzbekistan. As a result, the Supreme Soviet of the Uzbek SSR acted as the legislative body, and the Council of Ministers carried out executive power. Local state authorities included the councils of deputies and executive committees at the regional, district (city), and village levels.

During this period, all relationships related to state civil service were regulated by labor legislation. Working in a state institution or enterprise, holding a certain position in a state institution or enterprise, and receiving a salary from the state for the work performed can be considered the characteristics of public service at this time [12].

The third stage refers to the period from Uzbekistan's attainment of independence to the present day. During this period, a new era in public civil service began, as the state administration in our country was organized based on the principle of separation of powers according to the principles of democracy.

This stage can be divided into two periods: the period from 1991 to 2016, and the period after 2016. During the period from 1991 to 2016, a legal framework was established in our country to regulate specialized public service focused mainly on professional activity. Public civil service relations were primarily regulated by the labor code, as well as by separate decisions, decrees, and other regulatory documents pertaining to the activities of each ministry.

During this period, there was no unified legal document governing the regulation and legal practices concerning public civil service relations within state bodies.

Since 2016, a period of reforms in the public civil service sector began in Uzbekistan, marked by the following factors:

1. The lack of a legal framework specifically regulating the sector up to that point;
2. The absence of a special authorized body to implement state policy in the public civil service sector;
3. The non-adoption of medium- and long-term state programs and concepts aimed at developing the sector;
4. The absence of a clear definition of the concept of a public civil servant, including their legal status, the procedure for entering public service based on competitive selection, the formation of a personnel reserve, and the lack of a system for evaluating the performance of public civil servants;
5. The need for reforms due to the absence of a transparent system ensuring that suitable candidates are employed in public civil service, and the lack of measures to prevent corruption, nepotism, and favoritism in public civil service.

Therefore, in order to increase the efficiency of public civil service and meet the demand for qualified personnel in state bodies and organizations, the Presidential Decree-5843 on "Measures for the Radical Improvement of Personnel Policy and the Public Civil Service System in the Republic of Uzbekistan" and the Resolution PD-4472 on "Measures for Organizing the Activities of the Agency for the Development of Public Service under the President of the Republic of Uzbekistan" were issued on October 3, 2019.

Additionally, on August 8, 2022, for the first time in the history of Uzbekistan, the Law on "Public Civil Service" was adopted, regulating legal relations concerning public civil service and defining the legal status of public civil servants. The law also clarified legal terms such as "state body," "public civil service," and "public civil service position."

Moreover, through these legal documents, a special authorized body responsible for implementing state policy in the public civil service sector, the Agency for the Development of Public Service under the President of the Republic of Uzbekistan, was established.

In conclusion, it should be noted that the public civil service has evolved and developed in various forms and appearances depending on the history of statehood, the form of government, and the political system, as well as the legal system regulating social relations in different countries.

Currently, we can observe that the public civil service is continuously improving in line with the development of society, globalization, and the strategic goals set by countries.

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Rezyume: *Ushbu maqolada mamlakatimizda davlat fuqarolik xizmatining vujudga kelishi, shakllanishi va rivojlanishini o‘ziga xos davrlarga bo‘lingan holda tahlil qilindi.*

Резюме: *В данной статье анализируются возникновение, становление и развитие государственной гражданской службы в нашей стране, разделенные на отдельные этапы.*

Kalit so‘zlar: *davlat va huquq, davlat xizmati, davlat fuqarolik xizmati, tarixiy rivojlanish bosqichlari.*

Ключевые слова: *государство и право, государственная служба, публичная гражданская служба, этапы исторического развития.*

THE APPEARANCE OF CONJUNCTIONS WITH INDEXICAL SIGNS IN LINGUISTIC SYNTACTIC MODELS

Madaminov A.

Karakalpak State University named after Berdakh

Summary: *in this article, compounds with demonstrative determinants are analysed at the speech and linguistic levels, and their form and content aspects are studied.*

Key words: *syntactic unit, language, speech, linguistic syntactic pattern, derivation, adaptation, pointer determiner.*

While formal-functional linguistics analyzes syntactic units mainly from a structural aspect, they have been studied in a systematic direction at the level of speech and language.

As a result, the linguistic and speech sides of syntactic units became distinct. As a linguistic phenomenon, they have the features of non-dependence (freedom from materiality), quantitative limitation, reproducibility, sociality and obligatory.

On the contrary, it was studied as a speech phenomenon. SBs and phrases used in speech affect the sense organs, can be read, write, speak, hear as a speech syntactic unit. On the contrary, it has been studied as a speech phenomenon. A speech syntactic unit is understood as a word combination and a sentence that is used in speech, affects the senses, can be read, written, spoken and heard. Since they belong to the linguistic level, they break down into linguosyntactic forms[6: P.277].

Linguistic-syntactic character (LSC) and speech derivation are in a dialectical relationship and are distinct from each other. Linguistic syntactic form (LSF) is characterised by relative categories of dialectic such as generality, essence, possibility, cause and speech derivation such as individuality, event, actuality, consequence.

A pattern is dead and lifeless without a speech product, and a speech product cannot be without a pattern. [3:P.278]

Linguistic syntactic form is easily accepted by people from society and cannot change them at will. Each of the linguistic syntactic signs has its own form and content in the language. Linguistic syntactic forms are formed not by one person, but by all members of society speaking the same language over a long period of time. They serve not one person but all members of society.

However, the speech structure created on the basis of linguosyntactic forms is unique in each person's speech and has an individual character.

Professor H. Nematov compares linguistic syntax to a mould for pouring bricks and says that 'just as the mould leaves its mark on each brick when it is cast, so linguistic syntax will be repeated in each phrase or sentence'.3:[P-6-7].

But just as the second brick is not a repetition of the first, so the generation of speech is unique.

For example, the expression "village air" is expressed differently in the speech of each speaker. Even if the same person repeats the word several times, it is pronounced and heard differently.

However, subject-object relations usually maintain the same state of the language-syntax model. Thus, several new sentences can be created using one model. For example: a page of a book, air in a field, education of young people.

As a result, thousands of focus-determining sentences are formed based on one linguistic-syntactic model that creates an adaptive combination. Of course, it depends on the norms of the written language of Uzbekistan. These sentences are created according to the norms of the written language, which are based on the dichotomy "language-norm-speech" of systematic linguistics.

Therefore, while the number of linguistic-syntactic models in literary languages is limited, the derivation of languages is not. Thus, syntactic models of language are considered as assets existing in our consciousness, so their number is limited. For example, we are talking about the number of

basic syntactic forms, among which 18 preferred models of word combinations have been identified in Uzbek. [6: P-279].

On the basis of these linguosyntactic patterns, thousands of new word combinations and sentences are formed in our speech. If we input them into a computer program, it will help us to fully distinguish linguo-syntactic patterns in a text.

Below we will consider the nature of conjugations forming Uzbek indicative collocations. Because conjugations form a large group of noun phrases.

In Turkic languages, including Uzbek languages, the adaptive phenomenon is adapted to the Russian term "coordination" and is based on the agreement of the subject and secondary word in person and number. For example: a school garden, like my friend.

However, there were various conflicting opinions about the syntactic relationship of such word combinations. For example, Kh..Mamatov and A.Berdialiev recognize directional combinations such as "our city" as adaptation, but consider their unmarked form such as "campus", "school park" as grammatically unadaptable. [2: P-65].

They recognize only directed compounds of the type "our city", "my village" as adaptations. Also Prof. I. Rasulov, proceeding from the grammatical and semantic features of a compound word, applies the term "kinship" to them, taking into account the presence of relations of dominance and subordination to each other in the relationship between the subject and the object. [4:P-38].

These controversial issues were discussed and it was deeply analyzed by Professor Sh.U. Rakhmatullaev and the term "leveling" was applied to it, but this term also remained unpopular. [5:P.53].

In other Turkic languages, including Kazakh, Prof. M.B.Balakaev calls them matasu, considering their agreement in person and number, and kyusu, management - mengeru, and negotiation - zhanasu in relation to the unmarked accusative form.[1:P. -17-20].

Thus, since noun phrases are used in a broad sense, nouns, adjectives, numbers, pronouns, adverbs and comparatives form different nominative compounds. That is why the linguo-syntactic patterns of adaptive compounds are different.

For example: the fruit of the apple (noun+noun), the sweetness of the fruit (noun+adjective), one tenth - number+noun), my friend (pronoun+noun), the word of many (adverb +noun), knocking on the door (noun+ imitation word). Such attributive compounds represent a nominative syntactic unit and differ from each other linguistically and colloquially.

In short, since nouns are used in a broad sense, nouns, adjectives, numerals, pronouns, approximations and similes give rise to different combinations of nouns. Therefore, the LS of matching combinations are different. the fruit of an apple (noun + noun), the sweetness of a fruit (noun + adjective), one tenth, a boy + noun, my friend (pronoun + noun), the talk of many (ravsh + noun), a knock on the door (noun + similar). Such attributive compounds are nominative syntactic units and differ from each other according to language and speech.

The realization of linguo-syntactic regularities of word combinations takes place in the "language-speech" direction, going from the general through the intermediate form to the concrete - speech product.

For example, if [W→W] is a general linguistic syntactic pattern, then [nominative case → possessive adjective] is a lower linguistic syntactic pattern. So, the derivation of Karim's book is a colloquial phrase based on that linguistic syntactic pattern. [6: P.-307-309].

Generalized linguo-syntactic regularities of simple word-combinations considered as nominative units in the modern Uzbek literary language are determined and it is shown that they express several semantic relations.

In fact, such linguo-syntactic patterns, as discussed above, are created in our speech by naming and naming representations and concepts arising on the basis of such logical categories as things-events, processes, actions, states, signs-properties, etc. their relation to each other creates an infinite number of occurrences of word combinations.

But the speech manifestation of linguo-syntactic pattern is different. In fact, it occurs depending on the capabilities, perceptions and imagination of each speaker, the amount of knowledge and speech capabilities.

A linguosyntactic pattern has formal and content aspects. Its formal aspect has the characteristic of generality. Because the infinite combinations occurring in speech are the synthesis of a common form. Word combinations are a special form.

Therefore, concrete form means a form that can be read, written, spoken, heard, expressed in material form - words and suffixes.

For example, [W demonstrative → W possessive] = demonstrative language-syntax pattern forms the formal side of the pattern made up of sentences.

This is a common feature. And in speech, endless complex words are formed as a synthesis of a general form.

In terms of form, this pattern is similar to noun + noun (my brother's book), noun + adjective (beautiful apple), adjective + noun (good word), adjective + adjective (best of the best), noun + number . (three students), number+number (half of ten), noun+activity noun (Ahmad's saying), activity noun +noun (study result), noun+adjective (heartbeat), adjective+noun (reader's message), adverb + noun (a lot of knowledge) , pronoun+noun (my friend), belongs to the structure of simple sentences with several specific forms, such as adverb+noun (word of many).

Several of the above special forms formed from the demonstrative W → possessive suffix W give rise to different semantic relations. They are presented in the table below. [6: P.307-313].

Table 1

Word combinations	Spiritual relationship
My brother's book	A possessive thing
apple is beautiful	An attribute, a feature of a thing
Good word	Personality trait
Three of the students	Relationship between the whole and the part
Half a tenner	A whole-piece relationship
What Ahmad said	Personal speech
Result of the study	Result of action
Heartbeat	Purpose and result of the action
What the lookout said	The person and the result of the action
A lot of knowledge	Ratio of whole to quantity
My friend	Human relationships (Relationship between people)
The word of many	Quantity depends on the individual

It seems that such private spiritual relations are diverse and can be expressed in various forms during speech. It is known that in traditional Uzbek linguistics, such private spiritual relations were usually appreciated only in a referential form.

Further, that is, as a result of the study of language as a system, by decomposing them, the spiritual relations understood from the collocations are studied. In fact, each of these phrases reflects a different relationship of being - "fire," "separate," "possessive thing"

The occurrence of this subject relation is determined by the grammatical suffix in the compound word. The accusative case and the possessive suffix occur in the combination of Karim's book in two different semantic relations: "the thing to which it belongs" and "the author - his work". [6: P.307].

It should be noted that in formal-functional linguistics syntactic units have been studied mainly from the formal-functional side.

As a result, the meaning of collocations has been analyzed from the side of meaning in traditional formal linguistics. In fact, in order to fully reveal the syntactic nature of collocations, it is necessary to reveal the pragmatic side as well. After all, to fully illuminate the nature of any syntactic

unit, it is necessary to jointly study its syntactic (form), semantic (content) and pragmatic aspects related to the speech situation.

Because in order to fully illuminate the nature of any syntactic unit, its syntactic (form), semantic (content) and pragmatic aspects related to the speech situation must be studied together.

So, the linguo-syntactic pattern of accusative-defining compounds formed by the adaptation method has the form (noun, accusative case + noun, possessive case) and semantically they mean different topics.

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Rezyume: *ushbu maqolada qaratqich aniqlovchili birikmalar nutqiy, lisoniy sathlarda tahlil qilingan va ularning shakliy, mazmuniy tomonlari o'rganiladi.*

Резюме: *в данной статье анализируются соединения с указательными детерминантами на речевом и языковом уровнях, изучаются их формальные и содержательные аспекты.*

Kalit so'zlar: *sintaktik birlik, til, nutq, lisoniy sintaktik qolip, hosila, moslashuv, qaratqich aniqlovchi.*

Ключевые слова: *синтаксическая единица, язык, речь, языковая синтаксическая модель, деривация, адаптация, указательный детерминант.*

COMPARISON AS AN ENGLISH CULTURAL LINGUISTIC CODE

Usenova G.A.

Nukus State Pedagogical institute

Summary: *Comparison as a cultural linguistic code is an important element of language and culture that helps convey information, ideas and emotions. It is universal, culturally significant, emotionally expressive and plays an important role in intercultural communication. Understanding comparisons and their meanings helps people better understand each other and the world around them, making communication more effective and profound. The given article explores the role of comparison as a cultural linguistic code in English, illustrating its impact on communication, cultural identity, and social interaction.*

Key words: *cultural linguistic, comparison, code, English-speaking culture, simile, metaphor, idioms.*

In the world of language and culture, comparison plays an important role in the transmission of information, ideas and emotions. It is one of the key cultural linguistic codes that helps people better understand the world around them and express their thoughts and feelings.

According to V. Krasnikh, “cultural linguistic code is a set of names or their combinations that have, in addition to their own denotative meaning, cultural meanings”. [3:167]

Language is not merely a tool for communication; it is also a vessel for culture, identity, and social norms. Within this framework, comparison emerges as a significant cultural linguistic code that shapes how English speakers perceive and interact with the world around them. By examining the ways in which comparison functions in English—through similes, metaphors, idioms, and cultural references—we can gain insight into the values, beliefs, and social constructs that define English-speaking cultures.

According to professor P. Najimov, comparison is that rarest and most precious quality that man is endowed with by nature and with the help of which he distinguishes and evaluates objects, phenomena, events, and features existing in the world. Systematization of expressive means, expression and disclosure of semantic and stylistic features of comparative construction is one of the cardinal problems of linguistics, its special branch – stylistics [4:11]

Comparison in language can take many forms, including similes, metaphors, analogies, and idiomatic expressions. These linguistic constructs allow speakers to draw parallels between different concepts, thereby enriching the meaning of their utterances. For instance, when someone says, “*He's as brave as a lion,*” they are not merely stating a fact about bravery; they are invoking cultural associations with lions as symbols of courage and strength. This comparison not only conveys information but also evokes emotions and cultural imagery that resonate with the audience.

In English, comparisons often reflect societal values and cultural narratives. For example, the frequent use of animal imagery in comparisons, such as “*sly as a fox*” or “*busy as a bee,*” reveals cultural attitudes toward certain animals and the traits they symbolize. These comparisons serve as shortcuts for conveying complex ideas and emotions, allowing speakers to communicate effectively while also embedding cultural meanings within their language.

The comparisons used in English reflect the cultural values and norms of English-speaking societies. For instance, the use of comparisons that emphasize individualism, such as “*the early bird catches the worm,*” highlights the cultural belief in the importance of initiative and hard work. This saying not only encourages proactive behavior but also reinforces the idea that success is earned through personal effort.

Conversely, some comparisons may reveal cultural tensions or contradictions. For example, the phrase “*blood is thicker than water*” suggests that familial ties are stronger than other relationships, reflecting a cultural emphasis on family loyalty. However, this comparison can also be critiqued in modern contexts where individuals prioritize personal happiness and friendships over

familial obligations. Such linguistic comparisons, therefore, serve as a lens through which we can examine the evolving values and beliefs within English-speaking cultures.

In social interactions, comparisons play a crucial role in establishing relationships, negotiating power dynamics, and expressing identity. For instance, when individuals use comparisons to describe themselves or others, they are often signaling their social status, group affiliation, or personal beliefs. A person might say, "I'm no Einstein," to downplay their intelligence while simultaneously invoking the cultural icon of Albert Einstein as a standard of genius. This type of comparison not only communicates humility but also connects the speaker to a broader cultural narrative about intelligence and achievement.

Moreover, comparisons can serve as tools for persuasion and argumentation. In rhetoric, the use of analogies and metaphors can make complex ideas more relatable and accessible. For example, a politician might say, "*We are at a crossroads,*" to evoke imagery of choice and direction, prompting listeners to consider the implications of their decisions. Such comparisons can effectively mobilize public sentiment and influence opinions by framing issues in ways that resonate with cultural values and experiences.

I.R. Galperin gives the following definition of comparison: "The intensification of some one feature of the concept in question is realized in a device called simile" [2;138].

The use of comparison as a cultural linguistic code is particularly evident in literature and media, where authors and creators employ similes, metaphors, and cultural references to convey deeper meanings. As G.Usenova noted "similes help to create images in poetry and in text" [1:24] In poetry, for example, comparisons can evoke vivid imagery and emotions, allowing readers to engage with the text on multiple levels. A poet might write, "*Her smile was like sunshine,*" not only to describe a smile but also to evoke feelings of warmth, happiness, and comfort, drawing upon culturally shared associations with sunlight.

In literary works comparison helps to better reveal the images of characters. Linguist Jean Mouton believes that nothing more than a comparison reveals the spiritual and intellectual life of the author, and allows you to penetrate the secrets of the subconscious. Any image is based on the use of similarities between objects far from each other. For example: *It was that moment of the year when the countryside seems to faint from its own loveliness, from the intoxication of its scents and sounds. (J. Galsworthy)*

In contemporary media, comparisons are often used to shape public perceptions and narratives. Advertisements frequently employ comparisons to highlight the superiority of a product, using phrases like "*better than the rest*" or "*the best in class.*" These comparisons tap into cultural desires for quality and excellence, influencing consumer behavior and shaping market trends. Similarly, news media may use comparisons to frame political situations, often invoking historical events or cultural references to provide context and meaning.

While comparisons are powerful tools for communication, they are not without challenges and limitations. One significant issue is the potential for misinterpretation or cultural misunderstanding. Comparisons that rely on specific cultural references may not resonate with individuals from different backgrounds, leading to confusion or alienation. For example, idiomatic expressions like "*kick the bucket*" may be easily understood by native English speakers but can be perplexing to non-native speakers who lack familiarity with the cultural context.

Proverbs and idiomatic expressions often include comparisons and offer a glimpse into cultural wisdom. Phrases like "*The grass is always greener on the other side*" or "*Comparing apples to oranges*" utilize comparisons to deliver practical advice or illustrate a concept uniquely understood by English speakers.

In English culture, comparisons extend beyond language to reflect broader societal values and norms. For instance, the idiom "*keeping up with the Joneses*" compares one's lifestyle to that of one's neighbors. This captures a uniquely Western societal pressure to measure up in terms of material success and social status, illustrating how comparisons are embedded in cultural psyche.

Comparisons also find a comfortable home in idiomatic expressions, which often baffle non-native speakers with their inherent metaphorical nature. Take “*the elephant in the room*,” for example. This phrase captures the essence of a glaringly obvious problem that everyone chooses to ignore, transforming a mundane statement into a striking image that underscores the foolishness of avoidance.

Children in the UK grow up surrounded by such expressions, learning from young age to understand and employ them in conversation. This is evident in the playground insult, “*You’re as slow as a snail*,” or the praise, “*You’re as brave as a lion*.” These vivid comparisons reinforce the imagery and emotions intended by the speaker, shaping a communicative style that is both colorful and subtly nuanced.

Comparisons also surface in advertising, another realm where the English cultural preference for them is evident. Slogans like “*It’s like driving a cloud*” immediately offer a sensory correlation that can be more persuasive than mere factual information. Similarly, consumer reviews often favor comparisons: “*This burger is like heaven on a plate*” captures enthusiasm that might be lost in a straightforward description.

Moreover, comparisons can also serve to diffuse awkwardness or soften criticisms, which fits well with the English tendency towards politeness and indirectness. Instead of directly saying that someone is inefficient, one might hear, “*Well, they’re not exactly a speed demon*.” This approach allows the speaker to express their point without being overtly harsh, adhering to the social norm of maintaining face.

Additionally, comparisons can reinforce stereotypes or perpetuate biases. For instance, using animal comparisons to describe certain groups of people can evoke negative connotations and reinforce prejudicial views. Such linguistic choices can contribute to the marginalization of specific communities and perpetuate harmful narratives.

In conclusion, comparison serves as a vital cultural linguistic code in English, shaping how individuals communicate, express identity, and navigate social interactions. Through similes, metaphors, idioms, and cultural references, comparisons enrich language and reveal the underlying values and beliefs of English-speaking cultures. While they offer powerful means of expression, comparisons also present challenges related to interpretation and bias. As language continues to evolve, the role of comparison will remain essential in understanding the complexities of communication and cultural identity in English-speaking societies. By examining the ways in which comparison functions within the linguistic landscape, we can gain deeper insights into the cultural narratives that shape our understanding of the world.

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Rezyume: *Lingvomadaniy kod sifatida o'xshatish til va madaniyatning muhim elementi bo'lib, ma'lumot, g'oyalar va hissiyotlarni etkazishga yordam beradi. U universal, madaniy ahamiyatga ega, hissiy jihatdan ifodali va madaniyatlararo muloqotda muhim rol o'ynaydi. O'xshatish va ularning ma'nolarini tushunish odamlarga bir-birini va atrofdagi dunyoni yaxshiroq tushunishga yordam beradi, muloqotni yanada samarali qiladi. Mazkur maqola ingliz tilidagi lingvomadaniy kod sifatida o'xshatishning rolini o'rganadi, uning kommunikatsiya, madaniy xususiyatlari va ijtimoiy aloqasi o'zaro ta'sirini ko'rsatadi.*

Резюме: Сравнение как лингвокультурный код является важным элементом языка и культуры, который помогает передавать информацию, идеи и эмоции. Оно универсально, культурно значимо, эмоционально выразительно и играет важную роль в межкультурной коммуникации. Понимание сравнений и их значений помогает людям лучше понимать друг друга и окружающий мир, делая коммуникацию более эффективной и глубокой. В данной статье исследуется роль сравнения как лингвокультурного кода в английском языке, иллюстрируя его влияние на коммуникацию, культурную идентичность и социальное взаимодействие.

Kalit soʻzlar: lingvomadaniyat, oʻxshatish, kod, ingliz tilida soʻzlash madaniyati, obrazli oʻxshatish, metafora, idiomalar.

Ключевые слова: лингвокультура, сравнение, код, англоязычная культура, образное сравнение, метафора, идиомы.

UDC: 30428

USING LINGUOPRAGMATIC APPROACHES TO THE TEXT ANALYSIS IN ENGLISH

Haytanova Yu.Z., Xodjiyeva D.T., Seytkasimov D.B.
Karakalpak State University named after Berdakh

Summary: *This paper explores the potential of integrating linguopragmatic approaches into ESL/EFL text analysis instruction to enhance students' communicative competence. A review of relevant literature highlights the importance of pragmatics in second language acquisition and underscores the need for pedagogical strategies that address the social and cultural dimensions of language use. The paper then discusses various research methodologies that can be employed to investigate the impact of linguopragmatic approaches on student learning outcomes. Key aspects of data analysis, including thematic analysis, discourse analysis, and statistical analysis, are outlined. The paper concludes by offering recommendations for ESL/EFL teachers seeking to implement linguopragmatic approaches in their classrooms and suggests areas for further research. By emphasizing the contextual and social aspects of language, linguopragmatic approaches hold promise for fostering a deeper understanding of text and equipping ESL/EFL learners with the skills necessary for effective communication in a variety of real-world contexts.*

Key words: *Linguopragmatics discourse analysis second language acquisition communicative competence text analysis contextual factors speech acts implicature sociolinguistics authentic materials language teaching classroom instruction curriculum development assesment*

Linguopragmatic approaches to text analysis in ESL and EFL classes offer a powerful lens for teachers to help students understand how language is used in real-world contexts, going beyond just the literal meaning of words. The students of hiegher education should be aware of the analysis of literary texts with a help of linguopragmatic aspects ,especially, in the early period of the study. Because they enhanced their language skills by the time of being a student and the next step is developing critical thinking in terms of discursive materials. Thera were given the implementations.

1. Focus on the Communicative Context:

Background Information: Teachers should provide students with context about the text's author, audience, purpose, and situation. This sets the stage for understanding the intended meaning and the social implications of the language used.

Real-World Examples: Integrate authentic texts like news articles, social media posts, emails, or advertisements to showcase how language is used in real-life scenarios.

Role-Playing and Simulation: Engage students in role-plays and simulations that mimic real-world interactions, allowing them to practice using language in context.

2. Analyze Language Features:

Lexical Choices: Discuss how specific vocabulary choices influence the text's meaning and tone. For instance, compare formal vs. informal language, or the use of jargon.

Sentence Structure: Explore how sentence structure contributes to the text's impact. Analyze the use of active vs. passive voice, short vs. long sentences, and rhetorical questions.

Figurative Language: Explain how metaphors, similes, idioms, and other figurative expressions enhance the text's meaning and create specific effects.

3. Explore Pragmatic Functions:

Speech Acts: Identify the different actions performed by the text, such as requesting, offering, apologizing, complaining, or persuading. Analyze how language is used to achieve these acts effectively.

Politeness and Face: Analyze how language is used to maintain face (the positive social image of oneself and others). Consider the use of politeness markers, hedging, and strategies for softening requests.

Cultural Influences: Discuss how cultural norms and values influence the language used in the text.

4. Develop Critical Thinking Skills:

Textual Interpretation: Encourage students to consider different interpretations of the text based on its context, language choices, and potential hidden meanings.

Inferential Reading: Guide students to draw inferences from the text and understand unspoken implications.

Critical Evaluation: Facilitate discussions on the effectiveness of the text in achieving its purpose, considering its audience and the context of its use.

Analyzing a news article: Discuss the writer's perspective, the use of persuasive techniques, and the intended audience. Debating a social media post: Analyze the language choices and their impact on the audience, considering the potential for misinterpretation or misunderstandings. Creating a persuasive text: Guide students in crafting their own texts, incorporating elements of politeness, clarity, and appropriate language for the intended audience.

Benefits of Linguopragmatic Approach:

Increased Communicative Competence: Students become more proficient in understanding and producing language that is appropriate for various contexts. Improved Critical Thinking Skills: Students develop the ability to analyze texts, understand implied meanings, and evaluate language use effectively. Enhanced Cultural Awareness: Exposure to diverse texts and their language choices fosters cultural sensitivity and understanding. By incorporating linguopragmatic approaches, teachers can create engaging and effective ESL/EFL classes that prepare students for real-world communication challenges.

“Pragmatics” by Stephen Levinson (2000): A comprehensive overview of the field, including chapters on speech acts, politeness, and conversational implicatures. “Pragmatics for Language Teachers” by Michael Halliday (2004): Focuses on the practical applications of pragmatics for language teaching. “Sociolinguistics and Second Language Acquisition” by Carol Myers-Scotton (2006): Examines the intersection of social factors and language learning. “Analyzing Discourse: Text and Talk” by James Paul Gee (2011): Provides methods for analyzing written and spoken discourse in its social context. “Discourse Analysis” by James Gee (2014): This book focuses on the social and cultural contexts of language use, including analysis of literary works and everyday conversations. “The Discourse of Advertising” by George Dyer (2014): Examines the linguistic features of advertising and how they influence consumers. “Teaching English as a Second Language: A Teacher's Guide” by Diane Larsen-Freeman (2010): Covers a range of teaching methods, including those that integrate pragmatics. “Pragmatics and Language Learning” by Anita L. Wajnryb (2005): Provides practical strategies for teaching pragmatics in language classrooms.

“Teaching Pragmatics: A Practical Guide for Teachers” by Judith A. Hall (2003): Offers practical activities and exercises for teaching pragmatics in ESL/EFL contexts.

1. Qualitative Research:

Case Studies: In-depth analysis of a specific classroom or group of students using linguopragmatic approaches to text analysis. Data Collection: Classroom observations, interviews with teachers and students, analysis of student work (written assignments, transcripts of discussions). Analysis: Thematic analysis, discourse analysis, interpretative phenomenological analysis (IPA) to uncover patterns, themes, and student experiences. Ethnographic Studies: Immersive study of a particular ESL/EFL context to understand the cultural and social factors influencing language use. Data Collection: Participant observation, interviews, document analysis (classroom materials, policy documents). Analysis: Thick description, cultural interpretation to understand the interplay of language, culture, and teaching practices.

2. Quantitative Research:

Surveys: Collecting data from a larger sample of ESL/EFL teachers or students on their attitudes, beliefs, and practices related to linguopragmatic approaches. Data Collection: Structured questionnaires, online surveys. Analysis: Statistical analysis to identify trends, correlations, and

relationships between variables. Experimental Studies: Comparing the effectiveness of different teaching approaches (e.g., traditional grammar-based instruction vs. linguopragmatic approaches) on student language learning outcomes. Data Collection: Pre-tests, post-tests, standardized language assessments. Analysis: Statistical analysis to determine the significance of any observed differences in learning outcomes.

3. Mixed Methods Research:

Combining Qualitative and Quantitative Approaches: For a more comprehensive understanding, combine methods like case studies with surveys or experimental designs. Data Collection: Mixes qualitative and quantitative methods, such as interviews and surveys. Analysis: Uses both qualitative and quantitative techniques to analyze data and provide a rich understanding of the topic. Data Analysis: Select data analysis techniques that align with the chosen methodology and research question.

analysis and results

Thematic Analysis: Identify key themes and patterns emerging from interviews, observations, and document analysis. Increased student awareness of the importance of context in interpreting texts. Greater confidence in using language for different purposes. Challenges in applying pragmatics to unfamiliar social situations.

Discourse Analysis: Examine the language used in classroom interactions, student writing, or other texts. Look for patterns in:

Lexical choices: Do students use more specific vocabulary after linguopragmatic instruction?

Sentence structure: Do they adapt their sentences to suit different audiences or purposes?

Pragmatic markers: Do they use more politeness markers or hedging in their written work?

Statistical Analysis: Use appropriate statistical tests to analyze quantitative data, such as pre- and post-test scores, survey results, or observational data. Descriptive Statistics: Present descriptive statistics, such as means, standard deviations, and frequencies to summarize data patterns. For instance teachers use various types of materials to get real success in teaching processes quotes from interviews: "Before, I just focused on the meaning of words, but now I realize that the context matters a lot."

Examples from student work: Compare a student's writing before and after linguopragmatic instruction, highlighting changes in language choices. Observations from classroom interactions: Describe specific interactions that illustrate the impact of linguopragmatic approaches. Tables: Present the results of statistical tests, such as t-tests. Graphs: Visualize pre- and post-test scores, survey data, or other quantitative findings. Connect the findings back to your research question and theoretical framework. Explain the significance of the results and how they contribute to the field of ESL/EFL teaching. Discuss any limitations of the study and suggest areas for future research. Consider the implications of your findings for ESL/EFL practice. Qualitative analysis revealed that students who received linguopragmatic instruction demonstrated a greater awareness of the importance of context in interpreting texts. This suggests that incorporating linguopragmatic approaches into ESL/EFL classrooms can lead to a deeper understanding of language use and a more nuanced comprehension of texts. A t-test showed a statistically significant difference in post-test scores between students who received linguopragmatic instruction and those who did not. This finding supports the idea that integrating linguopragmatic approaches can enhance student communicative competence in ESL/EFL contexts. Remember, the analysis and results section are crucial for communicating the findings of your research. By presenting your data in a clear, organized, and meaningful way, you can contribute to the understanding of linguopragmatic approaches to text analysis in ESL/EFL teaching and learning.

conclusions and recommendations

Reiterate the main points from your analysis, highlighting the most significant findings that address your research question. Example: "The findings of this study suggest that incorporating linguopragmatic approaches into ESL/EFL text analysis instruction can enhance students'

communicative competence by promoting their awareness of context, social norms, and the intended meaning of language.

Based on your findings, offer practical recommendations for ESL/EFL teachers who wish to integrate linguopragmatic approaches into their classrooms. Example: "Teachers can use authentic texts, such as news articles, social media posts, or advertisements, to engage students in discussions about the pragmatic functions of language and how context influences meaning."

Conclusion: The findings of this study demonstrate that integrating linguopragmatic approaches to text analysis into ESL/EFL classrooms can significantly enhance students' communicative competence. The analysis of student work, classroom observations, and interviews revealed increased student awareness of contextual factors, greater confidence in using language for different purposes, and improved ability to interpret and analyze texts from a pragmatic perspective. These findings align with existing research on the importance of pragmatics in second language acquisition and suggest that linguopragmatic approaches should be further integrated into ESL/EFL curricula. Teachers should engage students with authentic texts and real-world scenarios to foster a deeper understanding of language use in context. Teachers should explicitly teach pragmatic concepts, such as speech acts, politeness, and cultural differences in communication. Teachers should encourage students to analyze texts from a pragmatic perspective, considering factors such as the author's intentions, the audience, and the purpose of communication.

Further research should investigate the long-term effects of linguopragmatic instruction on student language development and communicative competence in a wider range of ESL/EFL contexts. By providing a strong conclusion and offering clear, actionable recommendations, your research can have a lasting impact on the field of ESL/EFL education and contribute to the development of more effective language learning practices.

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Rezyume: Ushbu maqola talabalarning kommunikativ kompetentsiyasini oshirish uchun lingvopragmatik yondashuvlarni ESL/EFL matn tahlili yo'riqnomasiga integratsiya qilish imkoniyatlarini o'rganadi. Tegishli adabiyotlarni ko'rib chiqish ikkinchi tilni o'zlashtirishda pragmatikaning muhimligini ta'kidlaydi va tildan foydalanishning ijtimoiy va madaniy jihatlarini hal qiluvchi pedagogik strategiyalar zarurligini ta'kidlaydi. Maqolada lingvopragmatik yondashuvlarning talabalarning ta'lim natijalariga ta'sirini o'rganish uchun ishlatilishi mumkin bo'lgan turli tadqiqot metodologiyalari muhokama qilinadi. Ma'lumotlarni tahlil qilishning asosiy jihatlarini, jumladan, mavzuli tahlil, nutq tahlili va statistik tahlil. Maqola o'z sinflarida lingvopragmatik yondashuvlarni joriy etishga intilayotgan ESL/EFL o'qituvchilari uchun tavsiyalar berish bilan yakunlanadi va keyingi tadqiqot yo'nalishlarini taklif qiladi. Tilning kontekstual va ijtimoiy jihatlarini ta'kidlab, lingvopragmatik yondashuvlar matnni chuqurroq tushunishga yordam beradi va ESL/EFL o'quvchilarini turli real sharoitlarda samarali muloqot qilish uchun zarur bo'lgan ko'nikmalar bilan jihozlaydi.

Резюме: В этой статье рассматривается потенциал интеграции лингвопрагматических подходов в обучение анализу текста ESL/EFL для повышения коммуникативной компетенции студентов. Обзор соответствующей литературы

подчеркивает важность прагматики в освоении второго языка и необходимость педагогических стратегий, которые учитывают социальные и культурные аспекты использования языка. Затем в статье обсуждаются различные исследовательские методики, которые могут быть использованы для изучения влияния лингвопрагматических подходов на результаты обучения студентов. Излагаются ключевые аспекты анализа данных, включая тематический анализ, анализ дискурса и статистический анализ. В заключение в статье предлагаются рекомендации для преподавателей ESL/EFL, стремящихся внедрить лингвопрагматические подходы в своих классах, и предлагаются области для дальнейших исследований. Подчеркивая контекстуальные и социальные аспекты языка, лингвопрагматические подходы обещают способствовать более глубокому пониманию текста и вооружить учащихся ESL/EFL навыками, необходимыми для эффективного общения в различных реальных контекстах.

Kalit so'zlar: Lingvopragmatika nutq tahlili ikkinchi tilni o'zlashtirish kommunikativ kompetentsiya matn tahlili kontekstual omillar nutq aktlari implikatura sotsiolingvistika autentik materiallar tilni o'qitish sinfda o'qitish o'quv dasturini ishlab chiqishni baholash

Ключевые слова: Лингвопрагматика анализ дискурса изучение второго языка коммуникативная компетентность анализ текста контекстные факторы речевые акты импликатура социолингвистика аутентичные материалы преподавание языка обучение в классе разработка учебной программы оценка.

THE FORMATION OF NOUNS FROM OTHER PARTS OF SPEECH IN ENGLISH AND GERMAN LANGUAGES

Mambetnazarov M.K.

Karakalpak State University named after Berdakh

Rezyume: *In the article is studied the formation of nouns from verbs and adjectives in German and English languages. Comparatively is analyzed the nouns in both languages with suffixes and prefixes.*

Key words: *noun, suffix, verb, formation, adjective.*

Introduction: In the Republic of Uzbekistan is focused special attention to learning foreign languages and are accepted a range of Decrees and Ordinances on raise to new level of popularization among the population learning foreign languages. It's necessary to note, one of these is the Ordinance of the President of the Republic of Uzbekistan SH.M.Mirziyoev №OP-5117 dated the 19th of may 2021 «About measures on raise to qualitatively new level of activity on popularization of learning foreign languages in the Republic of Uzbekistan» [1]. In accordance with the «Year of support of youth and business», as well as with a view to learn foreign languages as main direction of educational politics in our country are created the necessary conditions for mastering of foreign languages perfectly. In our land in this direction are applied internationally accepted programs and training aids on learning foreign languages at all stages of education.

There are plenty of issues to study in comparative aspect in linguistics. Nowadays the comparative study of languages is of great importance, because by means of the study we know what a grammar of a language consists of and it becomes easier to learn a grammar and speech of a definite language. One of these studies that are studied comparatively is the formation of nouns from other parts of speech. We mostly form a noun from a verb, along with this, an adjective.

Main part: A noun is a “naming” word for a living being, thing or idea. Nouns play a large role among parts of speech and a grammar of every language. English and German languages belong to the Romanic-German languages family and therefore they have some similarities between them. But at the same time, we can observe differences among these languages.

When we talk about a noun, to a noun are added a gender (*das Heft – the notebook*), a case (*den ganzen Tag – the whole day*), a plural (*die Menschen – the people*). In English are absent a gender and a case, but in German are very important genders and cases when we make a sentence. For example:

Recently we have observed the parade of the planets of the solar system.

*Vor kurzem haben wir **die** Parade (feminine) von **den Planeten** (the plural noun) **des** Sonnensystems (the case) beobachtet.*

We do not use a gender in English, because we call all things with “it”, for instance, “telephone, internet, computer, window and so on” – “it”, but it is used in German, “**das** Handy, **das** Internet, **der** Computer, **das** Fenster” – “**das**” for neuter and “**der**” for masculine. At the same time, is used in German a case (nominative, genitive, dative and accusative – four cases), but in English only two cases (nominative and possessive cases).

As you noticed, German nouns are always written with a capital letter, that is, we capitalize all words (only related to nouns), but in English we do not capitalize nouns. Only nouns are written with a capital letters, for instance, names, surnames, pseudonyms, geographic names, names of streets, squares, buildings and parks, names of ships, hotels and so forth [2, 11].

In each language, including English and German, a noun might be like this: *science* (*Wissenschaft*), *person* (*Person*), *book* (*Buch*), *laptop* (*Laptop*), *technology* (*Technologie*), *verification* (*Verifikation*), *Wi-Fi* (or *WLAN*) and the like. Apart from these words, a noun is formed with other parts of speech, that is, it is constructed from a verb or an adjective. For instance, laughing (*das Lachen*) – from a verb “laugh” (*lachen*), visiting (*der Besuch*) – from a verb “visit” (*besuchen*),

organisation (die Organisation) – from a verb “organise” (organisieren), bookkeeping (das Buchhalten) – from a verb “bookkeep” (buchhalten), width (die Breite) – from an adjective “wide” (breit) and so on in both languages.

In German language is constructed a noun in most cases from a verb as in English. Weak verbs from nouns either by taking the same form, as the infinitive, for example the words:

leben (live) – das Leben (life), hören (hear, listen) – das Hören (listening), schreiben (write) – das Schreiben (writing), verstehen (understand) – das Verstehen (comprehension).

As you see, in the aforementioned example the word “**das**”, which goes before the formed noun, is a gender in German (a neuter gender), that is, in German has three genders (masculine, feminine and neuter – “*Maskulinum, Femininum, Neutrum*”) that are absent in English.

As well as, by forming a noun from the stem of the infinitive, that is, **-en** is omitted. For example:

arbeiten (work) – die Arbeit (work); suchen (search) – die Suche (search); besuchen (visit) – der Besuch (visit); schlafen (sleep) – der Schlaf (sleep) and so forth.

In English is used the **-ing** suffix when we talk about activities and it goes as a noun. That is, it means that it's not a verb. Along with this, the **-ing** suffix is used after the verb “**go**”. For instance:

Exercising is good for your health. – Das Training ist nützlich für Ihre Gesundheit.

We are going to go skiing on Monday evening. – Am Montag Abend fahren wir in die Berge zum Ski.

In German have strong, weak and mixed verbs. Verbs are either weak, their forms follow a set pattern. These verbs may also be called regular. Verbs are either strong (irregular), their forms change according to different patterns or mixed, their forms follow a mixture of the patterns for weak and strong verbs [3, 91].

Strong verbs form nouns from the infinitive with vowel and/or consonant changes in German:

annehmen – die Annahme (supposition, acceptance); geben – die Gabe (gift); einbrechen – der Einbruch (burglary); sehen – die Sicht (view); gehen – der Gang (walk); fahren – die Fahrt (drive, trip).

Some verbs form nouns with the **ge-** prefix in German language:

sprechen – das Gespräch (talk); backen – das Gebäck (cookies, small bakery items); denken – der Gedanke (thought) and so on.

In German most adjectives form the noun by adding **-keit** or **-heit**, but there are several common nouns from adjectives that are exceptions:

kalt – die Kälte (cold); heiß – die Hitze (heat); alt – das Alter (age); warm – die Wärme (warmth); fern – die Ferne (distance); weit – die Weite (width).

At the same time, we form nouns from verbs by adding suffixes **-ei**, **-ung**, **-heit**, **-keit** and **-schaft** in German. Some verbs form nouns with the suffix **-ung**, for example:

bearbeiten – Bearbeitung (processing, review); beschreiben – Beschreibung (description); darstellen – Darstellung (characterisation); vermitteln – Vermittlung (arranging, mediation); anmelden – Anmeldung (registration); melden – Meldung (message, news item) and the like.

As aforementioned, nouns are formed with the suffixes **-heit** und **-keit**:

wahr – Wahrheit (truth); schön – Schönheit (beauty); freundlich – Freundlichkeit (friendliness); wahrscheinlich – Wahrscheinlichkeit (probability).

Along with these formations, we form nouns with the suffixes **-ei** and **-schaft**. Suffixes **-heit**, **-keit**, **-ung**, **-ei** and **-schaft** are always feminine [4, 244]. For instance:

Die Eigenschaft (trait), die Landwirtschaft (agriculture), die Gesellschaft (society), die Wirtschaft (economy), die Bäckerei (bakery), die Metzgerei (butcher, meat store), die Verantwortung (responsibility), die Sauberkeit (cleanliness), die Eigenheit (peculiarity) and so on.

As you see, in English language when we are forming a noun from an adjective and a verb, we use the suffix, for example, **-liness**, **-ility**, **-tion** and other suffixes: *responsible – responsibility, clean – cleanliness, describe – description* in the aforesaid example.

But in English in most cases a formed noun is the same as a verb, for example: *search* (v) – *search* (n), *visit* (v) – *visit* (n), *tank* (v) – *tank* (n), *full* (v) – *full* (n) and so forth.

Conclusion: Thus in English and German languages there are suffixes and prefixes that form nouns from other parts of speech (mostly from verbs and adjectives). In the cited above examples are selected the most important suffixes that are necessary for the formation of nouns.

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Rezyume: *Maqolada nemis va ingliz tillarida otlarning fe'llar va sifatlardan yasalishi o'rganiladi. Ikkala tilda otlar suffiks va prefikslar yordamida qiyosiy tahlil qilinadi.*

Резюме: *В статье изучается образование существительных от глаголов и прилагательных в немецком и английском языках. Сопоставительно анализируется имена существительные в обоих языках с помощью суффиксов и префиксов.*

Kalit so'zlar: *ot, suffiks, fe'l, yasalish, sifat.*

Ключевые слова: *имя существительное, суффикс, глагол, образование, имя прилагательное.*

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ABOUT THE VOCABULARY OF FISHING IN THE KARAKALPAK LANGUAGE

Pahratdinov K.A., Tursinbaev A.

Karakalpak State University named after Berdakh

Summary: *The article is devoted to the vocabulary of fishing in the Karakalpak language. Until now, no one has specifically studied the fishing vocabulary of the Karakalpak language. We set ourselves the task of giving a general description of the vocabulary related to the fisheries and establishing a set of names of fish and gear.*

Key words: *vocabulary, professionalism, term, semantics, ichthyonym, structure, word formation.*

In the professional vocabulary of the Karakalpak language, the vocabulary related to fishing and fisheries occupies a special place.

Until now, no one has specifically studied the fishing vocabulary of the Karakalpak language. Certain professionalisms in the speech of fishermen are discussed in T. Begjanov's monograph, dedicated to the study of the vocabulary of the Muynak dialect of the Karakalpak language [1]. The Muynak region, located on the shores of the Aral Sea, has long specialized in the development of fisheries and the language of its inhabitants – the hereditary fishermen – is extremely rich in fishing vocabulary.

We set ourselves the task of giving a general description of the vocabulary related to the fisheries and establishing a set of names of fish and gear.

The Karakalpaks, who lived on the banks of large and small reservoirs, from time immemorial, along with other forms of economy, were also engaged in fishing. As it developed in the language of people, certain layers of vocabulary began to develop correspondingly, serving to express concepts related to fisheries. These lexical layers include an extremely rich and varied set of words. As a result of the gradual development of fisheries, a large mass of the local population living near large and small reservoirs of fishing importance became more and more involved in this business. Such a process made it necessary for people to familiarize themselves with fishermen's life and the basic concepts and expressions used in their speech. This, in turn, contributed to the fact that many of the professional words related to fishery became gradually close and known to the population of the area, at least to those representatives of the vernacular language who, by the nature of their occupation or for other reasons, had more or less close contact with people engaged in fishery. Thus, some of the professional words used by fishermen have long become the property of the national language, as evidenced by the geography of the distribution of fish names such as *sazan*, *alabuğa*, *bekire*, *shortan*, *súwen*, *ılaqa*, *marqa*, *torta*, *sıla*, *taban baliq*, *bórge*, *tıran*, which are used everywhere in the Karakalpak language.

The generic concept of “fish” in the Karakalpak language is conveyed by the name *baliq*. The name *baliq* is often used as a qualifying component in complex, compound and multi-component names. In the meaning of “fish” the name *baliq* is used in all Turkic languages.

The etymology of the word *baliq* has not yet been fully determined. In the etymological dictionary of E.V. Sevortyan it is noted that it seems that S.P. Tolstov came closest to the etymology of *baliq*. He pointed to *bal//bar* as a designation of a body of water, primarily non-flowing, swampy, dating back to the 3rd - 2nd millennium BC (Tolstov S.P. Cities of Guzov. // “Soviet Ethnography”, 1947, No. 3, p. 71 – 75)[4.60].

Bekire (in English sturgeon) is the name of one of the species of red fish. The word *bekire* in Turkic languages is found in different phonetic variants: in the Uzbek *bikri baliq*, in the Kazakh *bekire*, in the Bashkir *bikre*, in the Turkmen *bekre*.

In the speech of Karakalpak fishermen it has two names: *tátir bekire* (thorn) and *shoqır* (stellate sturgeon). *Shoqır* (stellate sturgeon) was introduced in the 1930s from the Caspian Sea. The name is apparently borrowed from the language of the Caspian Kazakhs [1,45].

Aqmarqa (in English salmon) is the name of a medium-sized species of fish. This word is used in the language of fishermen of the Aral Sea. In some Turkic languages, the name of this type of fish is expressed in different words: in the Uzbek *slaymonbaliq*, in the Kazakh *arqan baliq*, *aqmarqa*, in the Turkmen *gızılbalıq*, in the Tatar *sóláyman balığı*, in the Azerbaijani *gızılbalıq*, in the Nogai *o'giz baliq*.

Shabaq is one of the carp species. This word in some Turkic languages, including Karakalpak, has the meaning “small fish”: in Kyrgyz *chabak*, in Kazakh *shabaq*, in Tuvan *shavaga*. In the meaning “roach” it is found in the Tatar (*chabak*) and Bashkir (*sabak*) languages.

Among the Tatars and Bashkirs, *shabak* is a roach. Among the Kazakhs, Karakalpaks, and Kyrgyzs, *shabak* is all kinds of small fish. In the meaning of “small fish” the word *čabak* is found in Mahmud Kashgari.

Tiran (bream in English) is the name of one of the carp species. This word is widespread in the Karakalpak language. It lives in almost all lakes and rivers of Karakalpakstan. In addition to the common name *tiran*, there is also the word *tiran shabaq*, by which fishermen distinguish the varieties of this species.

Alabuğa (in English perch) is the name of a fish belonging to the perch family.

Ilaqa (in English catfish) is the name of one of the predatory fish species. For speakers of the Karakalpak language, *Ilaqa* is a well-known word. But however, not everyone knows such words as *lapış*, *jayın*, which fishermen call numerous subspecies of this fish. In the Uzbek language it is called *laqqa*, in Kazakh *laqa*, in Turkmen *lakga*, in Tatar *jáen*, in Bashkir *yáyen*, in Kyrgyz *jayan*.

Ilaqa, depending on its size, is called *jayın* (large catfish), *meshel* (medium-sized catfish), *lapış* (small-sized catfish).

Sazan (Carp) is a fish of the carp family. This lexeme is found in many Turkic languages: Kazakh, Uzbek, Kyrgyz, Uyghur, Nogai, Azerbaijani, Bashkir, Tatar, Tuvan, and Chuvash. The word *sazan* is formed from the word *saz* “silt, swamp” using the diminutive suffix – *an* (Kipch. *saz* “swamp, bog, mud”, Tatars, Nog., Kaz., Crimean-Tat. *saz* “swamp”, Bashk. *haz* “swamp”, *hazan* “carp”). Some experts associate the second component of the name of the fish with the Turkic *an* “animal” [5,13].

Súwen (in English, barbel). Fishermen call this fish *sıpayı baliq* “cultured fish.” This name is related to its appearance and character. In addition, *súwen* has the names *panaxanı súwen* [3,20], *kayaz* (Turkistan barbel), *utku* (barbel, small in size, fat and tasty).

Shortan is one of the most common fish in the waters of Karakalpakstan. In the Karakalpak language, the meaning of “pike” is conveyed by the name *shortan*. This lexeme is found in all Turkic languages: in the Kazakh *shortan*, in the Kyrgyz *chorton*, in the Uzbek *cho'rtan baliq*, in the Turkmen *chúybalıq*, in the Tatar *churtan*, in the Bashkir *surtan*, in the Nogai *shortan*. As can be seen from the above parallels, there are no large differences in the phonetics of names. There is no reliable etymology of the word *shortan* in Turkology yet.

Torta (roach in English) - It has the names *qızıl qanat* “with red fins”, *qarakóz* “black-eyed” (Caspian roach). Based on the appearance of the roach, it can be called *aqtorta* “white roach”, *kókmoyın torta* “ide”.

As for fishing gear, they are very diverse. The oldest method of fishing, apparently, was *aw* the “fishing net.” The word *aw* and its phonetic variants are known in many languages with different but interrelated meanings. We think that in the Turkic languages *aw* was originally known in the meaning of “hunting (animals)”, and later the meaning of “fishing” and “fishing net” appeared.

In the Karakalpak language, the word *qarmaq* is used to denote a fishing rod. The same word also appears in the meaning of “hook”. In ancient Turkic monuments, *qarmaq* was used in the meaning of “hook” [2,428]. This word in the meaning of “hook”, “fishing rod” is known in many Turkic languages with phonetic changes. Researchers believe that this word is common Turkic.

Qarmaq is the oldest fishing tackle; it has been known to mankind for thousands of years. It is used to catch fish in lakes, ponds, reservoirs, quiet and fast-flowing rivers, lowland and mountain streams, and seas. According to the fishing results, the float fishing rod is not inferior to any other amateur fishing tackle.

Although fish can be caught with a fishing rod without a float, the float is still an integral part of the float and wire fishing rod. In the Karakalpak language, the word *qalqı* appears in the meaning of “float”. *Qalqı* is a lightweight floating object made of sponge and attached to a net. There are parallels to the word *qalqı* in a number of Turkic languages: in the Kyrgyz *kalkıma*, “that which can float on the surface, swaying rhythmically”, in the Kazakh *qaltqı*, in the Nogai *kalkım*, in the Altai *kalatki*, in the Turkmen *galtxa*, in the Bashkir *kalkıwıs* “float”.

We believe that the word *qalqı* is formed from the verb stem *qalqı* “to float on the water like a tree.”

Fishing with a seine, both bottom and cast seine without a skein, is widely used by fishermen. In the Karakalpak language, the meaning of “net” is *jilım*. This word is used with different phonetic changes in a number of Turkic languages. It has the meaning of “big fishing net” in different languages.

There are different assumptions about the etymology of *jilım*. As etymological research shows, this fishing tackle could get its name from the method of manufacture (from *yıl* “to tie”, “to knit”, “to weave”) or from the method of use (from *yıl* “to crawl”). If we take into account the fact that the seine is pulled in such a way that it crawls along the bottom of the river, just like different types of seine - dragnet, drag, then it seems quite probable to us that the formation of *yılım/jilım* from *yıl* “crawl”.

In many Turkic languages, the word *tor* “fishing net” appears in the meaning of “snare”, “net”. In ancient Turkic monuments, the *tor* is “tenet”, “network” [2,578].

The oldest methods of fishing include spear fishing (*shanıshqı*).

Súwen aw is a special seine for catching barbel.

Qorgasın aw is a net with lead, which is placed in rivers with strong currents.

Qabadan aw is a special net for catching fish in lakes. It has a large opening that gradually narrows as it approaches its end.

Qaqpay - with the help of a device, fishermen sitting on the shore throw fish ashore.

Professional vocabulary related to fisheries has been poorly studied in the Karakalpak language. Professional vocabulary is one of the rich and diverse lexical sources that are of great importance in enriching the literary language.

From the point of view of lexical-semantic features, fishing vocabulary can be divided into several groups (names of gear and their parts, names of boats, names of dishes, names of fish and others).

Scientific cooperation between ichthyologists and linguists has not yet been organized for the linguistic analysis of fish names. Therefore, neither errors nor confusion are eliminated in both bilingual and explanatory dictionaries. In addition, inaccuracies in fish names are noted, with the name of one fish being associated with another fish.

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Rezyume: Mazkur maqola qoraqalpoq tilidagi baliqchilikga oid leksikaga bag'ishlangan. Shu kunga qadar qoraqalpoq tilidagi baliqchilikga oid leksika alohida ilmiy tarafdin tadqiq qilinmagan. Bu maqola orqali biz qoraqalpoq tilidagi baliqchilikga oid leksikaga umumiy xarakteristika berish, baliqchilik xo'jaligida keng qo'llaniladigan terminlarga izoh berishdan iborat.

Резюме: Статья посвящена лексике рыболовства в каракалпакском языке. До сих пор лексика рыболовства каракалпакского языка специально никем не изучалась. Мы ставили перед собой задачу, дать общую характеристику лексики, связанной с рыбным хозяйством, установить совокупность названий рыб и снастей.

Kalit so'zlar: leksika, professionalizmi, termin, semantika, ixtionim, struktura, so'z yashash.

Ключевые слова: лексика, профессионализмы, термин, семантика, ихтионим, структура, словообразование.

THE CONCEPT OF CIVIL-LAW INSTRUMENTS FOR SECURING DEBT OBLIGATIONS.

Ismaylov O.K.

Karakalpak State University named after Berdakh

Summary: *This article thoroughly examines the issues and theoretical foundations related to ensuring the fulfillment of obligations through methods such as penalties, collateral, retention of the debtor's property, guarantees, warranties, surety, and other methods provided by legal regulations or contracts. It also explores civil-law matters concerning the assurance of debt obligations..*

Key words: *Fulfillment of the obligation, penalties, collateral, retention of the debtor's property, guarantees, warranties, and satisfying the creditor's claims.*

Usually, the parties to a contract use one of the methods specified in the Civil Code to ensure the fulfillment of obligations. However, each of these methods may cause certain inconveniences for either the creditor or the debtor. Therefore, the parties are not limited to the methods listed in Article 259 of the Civil Code when ensuring the fulfillment of obligations. They are allowed to seek methods that maximize their interests, are convenient to apply, guarantee the expected outcome more easily, and are both cost-effective and efficient[1].

Chapter 22 of the Civil Code of the Republic of Uzbekistan is titled 'Ensuring the Fulfillment of Obligations,' and in part 1 of Article 259, it is stated that the fulfillment of an obligation can be ensured by means such as a penalty, pledge, retention of the debtor's property, surety, guarantee, mortgage, or other methods provided by law or contract. However, the general concept of methods for ensuring obligations is not provided therein[2].

Discussions continue among legal scholars regarding the definition of methods for ensuring the fulfillment of obligations. One group of scholars attempts to describe the methods of ensuring obligations from the perspective of sanctions, that is, civil liability[3]. In contrast, another group of scholars emphasizes that these methods are measures provided by law or contract, which serve as additional obligations designed to incentivize the debtor to fulfill the obligation or to protect the creditor's property interests. The views of scholars who attempt to describe these methods as sanctions or from the perspective of civil liability are not logically sound. These views fail to fully capture the nature and purpose of the methods for ensuring the fulfillment of obligations. This is because they express liability measures that are applied outside the process of ensuring obligations, only after the ensuring methods have failed to be effective, to restore the violated rights of the creditor[4].

Liability is a last resort and does not always align with the interests of both parties. After all, the parties who entered into the obligation with the intention of gaining significant benefits are now forced to settle for recovering damages only at the cost of significant losses. Moreover, several authors describe methods for ensuring the fulfillment of obligations as techniques, means, or measures employed by counterparties to ensure the effective fulfillment of the obligation, or as compulsory relationships aimed at the non-prejudicial appropriation of the debtor's property to satisfy the creditor's claims[5]. They are also described as special measures that sufficiently guarantee the fulfillment of the main obligation and encourage the debtor to behave appropriately[. The opinions presented are debatable, as they only highlight certain aspects of the methods of ensuring obligations. The aforementioned situations indicate the need to analyze existing theoretical approaches to reach a consensus on this matter.

There are the following theoretical approaches (main theoretical concepts) dedicated to methods for ensuring the fulfillment of obligations: The first approach is based on the 'functional' theoretical concept. This approach encapsulates the views related to the decisive role of the function performed by the legal structure in determining the methods for ensuring the fulfillment of obligations. According to O.S. Grin's acknowledgment, among the methods for ensuring the fulfillment of obligations listed in Chapter 23 of the Russian Civil Code, penalties and collateral are

considered stimulating, surety and independent guarantee have protective functions, while pledge, retention, and security payments have both functions[6]. According to this approach, methods of ensuring obligations in civil law are special (additional) measures of a property nature established by law and contract, which either protect the creditor's property interest when an obligation is breached or stimulate the debtor to fulfill the obligation properly, or perform both functions. We agree with the views of the proponents of the 'functional' concept, as such views are scientifically significant in elucidating the essence of the issue. After all, the methods of ensuring obligations essentially have two main functions: stimulating the debtor to fulfill the obligation properly and protecting the creditor's property interest in case of a breach.

A debt obligation is generally understood as the duty of one person to pay money to another person. This obligation arises from any type of contractual relationship. For example, if the price for delivered goods is not paid on time under a supply contract, it can be considered a debt obligation. This is because, until the buyer pays for the goods, they remain indebted to the seller. Therefore, it is appropriate to understand the concept of debt obligation in a broader sense and not limit it to just debt contracts.

The second approach is known as the 'External Source of Performance' concept. According to proponents of this approach, methods for ensuring the fulfillment of obligations are part of a legal system that performs a protective function by creating an external source for satisfying the creditor's interests. As noted by D.V. Tarikanov, a security obligation is an additional civil law measure of a property nature that provides external support for the performance of the main obligation created for the creditor[7]. However, this concept expresses the idea of ensuring the fulfillment of obligations in a relative sense, as the essence of the mentioned concept is not fully reflected.

The third approach, the subjective rights concept, defines methods for ensuring the fulfillment of obligations as specific subjective rights used by the creditor when the main obligation is breached by the debtor. This approach is widely interpreted in foreign literature.

In particular, K. Weber proposed the idea that methods for ensuring the fulfillment of obligations can be understood as 'certain rights (Sicherungsrecht) that a creditor (lender) may have in case the creditor's claim is not fulfilled, which arise as contractual structures that come into effect against the debtor.' He also described security as a legal right that ensures a claim against the debtor or a third party, which the creditor can exercise if the obligation is not fulfilled or is only partially fulfilled, thus giving rise to a mandatory and material contractual right[8].

Such rules can also be observed in the civil legislation of developed foreign countries. For instance, Article 2071 of the French Civil Code defines security as a contract in which the debtor provides something to the creditor to guarantee the debt. Additionally, for security measures to be recognized as methods for ensuring the fulfillment of obligations, they must have the characteristic of incentivizing the debtor to fulfill their obligations[9]. This characteristic of ensuring methods is acknowledged in a number of legal sources.

We agree with the views of legal scholars that security measures have protective and incentivizing characteristics. This is because such characteristics can justify recognizing them as methods for ensuring the fulfillment of obligations. These characteristics can reveal the essence of ensuring the fulfillment of obligations. At the same time, methods for ensuring the fulfillment of obligations must have the property of generating independent property consequences. Security measures should create a property effect and protect the parties' interests by compensating for the damage incurred. Moreover, methods for ensuring the fulfillment of obligations must have the characteristic of being additional (accessory) to the main obligation. The accessory nature of security obligations is expressed in the 'absence of debt and the absence of security'

In conclusion, methods for ensuring the fulfillment of obligations protect the property interests of the parties involved by directly incentivizing the debtor to fulfill their obligations and ensuring that the obligations are not breached. This protection is achieved through measures specified by special laws, legal regulations, or contracts.

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Rezyume: Ushbu maqolada majburiyatning bajarilishi neustoyka, garov, qarzdorning mol-mulkini ushlab qolish, kafillik, kafolat, zakalat hamda qonun hujjatlari yoki shartnomada nazarda tutilgan boshqacha usullar bilan ta'minlanishi masalalari va nazariy asoslari xamda karz majburiyatini ta'minlashning fuqarolik-huquqiy masalalar atroflicha tadqiq qilingan.

Резюме: В данной статье исследуются вопросы и теоретические основы исполнения обязательств и их обеспечения, в частности, посредством неустойки, залога, удержания имущества должника, поручительства, гарантии, залога, а также другими методами, предусмотренными законодательством или договором. Также всесторонне рассматриваются гражданско-правовые вопросы обеспечения долгового обязательства.

Kalit soʻzlar: Majburiyatning bajarilishi, neustoyka, garov, qarzdorning mol-mulkini ushlab qolish, kafillik, kafolat, zakalat, kreditorning talablarini qondirish.

Ключевые слова: исполнение обязательства, неустойка, залог, удержание имущества должника, поручительство, гарантия, задаток, удовлетворение требований кредитора.

MIGRATION SYSTEM OF ARAL SEA REGION OF THE BRONZE AGE AND EARLY IRON AGE

Kudaybergenov S.Sh.

Karakalpak State University named after Berdakh

Summary: *The article examines the formation and development of the Aral Sea culture in the Bronze Age and the Early Iron Age, describes the direction of the ancient routes that served the migration of pastoralist tribes and the economic relations of the Aral Sea region with adjacent regions. The importance of minerals in the development of the region is indicated.*

Key words: *Bronze Age, Early Iron Age, South Aral Sea region, Tazabagyab culture, Andronov culture, ancient roads, trade and economic relations, migration routes, Ustyurt plateau, Murgab rivers, minerals.*

In the Bronze Age, there was an intensive cultural and economic exchange between the tribes of different regions of Central Asia - the sedentary farmers of the southern oases and the steppe cattle breeders of the northeastern regions.

The increase in the role of exchange was facilitated by the development of bronze metallurgy, the growing level of productive forces and handicraft production, the formation of centers for the extraction of minerals and transport materials, as well as long-distance trade in copper, tin, gold and silver, lapis lazuli and turquoise.

Economic and technological contacts, cultural ties, and migration processes of the Bronze Age are studied mainly on the basis of an analysis of archaeological data.

The Aral Sea region was geographically located on the boundaries of the vast territory between the Volga and the southern Siberia where the cattle-breeding tribes lived. In the Bronze Age, cattle breeding also developed in the Southern Aral Sea region, with the skills of farming based on an irrigation system (Tazabagyab culture) [1, 59]. And in the scientific literature, for a long time, the point of view of the agricultural and cattle-breeding type of the Tazabagyab culture with a developed irrigation system prevailed [2, 106], recently these views have been revised.

According to new data, the quantitative indicators of the sown areas of the southern Aral region of the Bronze Age and the degree of land used for agricultural purposes were somewhat exaggerated, in addition, the types of sowing crops have not been identified and cereal grains have not been found [3, 19]. This allows us to attribute the ancient population of the Aral Sea region, to a greater extent, to the pastoral tribes of the steppe circle. This is evidenced by the cultural traditions and way of life of the Tazabagyab people, studied on the basis of archaeological materials.

In the middle of the 2nd millennium BC, the processes associated with the migrations of the steppe cattle-breeding tribes of the Andronov culture begin. A number of sites of representatives of this culture have been discovered on the territory of the Eastern and Southern Aral Sea region. The absence of stationary dwellings at the sites testifies to the temporary stay of the tribes of the Andronov culture in the Aral Sea region [4, 104]. These facts show that the Aral Sea region served as an intermediate territory for the migration of steppe cattle breeders to the southern regions of Central Asia.

Among the main factors of migration, researchers distinguish the following: an increase in livestock, the search for new pastures, the widespread use of horses and wheeled vehicles, the growth of surplus product and the desire for exchange, the development of bronze metallurgy [5, 132].

In our opinion, among the reasons for migration the demographic factor can be noted - the growth of the population in the pastoralist environment, the limitation of pasture areas, due to the increase in the livestock population. Periodic drought, lack of rain in the steppe, leading to drying out of the soil and death of vegetation, also contributed to the resettlement of the population, the search for new pastures and water sources.

The pastoral tribes of the northeastern steppes penetrated into the southern Aral Sea region through the Ustyurt plateau and the lower reaches of the Syr Darya. On the northern outskirts of Ustyurt, camps of cattle breeders of the Bronze Age were discovered [6, 116]. From here the steppe tribes penetrated into the lower reaches of the Amu Darya. Further, their path was divided into the direction of the Middle Uzboy - the foothills of the Kopetdag, and also went along the right bank of the Amu Darya to the lower reaches of the Zarafshan River.

The problems of relations between the steppe and agricultural tribes of Central Asia were studied at different times by a number of researchers (A.V. Zbrueva, S.P. Tolstov, M.A. Itina, V.M. Masson, B.A. Mandelstam, E.E. Kuzmina, A.A. Askarov, V.I. Sarianidi, etc.). However, the issues of the formation and development of the roads of historical and cultural ties, including migrations of the Bronze Age passing through the territory of the Aral Sea region, have been studied insufficiently.

The penetration of the steppe population from the north into the territory of Central Asia is documented not only by the presence of temporary, intermediate sites, but also by finds of ceramics and individual bronze items of the steppe culture. In the Eastern Caspian region, burial grounds of cattle breeders of the Bronze Age have been discovered, representing groups of mounds with a stone embankment [7, 239].

Archaeological materials indicate two centers, from where the migrations of the pastoralist tribes of the Bronze Age began. These are the Volga region - the Urals and northwestern Kazakhstan [8, 181]. The routes of the Northern Aral Sea region and the Ustyurt plateau were of particular importance in the resettlement of pastoral tribes [9, 28].

In the 50-60s of the last century, the issue of the territory of distribution of monuments of steppe cultures of the Bronze Age in Central Asia was studied [10, 148]. Based on the geography of archaeological sites, the routes of movement of shepherd tribes along the Ural and Emba rivers to Mangyshlak and the Ustyurt plateau, as well as from the Urals and northwestern Kazakhstan to the Northern and Eastern Aral regions, have been marked [11, 127]. From here, the steppe cattle breeders reached the Kyzyl Kum and Karakum deserts.

An important route that connected the northern and southern regions passed along the left bank of the Amu Darya in the direction of Margiana and Bactria. The archaeological characteristics of the path that passed in the Middle Ages through Khazarasp, Dzhigarband and Dargan to Merv (lower reaches of the Murgab River) is presented in the monograph by M.E. Masson [12, 67]. In the archaeological and topographic respect, the study of the trade route from Merv to Khorezm, which ran along the lower reaches of the Murgab delta, showed that there were dozens of settlements of the Bronze Age and Early Iron Age along the direction of the former medieval caravan road for about 70 km deep into the desert [13, 67].

Further research confirmed that in the lower reaches of the Murgab in the Bronze Age, the population lived on the territory of eight ancient agricultural oases, where more than 100 settlements were found [14, 11]. In the middle of the 2nd millennium BC the decline of ancient Margian agricultural oases began, apparently due to changes in environmental conditions, desertification of irrigated lands. At the same time, on the borders of the oases, the camps of the Andronovsky culture cattle breeders appeared [15, 20].

The steppe tribes penetrated into Margiana from the Southern Aral Sea region. Then they moved along the paths, along the channel of the Kelif Uzboy to Bactria [16, 89], and also to the south, down the river Murgab. In the middle reaches of this river, ceramics of steppe cattle breeders were found in the vicinity of the wells Karakhanbai, Yakhbil, Cherkezli, Dortkuduk and others, connected by old paths. Some of the campsites of the Late Bronze Age pastoralists are 70-80 km away from the valley of the middle Murgab and were located in areas of pastures on gray soils [17, 6].

The development of copper mines, which were located in the Kyzylkum mountains, was of great importance in the economic life of the population of the Aral Sea region. As the study of the metal of the Zamanbaba culture shows, the development of the Kyzylkum mining region began at least at the end of the 3rd and the beginning of the 2nd millennium BC [18, 47]. In addition, the deposits

of turquoise and workshops for the manufacture of beads from this mineral have been discovered there [19, 43].

In the districts of Tamdytau and Bukantau (Central Kyzylkum), the camps of cattle breeders of the Bronze Age were investigated and traces of copper smelting were found [20, 508]. The ancient trails that led from the Aral Sea region to the Inner Kyzyl Kum and the Zarafshan valley were also intensively used in earlier times (the Mesolithic-Neolithic era).

Thus, the above data allow us to conclude that in the Bronze Age, transit routes crossed in the Aral Sea region, which connected the Eurasian steppes, southern regions of Central Asia, Iran and the Indus valley. Their routes passed through steppes, deserts, river crossings and mountain passes. These roads were used not only for transit, but also for local traffic, as well as for pack transport, exchange and economic ties. There were also traditional routes for driving livestock to summer and winter pastures. Attention is drawn to the formation of caravan roads associated with the extraction and transportation of natural resources.

In the Bronze Age, the camel, horse and donkey served as transport and cargo transportation. For example, the bones of a camel and a horse were found in the Tazabagyab settlements of the Southern Aral Sea region [21, 185], and the bones of a donkey were also found in the settlements of the lower reaches of the Murgab [22, 110].

According to archaeological data, the directions of the routes of the Bronze Age and Early Iron Age practically coincided with each other. This is evidenced by the geography of the Aral Sea archaeological sites.

In the 10th - 8th centuries BC, the Amirabad culture herders, who had the skills of irrigation farming, lived in the southern Aral Sea region [23, 188]. In the lower reaches of the Syr Darya (Eastern Priaralye), a culture of semi-sedentary pastoralists was formed, studied based on materials found during excavations of the mausoleums of Northern Tagisken [24, 80].

At the same time, in the area of the middle reaches of the Amu Darya, on the way from Margiana and Bactria to Khorezm and the Bukhara oasis, the settlement of Odoytepa was built, fortified by defensive walls [25, 187]. Researchers associate these processes with the beginning of migrations to the lower reaches of the Amu Darya of certain groups of the population of Margiana (farmers, craftsmen, builders), which had a significant impact on the further development of the Khorezm oasis and led to ethnocultural synthesis. As a result of this, starting from the end of the 7th century BC, in Khorezm, the Kyuzeligyr culture was formed, which had no genetic similarity with the previous Amirabad culture, as well as with the local cattle-breeding culture of the Saks - Khorezmians [26, 28].

In the 7th - 5th centuries BC, the territory of the Ustyurt plateau acquired great importance, through which seasonal movements of nomadic tribes, known from written sources as Dakhi, Massagets and Saki, took place. In the early stages, they roamed between the Ural and Emba rivers to the Eastern Caspian and the Amu Darya - Uzboy channel [27, 74].

Ustyurt has seasonal forage resources (wormwood, salsola), the plateau served as a wintering place for nomads and winter grazing, as well as hunting wild animals (onager, saiga antelope, gazelle). From the middle of the 1st millennium BC, the nomads of Ustyurt used special structures for hunting - stone fences with pits. The hunters drove wild animals into these fences [28, 193].

In the early Iron Age, the ancient routes of the Aral Sea region performed various functions of an economic nature and contributed to the widespread dissemination of cultural innovations. However, in the context of a changeable political situation, these routes were increasingly used for military raids and long-distance campaigns, for example, the Saks to Media, information about which was preserved by the messages of ancient authors.

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Rezyume: *Bronza davrida O'rta Osiyoning turli viloyatlari qabilalari – janubiy vohalar o'troq dehqonlari va shimoli-sharqiy o'lkalaridagi dasht charvodori o'rtasida turli ko'rinishdagi iqtisodiy-madaniy aloqalar amalga oshirilgan. Bu aloqalarni shakllanishi va rivojlanishi asosida*

bronza metallurgiyasining keng yoyilishi, ishlab chiqaruvchi kuchlar va hunarmandchilik rivoji, foydali qazilmalarni qazib olish va xom-ashyo mahsulotlarini yetkazib beruvchi markazlar shakllanishi, shuningdek mis, qalay, oltin va kumush, loljuvard va feruza kabi nodir metallar va toshlar bilan tranzit savdo aloqalari paydo bo'lganligi muhim ahamiyat kasb etgan.

Резюме: В эпоху бронзы происходил интенсивный культурно-экономический обмен между племенами различных областей Средней Азии – оседлыми земледельцами южных оазисов и степными скотоводами северо-восточных районов региона.

Увеличению роли обмена способствовали развитие металлургии бронзы, растущий уровень производительных сил и ремесленного производства, формирование центров добычи полезных ископаемых и транспортировки сырья, а также дальняя торговля медью, оловом, золотом и серебром, лазуритом и бирюзой.

Хозяйственные и технологические контакты, культурные связи и процессы миграций эпохи бронзы исследованы главным образом на основе анализа археологических данных.

Kalit so'zlar: Bronza davri, ilk temir davri, Janubiy Orolbo'yi, Tozabog'ob madaniyati, Andronov madaniyati, qadimiy yo'llar, savdo-iqtisodiy aloqalar, migratsiya yo'llari, Ustyurt platosi, Murg'ob daryolari, foydali qazilmalar.

Ключевые слова: Бронзовый век, ранний железный век, Южное Приаралье, тазабагыбская культура, андроновская культура, древние дороги, торгово-экономические связи, пути миграции, плато Устюрт, реки Мургаб, полезные ископаемые.

UDK: 903.2 (903.01/ 903.21)

ABOUT MESOLITHIC CULTURES IN SOUTHEAST USTYURT

Madreymov B.Dj.

Karakalpak State University named after Berdakh

Summary: *The article examines the history of archaeological study of the Mesolithic monuments of Ustyurt and the possibility of revising existing archaeological materials, as well as raising the study of the Mesolithic period in Uzbekistan to a new modern level.*

Key words: *Ustyurt, Kyzylkum, archaeological research, Mesolithic, E.B. Bizhanov, A.V. Vinogradov, MachaiAydabol, Churuk, Kartpaykum.*

In the Mesolithic era, a more humid climate existed in the vast expanses of the plain zone of Central Asia. Tugai forests grew along the rivers and in marshy lowlands. Here were found microlithic items, small flint tools of geometric outlines, characterizing the Mesolithic era.

To date, about 30 stratified sites and more than 200 sites of the Mesolithic era have been identified in Central Asia, most of which correspond to the territory of Uzbekistan. These monuments can be divided into two groups: the first group consists of cave monuments Obishir 1-5, Machai, Kushilish, Karakamar and Ochilgor; the second group of monuments is the discovery of the site: Aydabol 25, Lavlakon 24, Charbakti, etc. In general, the Mesolithic of Central Asia covers the 11th-7th millennia BC. (Romanova E.N., Sementsov A.A., Timofeev V.I. 1972: 58; Markov Yu.N., Obratsov V.A. 1981: 74-77; Ranov V.A. 1975: 34; Vinogradov A.V. 1981: 28; Islamov U.I. 1980: 23-24).

The territory of Ustyurt is of great importance in the study of the Mesolithic of Uzbekistan. In the second half of the twentieth century, E. B. Bizhanov and A.V. Vinogradov discovered about 20 Mesolithic monuments here. They are mainly open-type monuments (without stratigraphy) (Vinogradov A.V. 1981: 48).

According to researchers, these monuments are located in takyr, salt marshes, sandy massifs, on the banks of the dry riverbed of ancient water sources. The sites of Aydabol, Churuk, Kartpaykum, Alan massif and Tailak and others have such a topography. Long-term monuments include Aydabol 25 (more than 2000 finds), Aktaylak (14000 finds), Kiyikshingrav 2 (12000 finds). Short-term monuments are Aydabol 15 (83 finds), Churuk 2 (84 finds), Sumbetimer 1 (263 finds) (Vinogradov A.V. 1981: 29). In addition, there are hundreds of medium-sized monuments, such as Aydabol 10 (about 400 finds), Aydabol 16 (about 5000 finds), Aktyube 2 (more than 5000 finds) (Bizhanov E.B. 1982: 33).

According to A.V. Vinogradov among these monuments with 200 to 1000 artifacts are one-time or seasonal sites (Vinogradov A.V. 1981: 28). According to the classification of K. Flannery and F. Hole, the Mesolithic monuments of Ustyurt are divided into three types (Hole F, Flannery K. V. 1967: 162-163).

1. seasonal, main camps;
2. shelters for the separation of prey hunting;
3. short-term intermediate parking.

Numerous and multifunctional stone tools were found from the sites of the first group. The second group of monuments is intended for finishing the hide and carcass of hunting objects, and therefore they are limited to a set of special stone tools. The tools of the third group, although similar to the first group, are characterized by a small number of stone products.

According to E. B. Bizhanov, the sites of Aydabol 16, 25, 6, 9, 11, 21, 22 can be confidently attributed to the Mesolithic, and the memorial location of Zharinuduk is conventionally considered the Mesolithic. Locations Aktaylak 1 (complex 1), Aktobe 2, Churuk 2 (complexes 1 and 2), Churuk

7, Sulama, Churuk 8 (complex 2) E.B. Bizhanov attributed it to the Late Mesolithic (Bizhanov E.B. 1978: 74-75) or the Early Neolithic.

The sites of the Mesolithic of Ustyurt are characterized by a large percentage of microlithic technology of cleavage. In the secondary processing in most of the projects, blunt retouching was used. Also in the set of these industries are shell ornaments.

The origin of the Ustyurt Mesolithic is still unknown. According to E.B. Bizhanov, a mixed and peculiar local culture was formed in Ustyurt under the influence of the Mesolithic of the Caspian and Southern Urals (Bizhanov E.B. 1982: 33; Bizhanov E.B. 1996: 23).

As an example, he cites the presence and similarity of the Mesolithic trapeziums of the Caspian and Ustyurt. At the same time, E.B. Bizhanov also pauses about the differences. Between them, and speaking about the peculiarities of the Ustyurt Mesolithic, he notes that the Ustyurt Mesolithic grew from local Middle Paleolithic monuments, such as Esen 2 and Churuk 12 (Bizhanov E.B. 1979: 522; Bizhanov E.B. 1980: 76).

On the territory of Surkhandarya, separate points of the Mesolithic epoch were discovered (Islamov U.I. 1975: 10-11; Okladnikov A.P. 1945: 243). These include finds around the ancient settlement of Ayrtam and near Old Termez. These finds consist of wedge-shaped and prismatic cores for microblades, side-scrapers, retouched flakes and blades, incisors and large points. A.P. Okladnikov and U.I. Islamov genetically link them with the Samarkand site and the Obishir 1-5 monuments (Okladnikov A.P. 1945: 12; Islamov U.I. 1972: 9-11).

Table 1

Periodic cultural table of Mesolithic monuments of Uzbekistan

№	Monuments	Dates	Cultures
1	Тошкўмир	XI (IX?) millennia	The first stage of Obishir culture
2	Obishir I-V (2 points, Madyor, Ashi-Kul, Yangi- Qadam 21, Zambar 2 and others)	IX (VIII?) - VII millennia	Middle stage of Obishir culture
3	Central Ferghana Mesolithic (3, 5, 16 points, Sariq-Suv, Baxrobad and others)	7th millennium	The last stage of Obishir culture
4	Kushilish	X-IX millennia	Tashkent variant of Obishir culture
5	Ayritom, Termez materials	IX-VII millennia	Surkhandarya culture
6	Machai	7550±110 years	Surkhandarya culture
7	Sazagan 1 space	VIII? -VII millennia	Sazaghon culture
8	Ochilgor space	IX-VII	
9	Ustyurt. Advanced Mesolithic: (Aydabola 16 and 25)	VIII-VII millennia	?
10	Ustyurt. Late Mesolithic and Early Neolithic: (Aidabol 2, 4, 7, 9, 10, 11, 20, 21, 22, 23, Aktobe 1, Churuk 3, Aktobe 2.	VII-VI millennia	?

Comprehensive paleogeographic and archaeological studies in the territories of Uzboy, Amu Darya, Zarafshan, Kyzylkum and the Central Asian Mesopotamia indicate that these territories were densely populated during the late Pleistocene and early Holocene. The discovered monuments in various ecological conditions indicate that there were favorable natural conditions for human existence. The Mesolithic tribes living in these territories lived in different natural conditions, continued their cultural development and laid the foundation for the further evolution of the Stone Age cultures.

Of course, the importance of studying the Mesolithic monuments of Uzbekistan is great, or it gives us for the first time an idea about the types of economy, about the life of the Mesolithic tribes of Uzbekistan.

Man has made great strides in improving the tools of labor. Already in the Paleolithic, throwing spears - darts were invented. Then man acquired a bow and arrow, which was a huge achievement in the history of mankind. Now it was possible to hunt birds, small swift-footed animals that rarely fell prey to humans in the Paleolithic era.

The bow was essentially the first mechanism invented by man. In the Mesolithic era, the microlitization of guns reaches a height of. Different shapes of geometric tools appear. The era from the appearance of onions to the invention of ceramics covers the period from about the 10th to the 5th millennium BC. e. and is called the Mesolithic.

The animal world has also changed. Before that, hunting in mountainous areas, like the previous era, was roe deer, mountain goats and rams, and in the lowland areas - bison, gazelle, horses, hares. Hunting could not be a reliable source of food. This set before the person the task of finding new forms of economy, new means of subsistence. Following the change in the landscape and fauna, the way of life of the people of the Stone Age also changed.

According to the faunal remains, paleogeographic and functional data of the materials of the Obishir 1-5 site, representatives of this culture were hunters and gatherers. They hunted Siberian deer, argali, gazelle, deer, etc. animals. The main hunting weapon was a bow and arrow; individual arrows were found from the sites of Obishir and Central Fergana. Stone tools also indicate that hunting was the main business of the economy. In the economy of this culture, the processing of skins and the manufacture of various things from them played an important role. In the economy of representatives of this culture, leather processing played an important role. The existence of collecting is evidenced by stone sickles and grain grinders found from the Mader locality (Korobkova G.F. 1969: 127-142; Korobkova G.F. 1977: 112).

In general, representatives of the Obishir culture were engaged in wandering hunting in the foothill and desert zones (Korobkova G.F. 1982: 163).

According to the quantitative indicators of labor tools, it can be said that there were main long-term camps (Obishir 5, Sarik-Suv, etc.), short-term shelters (point 3, Ittak-Kala 1, etc.) and locations for cutting hunting prey (Ashi - Cool, Mader 11, 2 and point 16, Taipak 3).

To study the economic activity of the Mesolithic tribes of Central Asia, we use a number of sources. This information about the natural environment of the study area, about the visible and quantitative composition of the fauna, the nature of its distribution in the layer, the functional purpose of tools, etc.

Cattle breeding in their economy in this era did not yet exist or did not play a decisive role. The bones of small ruminants from domestic animals were found in the upper layer at Obishir 5 Cave and Machai Cave. The most famous are the presence of cattle bones in both layers of Machai Cave. Hence, it remains to accept that the inhabitants of the cave raised sheep, goats, and possibly cattle. At least there is reason to talk about the initial stage of the timing of large horned animals. Now it is difficult to decide with certainty the question of whether the territory of Uzbekistan will be found as an independent center for the development of cattle breeding or be part of the Central Asian cattle breeding center.

In the economy of the Mesolithic populations of Ustyurt, traceological data testify, and it is mainly of an appropriating nature. The main occupation of the population in this era was hunting and gathering. In the household, the main place was occupied by the processing of bones, wood and hides. The Mesolithic population of Ustyurt lived in cultural contacts with the cultures of adjacent territories and played an important role in the development of the subsequent Neolithic era.

On the basis of the achievements made by the Mesolithic tribes of the south, it became possible for their transition from gathering to the cultivation of cultivated plants - to agriculture and breeding of domestic animals. Equally naturally, in the course of time, the inhabitants of the steppes and mountain regions, probably with the help of their settled neighbors, switched from hunting wild

animals to cattle breeding. The first farmers and pastoralists owe all this to their predecessors, the people of the Mesolithic time, in which the first cracks in the ancient consuming economy, which dominated for several million years, began, when the search for new sources of livelihood, new forms of life and culture. These first timid steps of the Mesolithic people prepared a great turning point - the transition to a productive economy, and with it many other progressive changes in all areas of culture and human life.

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Rezyume: *Maqolada Ustyurtning mezolit yodgorliklarini arxeologik o'rganish tarixi va mavjud arxeologik materiallarni qayta ko'rib chiqish, shuningdek, O'zbekistonda mezolit davrini o'rganishni yangi zamonaviy bosqichga ko'tarish imkoniyatlari ko'rib chiqiladi.*

Резюме: *В статье рассматривается история археологического изучения мезолитических памятников Устюрта и возможность пересмотра существующих археологических материалов, а также поднятия изучения мезолита в Узбекистане на новый современный уровень.*

Kalit so'zlar: *Ustyurt, Qizilqum, arxeologik tadqiqotlar, mezolit, E.B. Bijanov, A.Vinogradov, Machay, Aydabol, Churuk, Kartpaykum.*

Ключевые слова: *Устюрт, Кызылкум, археологические исследования, мезолит, Е.Б. Бижанов, А.В. Виноградов, Мачай, Айдабол, Чурук, Картпайкум.*

FOUNDATIONS FOR THE FORMATION OF ANCIENT ROUTES.

Kudaybergenov S.Sh.

Karakalpak State University named after Berdakh

Summary: *The article discusses issues related to the development of the Aral Sea region by ancient hunters and fishermen, describes the geography of archaeological sites in the Aral Sea region, the ancient deltas of the Amu Darya as well as studies the foundations of the formation of ancient routes that connected the South Aral Sea region with adjacent territories and their importance in the development of the region.*

Key words: *Ustyurt plateau, Sultanuizdag ridge, Eastern Pre-Caspian region, Aral Sea, Akchadarya, Sarykamysh, Barsakelmes hollows, Kyzylkum deserts, ancient hunters, fishermen, hunting for steppe animals, early routes.*

The history of ancient routes is closely related to the problem of human settlement in certain regions and the development of the anthropogenic landscape. According to archaeological data, human development of the Aral Sea region began from the territory of Ustyurt, in the Middle Paleolithic. This is evidenced by the finds of stone tools at Paleolithic sites located on the southern and northern outskirts of the Barsakelmes depression of the Ustyurt plateau (Esen 2, Karakuduk, Shakhpakhty, Churuk) [1, 58].

In the late Paleolithic era, the expansion of the territories of settlement of primitive communities took place. At this time, the northwestern and southern spurs of the Sultanuizdag ridge (Southern Aral Sea region - Khorezm oasis) [2, 34] were developed. Tools of the Late Paleolithic era were also found in the Kokcha area in the area of the ancient Akchadarya delta of the Amu Darya [3, 33].

At the end of the middle to the beginning of the Late Paleolithic, Ustyurt and the southern Aral Sea region, apparently, found themselves in the zone of large-scale migrations in Eurasia, which were associated with evolutionary processes - the replacement of one type of hominid with another, the formation of a modern person, as well as a tribal community [4, 64].

During the Mesolithic, and especially the Neolithic, there was a large-scale development of the territories between the Eastern Caspian and the Aral Sea, the regions of the Southern and Eastern Priaralye, as well as the Kyzyl Kum desert. The geography of numerous monuments of the Mesolithic and Neolithic times, the nature and features of the settlement of ancient hunters, fishermen and gatherers show that their sites are located in places where human habitation is now extremely difficult or impossible. Attention is drawn to the supply of fresh water to desert areas. At present, the sites of ancient sites are practically devoid of not only surface water, but also groundwater suitable for consumption.

In the process of studying the Mesolithic and Neolithic sites in the Inner Kyzyl Kum, geological, geomorphological and soil studies were carried out, which made it possible to raise the question of a noticeable humidification of the climate in the Mesolithic and especially in the Neolithic, the so-called Lalyakan pluvial. Special analyzes of a series of ancient soils showed that they could not have formed under modern landscape and climatic conditions [5, 43]. At that distant time, a significant amount of precipitation fell on Ustyurt, in Kyzylkum and adjacent territories, there were lake reservoirs with fresh water. More humid and cooler climatic conditions in the deserts, in comparison with the modern dry and hot climate, contributed to the development of rich herbaceous and shrubby vegetation and a diverse composition of the animal world [6, 137]. All this created favorable landscape and climatic conditions for human settlement in the steppe regions of Central Asia.

The nature of the development of human relations with the surrounding nature, the peculiarities of paleoecology and the territorial settlement of ancient communities, the construction of dwellings and settlements, methods of obtaining food and raw materials for labor tools are of great

importance for studying the issue of the formation and development of ways to develop natural resources and intercommunal ties.

It is known that the most important way of obtaining food in the Stone Age was hunting, which was associated with a specific territory and determined the nature of the camps. It was the location of the hunting territory and natural outcrops of the silicon rock necessary for the manufacture of tools that determined the directions of the early paths [7, 9]. So, in the south-west of the Barsakelmes hollow, in the area of the Esen Upland, sites were discovered - workshops for the extraction and primary processing of flint [8, 58]. Natural outcrops of black quartzite and tools made of this stone were found in the spurs of Sultanuizdag [9, 33].

These data indicate that already in the Late Paleolithic in the Ustyurt and in the southern Aral Sea region, directions of paths were formed that connected human sites with the hunting territory, sources of raw materials for stone tools, as well as with freshwater lakes.

The archaeological monuments of the Stone Age discovered in Ustyurt are open-type sites, without a preserved cultural layer. Ustyurt, devoid of natural shelters, was not a place of permanent residence of man in the Paleolithic era. This situation continued in subsequent periods. More than 200 sites and locations (Karakuduk, Aydabol, Churuk, Aktaylak, etc.) dating back to the Mesolithic and Neolithic times are known on the Ustyurt plateau. However, the remains of ancient dwellings and traces of permanent, long-term settlements have not been found here [10, 14].

All this testifies to the fact that communities of hunters came to Ustyurt from neighboring territories. These are the Eastern Caspian Sea during the Mesolithic period and the South Aral Sea region during the Neolithic period, where there were more favorable conditions for long-term settlements [11, 43]. The fact itself shows the presence of both internal and external paths that connected various, distant territories.

Mobile hunting groups could come to Ustyurt to hunt large steppe animals (onager, saiga antelope, gazelle). This is confirmed by the study of stone tools intended for hunting and cutting hunted prey. According to the analysis of materials from the sites of Aydabol, Churuk, Isatay, tools intended for cutting hunting prey make up from 33 to 57 percent of all tools, stone scrapers used at various sites for processing skins - from 8 to 20%, tools related to hunting activities - 36-46- 60 percent [12, 43].

The Neolithic epoch (VI-IV millennium BC) is characterized by a wide distribution of sites and settlements of the Kelteminar culture in the lower reaches of the Amu Darya and Syr Darya, in the Kyzyl Kum and the lower reaches of the Zarafshan. At this time, there was a large-scale development of the flat territories of the vast steppes and deserts of Central Asia [13, 44]. The geography and cartography of archaeological sites testifies to the formation of sustainable paths that linked different parts of the region.

During the Neolithic period, the Amu Darya river had two deltas - Akchadarya (South Aral) and Sarykamysh. From Lake Sarykamysh, the waters of the Amu Darya filled the channel of the Uzboy and flowed into the Caspian Sea [14, 35]. At the same time, part of the water was discharged into Akchadarya.

The Akchadarya delta was a wide, watered plain with numerous channels and lakes, rich in fish and waterfowl. At this time, fishing was intensively developed, which contributed to a certain degree of settlement of the population. The Kelteminar sites were tribal settlements, which consisted of large ground dwellings of a frame structure [15, 148]. At the same time, a significant part of the population was engaged in hunting, led an active lifestyle outside the delta plains.

Other areas of economic and industrial activity of the Neolithic communities were the extraction and processing of stone raw materials for tools. At the sites of Beshbulak 1 and Lavlyakan in Kyzylkum, traces of a workshop of the Late Neolithic and Early Bronze Age were found, where beads were made of onyx and turquoise [16, 43].

On the basis of archaeological data, one can single out the main factors that had a significant impact on the development of the directions of ancient routes. This is the hunt for seasonally

migrating herds of mobile wild animals (kulan, saiga, gazelle, deer, wild bull), as well as the extraction of flint, quartzite, onyx, turquoise - raw materials for the manufacture of tools and jewelry.

Particularly noteworthy is the presence of exchange – the primitive trade. The need for exchange was the motive for the emergence of intercommunal ties and mutual economic and cultural influences. The specificity of the archaeological material makes it possible to distinguish the exchange of raw materials, jewelry and tools [17, 74]. Moreover, these types of exchange developed at an earlier time - in the era of the late Paleolithic and Mesolithic.

The territory of the Aral Sea region, bounded in the west by the Ustyurt-Sarykamysh line, in the south by the Zaunguz Karakum desert and in the southeast by the dunes of the Kyzylkum desert, in ancient times constituted the geographical part of the economic and cultural region between the Caspian Sea and Central Kazakhstan, as well as the lower reaches of the Volga and the South Urals. Findings in different areas of the indicated region of stone arrowheads of the Kelteminar type make it possible to determine the paths of propagation of these arrowheads in the northern direction. According to researchers, arrowheads of the Kelteminar type are a specific component of the stone inventory of the Neolithic sites in the desert zone of Central Asia [18, 3]. According to the published map of finds of arrowheads, the direction of distribution of these tools through the Eastern Ustyurt and the Northeastern Aral Sea region to the Volga region and the Southern Urals is highlighted [19, 5].

On the basis of archaeological data, one can single out the main factors that had a significant impact on the development of the directions of ancient routes. This is the hunt for seasonally migrating herds of mobile wild animals (an onager, a saiga antelope, a gazelle, a deer, a wild bull), as well as the extraction of flint, quartzite, onyx, turquoise - raw materials for the manufacture of tools and jewelry.

Particularly noteworthy is the presence of exchange - primitive trade. The need for exchange was the motive for the emergence of intercommunal ties and mutual economic and cultural influences. The specificity of the archaeological material makes it possible to distinguish the exchange of raw materials, jewelry and tools. Moreover, these types of exchange developed at an earlier time - in the era of the late Paleolithic and Mesolithic.

In this regard, it is noteworthy that it was through the Ustyurt plateau in the Middle Ages that an important trade road passed, which led to the Volga region, Eastern Europe, Transcaucasia and the Northern Black Sea region. Information about it is contained in the works of F.B. Pegalotti (1290-1350), Ibn Battuta (1304-1377) and Russian authors of the 19th century [20, 352]. In the 1946-1947s the archaeological and topographic study of the Ustyurt road was carried out by the staff of the Khorezm expedition, as a result of which caravanserais, fortresses and guard objects of the early and developed Middle Ages were examined along this route [21, 30].

During the research of the expedition, monuments of an earlier time were not revealed. It is now known that the sites of the Mesolithic and Neolithic eras were found in the vicinity of the old wells Churuk, Karakuduk and others, located on the ancient path of the Ustyurt plateau. On the northern cliffs of and the heights of Ustyurt, seasonal settlements of cattle breeders of the beginning of the 2nd millennium BC (Toksanboy, Aitman, Manaysar) were found and their dwellings - dugouts - were studied [22, 116]. All this testifies to the antiquity of the routes passing through the territory of the Aral Sea region in the northern direction. Obviously, the routes of the southern and southeastern directions were also formed very early.

The trails that led to Ustyurt were apparently used by the communities of the Mesolithic-Neolithic hunters who lived in the caves of the limestone mountain of the ancient coast of the Eastern Caspian Sea (Damdamchashma, Kailu, Dzhebel) [23, 59]. Research of the Khorezm archaeological expedition showed that in the VI millennium BC the waters of the Amu Darya flowed into the Caspian Sea along the Uzboy, which had a permanent channel. More than 20 monuments of the Neolithic period and briefly temporary sites of the Bronze Age were discovered on the banks of the middle and upper Uzboy [24, 296]. The locations of ancient archaeological materials coincide with the location

of large, fortified medieval caravanserais - Devkala, Ortakuyu, Talaykhanat and Akyayla, built on the trade route from Khorezm to Khorosan [25, 325].

This road connected the Khorezm oasis with the southwest of Turkmenistan and northeastern Iran. Apparently, this path was used by the troops of the ancient Persian kings Cyrus II and Darius I in campaigns against the Massagets and Sakas of Tigrahauda, respectively, in 530 and 519. BC. In both the first and second campaigns, the Persians reached the river, which is named in the "History" of Herodotus Araks [26, 115], and in the Behistun inscription - Arakhsha [27, 19]. It draws attention to the fact that the ancient Greek and ancient Persian names of the river (hydronyms) are in many ways close to each other. Considering that the Massagets and Saki Tigrahauda lived in the territory between the Caspian and the Aral Sea [28, 350], the Araks or Arakhsha river is the Amu Darya - Uzboy, as the only ancient river in the Karakum desert.

In the Neolithic era and the following periods of ancient history in the southern Aral Sea region - the Khorezm oasis, the paths that led to the Central Kyzyl Kum and the lower reaches of the Zarafshan (South-Western Kyzyl Kum) began. These territories were inhabited by tribes with a similar culture. In the Central Kyzyl Kum there were deposits of turquoise and copper ores. At the Beshbulak site, the remains of copper-smelting furnaces, fragments of foundry molds and accumulations of copper ore were found [29, 508]. Metallurgical sites of the 2nd millennium BC were also found in the Tamdytau and Sangruntau mountains. As a result of the analysis of fragments of copper ore found in ancient workshops, in its composition, along with copper, increased contents of silver, as well as tin and gold were established [30, 533].

Thus, in the Bronze Age, the Kyzylkum center of copper and tin mining was formed. At this time, the horse and camel were domesticated, and vehicles - wheeled carts - appeared. Using stable caravan trails, cattle breeders of the Southern and Eastern Aral Sea regions, as well as the Zarafshan valley, came to the Central Kyzyl Kum. They were engaged in the extraction of copper ore, copper smelting and transportation of metallurgical raw materials. Analysis of the chemical composition of bronze items found at the Aral Sea sites showed their origin from a single Kyzylkum metallurgy center [31, 38].

During the Bronze Age, large migrations took place associated with the search for new sources of raw materials for the developing metallurgy (copper, tin, lead). They were also determined by the need to develop deposits of rare minerals and metals (lapis lazuli, turquoise silver, gold). All this contributed to the development of long-distance trade, a significant expansion of the territories of settlement of ancient farmers and pastoralists, as well as broad cultural and economic ties [32, 88].

The ancient paths passing through the Aral Sea area served the interactions between tribes with different economic bases, the development of exchange, technological and cultural achievements in general.

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Rezyume: *Qadimgi yo'llar tarixi odamlarning ayrim hududlarga ko'chib o'tishi va antropogen landshaftning rivojlanishi bilan chambarchas bog'liq. Arxeologik ma'lumotlarga ko'ra, Orolbo'yi insoniyat tomonidan o'rta paleolitida Ustyurt hududidan boshlangan.. Buni Ustyurt platosidagi Barsakelmes dovonining janubiy va shimoliy chekkasida joylashgan paleolitik yodgorliklarda topilgan tosh asboblari tasdiqlaydi (Yasn 2, Karakuduk, Shahpaxt, Churuk).*

Резюме: *История древних путей тесно связана с проблемой расселения человека в отдельных регионах и развитием антропогенного ландшафта. Согласно археологическим данным, освоение человеком Приаралья начиналось с территории Устюрта, в среднем палеолите. Об этом свидетельствуют находки каменных орудий труда на палеолитических памятниках, расположенных на южной и северной окраинах впадины Барсакелмес плато Устюрт (Есен 2, Каракудук, Шахпахты, Чурук).*

Kalit so'zlar: *Ustyurt platosi, Sultonuzdog' tizmasi, Sharqiy Kaspiybo'yi mintaqasi, Orol dengizi, Aqchadaryo, Sariqamish, Barsakelmes bo'shliqlari, Qizilqum cho'llari, qadimgi ovchilar, baliqchilar, dasht hayvonlarini ovlash, ilk marshrutlar.*

Ключевые слова: Плато Устюрт, хребет Султануиздаг, Восточный Прикаспий, Аральское море, Акчадарья, Сарыкамыш, котловина Барсакельмес, пустыни Кызылкум, древние охотники, рыболовы, охота на степных животных, ранние маршруты.

UDK: 903.2 (903.01/ 903.21)

PALEOLITHIC STONE-WORKING WORKSHOPS IN THE BARS-KELMES BASIN OF USTYURT

Madreymov B.J.

Karakalpak State University named after Berdakh

Summary: *The territory of Uzbekistan is one of the richest ecumenes of the earth with stone-working workshops of the Stone Age. The article is devoted to a new interpretation of the stone-working workshop Esen 2, located on the shore of the Barsa-Kelmes depression of the Ustyurt plateau. The only available classification was developed by M.R. Kasymov and L.Ya. Krizhevskaya in the 70s of the twentieth century. This article is devoted to the history of the study of the flintworking workshops of Central Asia, as well as the new cultural and chronological classification and interpretation of the Esen 2 workshop.*

Key words: *Paleolithic, flint-working workshop, Esen-2, specialized workshop, biface, cleavers (stone axes), migration wave.*

The region of Central Asia is one of the countries rich in stone-working workshops of the Stone Age. Most of these workshops are located in Uzbekistan. The discovery and study of stone processing workshops in our country dates back to the 60-70s of the 20th century [Kasymov, 1962. S. 18; Kasymov, 1972. S. 1-160; Okladnikov, Kasymov, Konoplya, 1965, S. 5-11; Kasymov, 1966. S. 28-34; Kasymov, 1963. S. 239-250; Kasymov, 1961. S. 62-64; Kasymov, 1964. S. 12. Kasymov, 1965. S. 30-39; Kasymov, 1970. Pp. 143-145; Kasymov, 1962. S. 19-27; Kasymov, 1967. S. 57-58; Kasymov, 1968. S. 52. Okladnikov, 1966. S. 40. Kasymov, Rostovtsev, 1969. P. 8; Kasymov, Krijevskaya, 1969. P. 265-268. Kasymov, 1962. P. 17]. Workshops of the early, middle and late Paleolithic and Neolithic periods were found on these lands. This situation makes it possible to observe the evolution of Stone Age workshops.

It is known that the monuments of the Stone Age are divided into two large groups: spaces and stone-working workshops. The sites are hearths (sometimes remains of houses), kitchen waste, stone and bone objects, etc. will have leftovers.

The classification of Central Asian stone-working workshops was originally M.R. Kasimov and L.Ya. Krijevskayas it was carried out by the [Kasymov, Krijevskaya, 1969. S. 265-268]. When they classified the workshops of stone-working here, they predicted that "this classification is not eternal and that further research in the Central Asian regions may introduce changes and clarifications" [Kasymov, Krijevskaya, 1969. S. 265-268]. We found it necessary to cite the classification of Central Asian workshops developed by M.R. Kasimov and L.Ya. Krijevskaya.

They divided stonework workshops into two types: space-workshops and literal workshops. In turn, the space-workshops are divided into two groups:

The first group includes finds located in the immediate vicinity of stone mines. The occupation of the inhabitants of such workshops consisted mainly of obtaining raw materials, primary and partly secondary processing of stones.

The second group of space-workshops differs from the first in that they are located far from the raw material mines. Residents of such workshops brought raw materials to their premises from outside and fully processed them here.

A characteristic feature of both groups of workshop-sites is the presence of household items, which testify to the seasonal or permanent habitation of these places by people, along with primary worked stones.

Workshops in the literal sense are characterized by the presence in them only of items related to the production of weapons. There are no signs of human habitation in these places. Such workshops

are usually located near certain stone deposits suitable for making weapons. These workshops are divided into two types according to the nature of people's production activities:

The first type are literal workshops - places where stones are primarily processed and rough pottery is polished. In these lands, in the Paleolithic and Neolithic periods, raw materials were obtained by a simple or open method. Since the Neolithic period, raw materials have been obtained by digging pits, wells and mines.

Unlike the first type, in the second type literal workshops, not only primary processing of stones was carried out, but also specialized (specialized) types of weapons were produced. According to the nature of processing certain weapons, monuments of this type are divided into several types of workshops where axes, scrapers, spear blades, etc. are made.

According to the authors, such "specialization" is characteristic of the Neolithic period. In the Paleolithic period, such workshops did not exist yet. This situation is explained not by the fact that the workshops of the Paleolithic period are not well studied, but by the fact that the level of social division of labor in the Paleolithic period was still in its infancy [Kasymov, Krijevskaya, 1969. S. 265-268].

During the Neolithic there was a great differentiation of production and this was associated with a more distributed and improved division of labour. This situation is reflected in the different categories of monuments.

In the Paleolithic period, it is suspected that the space was workshops, "home" workshops or workshops of "specialized importance" [Kasymov, Krijevskaya, 1969. S. 265-268]. Although V.P. Although Lubin expressed the opinion that such workshops may have existed in the Muste period [Lyubin, 1965. S. 55-56].

By the Neolithic period, workshops take on a vivid appearance with all the social consequences of production processes in the form of intensive division of labor arising from them. This is reflected in exchange, which in turn leads to further development of the productive forces.

The Esen 2 monument is located on the Esen hill at the southern border of the Borsa-Kelmes basin of Ustyurt. He is E.B. Bijanov [Bijanov, 1979. S. 48] and A.V. It was discovered by the Vinogradovs in 1977 [Vinogradov, Bijanov, 1977. S. 522]. The area of this find is 90x40 square meters on a low flat hill. There are eroded deposits of heavily silicified limestone. A stone collection of 200 items was collected among the scattered fragments of this rock. About 15 of this collection are natural stone fragments, while the rest are unmistakable artefacts.

The industry of Esen 2 workshop it was fully studied by A.V. Vinogradov and published in his monograph "Drevnie okhotniki i rybovy sredneaziatskogo mejdurechya". The majority of the 15 finished stone tools found in the Esen 2 workshop are bifacially worked large and thinned almond-shaped pieces - bifaces. Most of them are fragments of bifas, and this condition determines the character of the monument, which is Esen 2 workshop. Their shape and size can be imagined by looking at the only intact biface preserved among the collected materials of 1977 (height 14.6 cm; width 7.7 cm; thickness up to 3 cm). In the preliminary data, Esen 2 materials were tentatively dated to the Late Paleolithic period [Vinogradov, Bijanov, 1977. P. 522]. Such dating is based on comparison with the materials of Central Kazakhstan. But these materials from Central Kazakhstan are not published enough and do not allow a full comparison with them. Based on the above comparative data, E.B. Bijanov dated the Esen 2 materials to the end of the Early Paleolithic or the beginning of the Middle Paleolithic [Bijanov, 1979. Fig. 3, 5]. Thus, Esen 2 and the Kazakh materials compared to it also require careful re-study [Vinogradov, 1981. p. 56].

A.V. Vinogradov did a great deal of research on Esen 2 materials. For the Esen 2 collection the dating proposed by E.B. Bijanov is based on comparison with the monuments in South Kazakhstan (Borykazgan, Tanirkazgan, etc.). It should be noted that there are more differences than similarities between the materials of the monuments compared above, and South Kazakhstan, especially the Karatog region, is characterized by completely different cultural and technical traditions [Alpysbaev, 1979. S. 189-190]. Bifas or hand grips do not play a significant role in this. In the articles of A.A. Alpysbaev, only one hand-pitcher (found in the Akkol site) from the Early

Paleolithic finds can be cited here, and only this pitcher can be compared with Esen 2 bifas. Other materials from South Kazakhstan are typologically closer to chopping or double-sided flanged weapons.

As a summary of the above-mentioned points, A.V.Vinogradov suggests dating the Esen 2 materials to the end of the Middle Paleolithic or the beginning of the Late Paleolithic rather than to the Acheulean or Acheulean-Muste [Vinogradov, 1981. p. 57].

Printed materials of the Esen 2 monument carefully analyzed by L.B.Vishnyatsky [Vishnyatsky, 1996. P. 213]. According to him, the Esen 2 collection does not contain real nuclei and they are fragments of flint without any system.

Almost half of the Esen 2 collection is made up of fuel and their fragments. These are mostly small-sized uchirindis with a natural flat strike area and dorsums that are flashed in an irregular manner. About 15 fibers of the set are plate-like in nature and on average they are 5-7 cm tall and 1.5-2 cm wide. Almost all of them are triangular in cross-section, in 50% of cases there are only 3 semi-primary plates [Vinogradov, 1981. Fig. 14, 2, 5]. None of the kit fuels have been retouched. Only a few stone fragments were retouched and 2-3 scrapers and 2 carved weapons were found. One of them is a retouched ankosh, and the other is a muzzle weapon formed using two ordinary ankosh [Bijanov, 1979. P. 71].

The most important group of objects for understanding the Esen 2 industry are bifas. They make up a little less than a third of the collection. There are about 20 bifas in the initial stage of development, and 42 bifas near the completion stage. Unfortunately, it is possible to think about bifaces in the completed stage only by their fragments: 16 of them are distal, 10 are proximal, and 6 are medial and lateral fragments [Vinogradov, 1981. Fig. 14, 14]. But there are also whole copies of them. These bifas are made from rock fragments. Judging by the few almost complete and whole bifas of the Esen 2 monument, and their rather large fragments, it can be said that the masters who made them were as thin as possible, but wide and large (they are not less than 10-12 cm in height). In some cases, these bifas are smoothed with retouches along the entire perimeter, but mostly they are formed with the help of fuels that completely or partially cover their surface.

Regarding the classification of Central Asian workshops, O.T. Ergashev's works in the study of Kokayaz 1-8 workshops are noteworthy. It was proved by him that Kokayoz workshops are specialized workshops of the Eneolithic period [Ergashev, 2013. P. 162].

Thus, the Esen 2 stonework workshop can be considered a workshop specializing in the production of bifas, rather than a "literal one" as the authors claim. After all, in Esen 2, the attention of the manufacturers is focused on the production of full bifas. Other items in the kit can be considered waste products from the manufacture of these weapons. Nuclei are rarely found in the collection. It can be said that the activity in Esen 2 was focused only on the production of bifas. Regarding the date of the monument, it can be said that, according to our modern technical-typological studies, some cleavers (stone axes) are found in the Esen 2 collection along with bifas (a new technical-typological study of Esen 2 stone objects is the subject of another article). This situation, as well as the technique of processing materials and the level of preservation, indicate that the Esen 2 complex belongs to the pure Acheulean culture of the Early Paleolithic, and not to Muste.

Based on A.P. Derevyanko's research [Derevyanko, 2017. p. 877], it can be said that Esen 2 communities belong to the second wave of migration from Africa (after the first migration of ancestors) or to the first wave of the Acheulean culture. The absence of Levallois technologies in the Esen 2 technocomplex confirms our opinion. It is known that after the representatives of this migratory wave entered Eurasia about 1.5 million years ago, they had two paths of development: There was a way of 1. Cultural development mixed with the communities of the local ancestral culture, or 2. Independent, that is, while preserving the Ashelian traditions. The materials from Esen 2 may be an example of an independently developed Acheulean culture of the second of the above-mentioned ways, that is, without spear weapons.

Thus, in our opinion, Esen 2 is a workshop specializing in the production of biface weapons, which, unlike Neolithic workshops of this type, can be classified as "limited" to the needs of the manufacturing community, and not for exchange.

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Rezyume: O'zbekiston hududi yer yuzining tosh davri toshga ishlov berish ustaxonalariga boy o'lkalaridan biridir. Maqola Ustyurt platosining Borsa-Kelmas botig'i sohilida joylashgan Esen-2 toshga ishlov berish ustaxonasining yangicha talqiniga bag'ishlangan. O'rta Osiyo ustaxonalarining yagona tasnifi XX asrning 70-yillarida M.R. Qosimov va L.Ya. Krijevskayalar tomonidan ishlab chiqilgan edi. Ushbu maqola O'rta Osiyoning tosh davri toshga ishlov berish

ustaxonalarini o'rganilish tarixi hamda Esen 2 ustaxonasining yangicha tasnifi va talqiniga bag'ishlangan.

Резюме: Территория Узбекистана является одним из богатых ойкумен земли камнеобрабатывающими мастерскими каменного века. Статья посвящается к новой интерпретации камнеобрабатывающей мастерской Esen 2, расположенной на берегу впадины Барса-Келмес Устюртского плато. Единственная, имеющаяся классификация разработана М.Р. Касымовым и Л.Я. Крижевской в 70-годы XX столетия. Данная статья посвящена к истории изучения кремнеобрабатывающих мастерских Средней Азии, а также новой культурно-хронологической классификации и интерпретации мастерской Esen 2.

Kalit so'zlar: Paleolit, toshga ishlov berish ustaxonasi, Esen-2, ixtisoslashgan ustaxona, bifas, kliverlar (tosh boltalar), migratsion to'lqin.

Ключевые слова: Палеолит, кремнеобрабатывающая мастерская, Esen-2, специализированная мастерская, бифас, кливеры (каменные топоры), миграционная волна.

DERIVED WORDS AND PHENOMENON OF ECONOMY

Rambergenova R.G.

Karakalpak State University named after Berdakh

Summary: *This article is devoted to the analysis of the phenomenon of economy in the process of word formation, especially in derivative words formed from word-forming morphemes. Until now, the phenomenon of economy, which manifests itself in derivative words of the Karakalpak language, has not been studied scientifically. In this article, we will try to explain the phenomenon of economy that occurs in the process of word formation in the Karakalpak language.*

Key words: *phenomenon of economy, affixation, homonymous affixes, productive and non-productive affixes.*

The phenomenon of saving psychological and physical strength is one of the factors that develop language. However, this phenomenon is not mentioned as the main factor, as it is closely related to the phenomenon and semantic features of language. In most cases, this phenomenon leads to the emergence of additional semantic coloring in words. Studies show that the rate of reduction of excess components in functional styles has different indicators. Through a small number of word-forming suffixes, we can create new meaningful words that form several concepts, and if we added a new suffix for each word, this would lead to our fullness of memory. Therefore, the formation of derived words can also be considered as one of the manifestations of the phenomenon of economy.

Word formation methods are divided into two large groups according to the structure and form of newly formed words.

1. Words formed by the combination of morphemes.

2. Words that have acquired a new meaning, that is, words that have transitioned into a single part of speech as a result of transposition (substantiation, adjectivation, pronominalization, adverbialization, lexicalization) without any change in morpheme composition (i.e., the morphemes already existing in the word are preserved in their places). It is also possible to include the transformation of some word combinations into compound words, that is, their lexicalization, in this type of word formation: because, for each root, it is not from word-forming morphemes with a new phonetic structure, but from such features of the formation of long-existing words that the following ways of word formation can be shown in the modern Karakalpak language: 1. The morphemic method; 2. Non-morphemic method.

1. For the formation of a word with a new meaning through the morpheme method, a root and auxiliary morpheme or root morpheme and morpheme are added to each other, joined, and arranged. According to this feature, the word-formation method is divided into several types: 1. Affixation (the connection of word-forming morphemes to a root morpheme); 2. Word addition (the sequence of root morphemes with each other, pairing, combining); 3. Word addition and affixation (the addition of two root morphemes and the addition of a word-forming morpheme to them); 4. Abbreviation (abbreviation of words).

By the method of affixation, words with a new meaning are formed by attaching a word-forming morpheme to a specific root morpheme or the base of a word. For example: xizmet-ker, ón-im, ásker-iy, kech-ki, pútin-ley, kúsh-ey, basqar, etc. This method is the most productive in word formation in the modern Karakalpak language, through which many nouns, adjectives, adverbs and verbs are formed from meaningful parts of speech. Each part of speech has its own word-formation morphemes. By using already existing word-forming morphemes in the formation of new meaningful words, we can save our energy.

The main linguistic sources are "Grammar of the Modern Karakalpak Language" published by the authors' collective. Word formation and morphology" [1;46], A. Bekbergenov's work [2;34], as well as A.K. Pirniyazova's works [3;25] and examples taken from the works of Karakalpak writers and poets.

Professor V.A. Bogorodsky, one of the members of the Kazan Linguistic School, states that "language changes in its sounds, form, syntax, and vocabulary" [4;49]. This can be clearly felt by comparing the language of written monuments with the current language. But the speaker himself does not notice these changes. However, such an opinion cannot be expressed about the vocabulary or lexicon of the language, because without changing generations, many new words can be formed and depreciated in one generation.

There is still no consensus on the definition of word formation methods in the Karakalpak language. N.A. Baskakov identifies three main methods in the Karakalpak language: lexical, morphological, and syntactic [5;152]. A. Kidirbaev recognizes only two methods in the Karakalpak language: morphological and syntactic [6; 17].

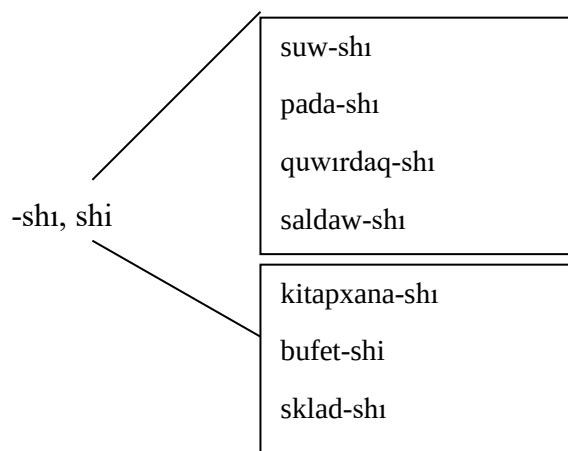
V.A. Bogorodsky, before many scientists, noticed that the affixation method of word formation has a manifestation of economy. According to the scientist, the use of word-forming morphemes in the creation of new words can see a wonderful effect of saving our energy. By using a small number of word-forming affixes, it is possible to create several new meaningful words. If we were to use a special additive for each object, to make the name of the concept, it would cause our brain to overflow" [7;50]. Therefore, according to V.A. Bogoroditski, by using already existing word-forming morphemes in the formation of new meaningful words, we can save our energy.

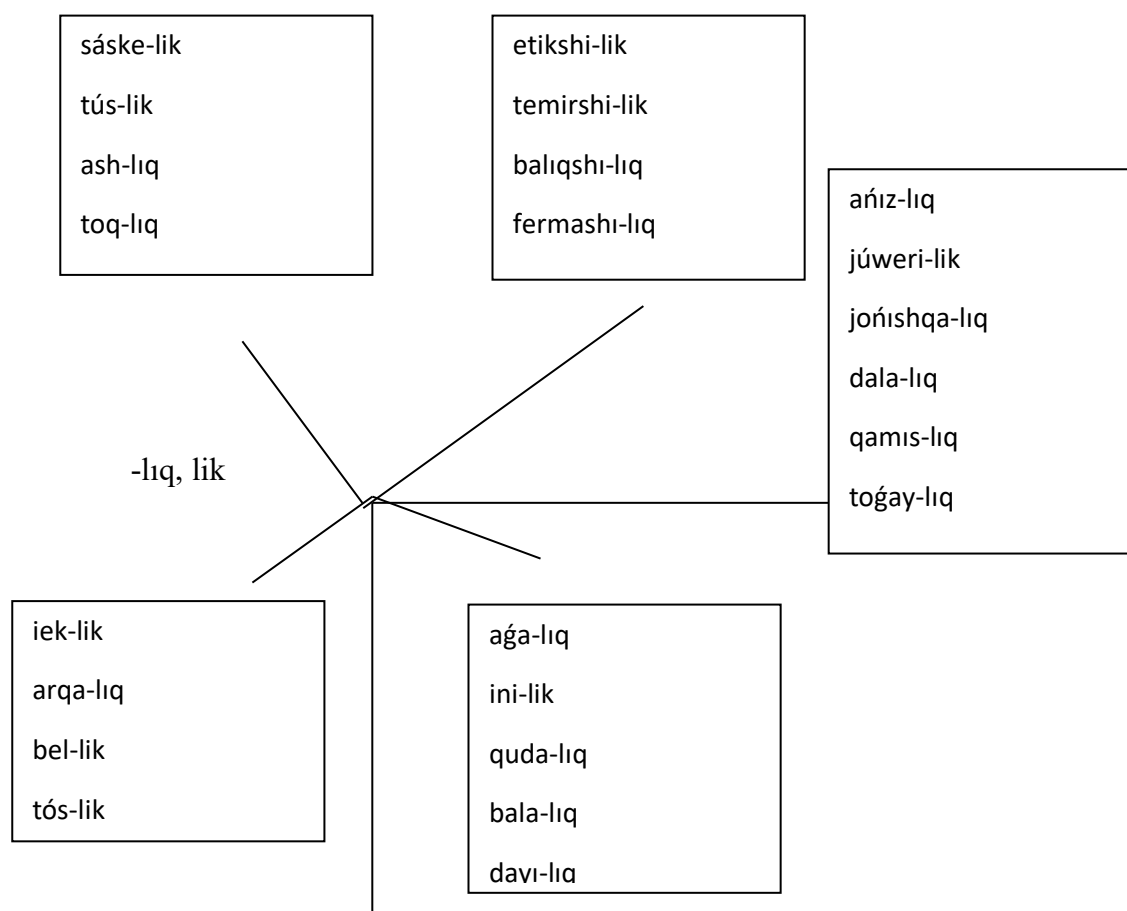
However, if the word-forming morphemes are in a homonymous relationship to each other, we cannot speak about the phenomenon of economy in this case. Sometimes morphemes with the same sound elements, like individual words, are different in meaning and function. They are called morphemic homonyms or homomorphemes.

The homonyms formed as a result of semantic development differ lexically and grammatically, homonyms of the same form belong to different word groups. The formation of homonyms in this way depends on the semantic development of words, the polysemy of words, and the substantivization of words [8;24].

By the method of affixation, words with a new meaning are formed by attaching a word-forming morpheme to a specific root morpheme or the base of a word. This method is the most productive method of word formation in the modern Karakalpak language, through which many nouns, adjectives, adverbs and verbs are formed from meaningful word branches. Each part of speech has its own word-formation morphemes.

Through a small number of word-forming suffixes, we can create new meaningful words that form several concepts, and if we added a new suffix for each word, this would lead to our fullness of memory. For example:





In particular, the affixes -shi, shı, -lik, -lik, -ma, -me; the affixes -li, li, -siz, siz; the affixes -la, -le and the affixes -ma, me can be said as above. But if the word-forming morphemes are in a homonymous relationship to each other, we cannot say about the phenomenon of economy in this case. Sometimes morphemes with the same sound elements, like individual words, are different in meaning and function. They are called morphemic homonyms or homomorphemes. The phenomenon of homonymy in affixes, similar to lexical homonymy, is mainly formed in two ways. 1. As a result of the fact that linguistic units in the history of language development were suddenly in the same form; 2. As a result of the semantic development of affixes.

1. 1. In the Karakalpak language, as a result of the formal coincidence of auxiliary morphemes, homonymy is formed in auxiliary morphemes. In this syllable, the participle in the Karakalpak language forms a homonymous line with the affix -sha, -she.

a) -sha/-she affix, forming a diminutive meaning of the noun: kitap-sha, bel-she.

b) -sha/-she adverbial affix: qisqa-sha, erkeklar-she.

2. There is a phenomenon of homonymy between the affixes of the Karakalpak language and affixes from other languages.

a) -a-word-forming affix of the noun: jir-a.

b) -a - appears as a gender indicator in the composition of female nouns borrowed from the Arabic language: Karim-a. Such affixes are historically not close to each other.

3. Affixes borrowed from other languages are mutually homonyms:

a) adverbial word-forming affix: action

b) adjective forming the form -dar: hosil-dar

Although this affix originally entered the Karakalpak language from Iranian languages in the form of a word, over time it joined the native words of the Karakalpak language and became a word-forming word.

II. The formation of homonymous affixes as a result of semantic development. Omoaffixes are formed as a result of the semantic development of additional morphemes. In many cases, homomorphemes are formed when morphemes give many meanings, and then their meanings are separated from each other. -ma, -me, -ba, -be, -pa, -pe affixes were formed in this way.

a) -ma, -me - noun forming affix: shigar-ma

b) -ma, -me - figurative affix: oy-ma

Therefore, homonymous affixes are formed in the ways indicated above. Homonymous affixes cannot serve as an example of the phenomenon of economy. This is because, as we have mentioned above, there are not many words that enter the part of one word through one affix. On the contrary, each affix leads to the formation or change of the form of other words.

In conclusion, we have witnessed that the formation of creative words through word-forming productive affixes can be one of the manifestations of the phenomenon of economy. In particular, the formation of words with the affixes -shi, -sh, -lik, -lik, the affix -li, -li, the affix -sha, -she, the affix -la, -le is a clear manifestation of this phenomenon.

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Rezyume: Mazkur maqola so‘z yasalish jaraenida, ayniqsa, so‘z yasovchi qo‘shimchalar erdamida hosil qilingan yasama so‘zlarda uchraydigan tejamkorlik hodisasini tahlil qilishga bag'ishlangan. Shu kunga qadar qoraqalpoq tilida yasama so‘zlarda ko‘rinish beruvchi tejamkorlik hodisasi ilmiy tarafdin tadqiq qilinmagan. Ushbu maqola orqali biz qoraqalpoq tilining so‘z yasalishi bosqishida yuzaga keluvchi tejamkorlik hodisasiga izoh berishga harakat qilamiz.

Резюме: Данная статья посвящена анализу феномена экономии в процессе словообразования, особенно в производных словах, образованных от словообразующих морфем. До сих пор с научной стороны не изучен феномен экономии, проявляющийся в производных словах Каракалпакского языка. В данной статье мы попытаемся объяснить феномен экономии, возникающий в процессе словообразования Каракалпакского языка.

Kalit so‘zlar: tejamkorlik hodisasi, affiksatsiya, omonim affikslar, unumli va kamunum qo‘shimchalar.

Ключевые слова: феномен экономии, аффиксация, омонимичные аффиксы, продуктивные и не продуктивные аффиксы.

VALIDITY OF GUARANTEES OF PRIVATE PROPERTY RIGHTS

Ismaylov O.K.

Karakalpak State University named after Berdakh

Summary: The article discusses the concept and content of the private property rights of citizens, as well as issues of protecting and improving the rights and legitimate interests of owners

Key words: private property, property rights, violation of private property rights, protection of private property

Legal reforms related to the protection of the rights and legal interests of private owners and its improvement are being gradually improved.

Entrepreneurial activity manifests itself in various legal rules related to the registration and the verification and control of the activities of business entities, their various tax, customs, administrative processes and in the absence of its object and subject in relation to the implementation of specific legal procedures. For this reason, in some cases, it is necessary to point out that in some cases there are obstacles in the protection of the rights and legal interests of business entities in the legislation[1].

In order to protect the legal and legitimate interests of private owners, we need to clarify the nature of its system.

The legal protection system consists of a set of institutional, procedural norms that ensure the enforcement of legal measures which are applied in order to guarantee the normal implementation of the rights and legitimate interests of the subjects of law, to protect these rights and interests from any violations and encroachments. Consequently, it can be said that the protection of the rights and legal interests of the subjects of business activity is reflected in both substantive and procedural legal rules.

The diversity of material law rules related to the legal protection of the subjects of entrepreneurial activity means that the protection of their rights is regulated not only by the norms of civil legislation, but also in some cases the rules of administrative and criminal and labor legislation are applied[2].

Today, if we study the legal practice and theory related to the protection of the rights and legal interests of the subjects of business activity, we can face with cases when the rules of law are misapplied, one of legal documents repeats the other, or one contradicts the other. It is not possible to perfect the existing legislation in this area. However, one should not ignore the other side of the issue which are seen in the cases when the state body with the authority to check and control the activities of the entrepreneur interfere with the free activity of the entrepreneur in one form or another, bypassing the law. In a general sense, it is necessary to pay special attention to inculcate the principle of monitoring in the legal norms related to the inspection and control of the activities of business entities.

One of the new provisions for civil legislation added in the Law "On Protection of Private Property and Guarantees of Owner's Rights" is the provision of non-revision and non-repeal of privatization results, specified in Article 24. This provision is a guarantee for the owners of the property acquired as a result of privatization, which ensures that abuses by state authorities will not be allowed.

It is worth noting that along with the positive aspects of the new Law, it is possible to express opinions on its further improvement. In particular, it would be expedient to include in this law, first of all, articles on the subjects and objects of private property rights, and to designate citizens and non-governmental organizations as private owners, and to specify that private property objects are any property not prohibited by law. In addition, the basis of the formation of private property should be listed in the Law. After all, since the law specifies the protection of private property and the guarantees of the rights of owners, it is also necessary to determine the basis on which the objects to be protected are created. The inclusion of such a provision in the law shows that, first of all, in the

conditions of market relations, wide opportunities and privileges have been given to acquire the right to private property, and in the conditions of the principles of the democratic market, it indicates that it has been created convenient atmosphere for the representatives of the private sector.

In addition, it was necessary to establish the method of "restoring the state before the violation of private property rights and preventing actions that violate or threaten to violate private property rights" in the following version of the law: in case of violations of private property rights, the owner shall be able to demand from the court or from those responsible to restore the state which was actual before the violation of his right to private property.

The owner has the right to demand the cessation and prohibition of such activities when there is a risk of violation of the right to private property or there is a risk of its violation in the future.

The next way to protect the private property right is to change the rule "declare the deal invalid and apply the consequences of its invalidity" into "in cases where the private property right is violated by entering into the transaction, in accordance with the law the owner has the right to declare the transaction invalid in court and demand to apply the consequences of its invalidity".

The method of forcing to perform the responsibility in kind should be defined as a separate article in the law and expressed as follows: in cases where there are different methods of satisfying the owner's demands, in order to ensure his rights and legal interests, performing the responsibility in kind should be used. An exception to this condition is allowed only in cases stated in laws and with the permission of the owner.

Compensation for damage is one of the important methods of protecting private property rights [3], and it is important to specify in the law what this method means and what the owner of private property can demand. Generally, it is necessary to determine the method of compensation of damages in the law in the following form: the owner has the right to demand expenses incurred by the owner to restore his violated right, loss or damage to his property (actual damage), as well as what he could have received under the conditions of normal civil treatment if his rights had not been violated (lost profit).

When the right to private property is violated, it causes material damage as well as moral damage for the owner. In this case, what is understood as moral damage and what factors are used to determine the essence of moral damage should be provided by the law. In this regard, it is appropriate to include in the law the rule "if the owner has suffered physical and mental suffering as a result of the violation of his rights, he has the right to demand compensation for moral damage in accordance with the law."

Ensuring the stability of legislation in the regulation of private property rights is a new method of protecting private property rights, which is being included in our national legislation for the first time [4]. This method of protection serves to limit the violation of private property rights by the bylaws issued by governmental bodies, resulting in ensuring the stability of laws in the field of private ownership. In our opinion, this method of protection should be defined in the law as follows:

Relations of private property rights must be regulated by law.

By-laws are adopted to implement or enforce laws and must not be contrary to the law.

In their activities, state authorities and management bodies must ensure the stability and rigor of the legislation regulating relations in the field of private property.

State registration of the creation, change and cancellation of private property rights to certain types of property also has its own place in the protection of property rights. After all, the person whose private property right is registered as the owner is considered the owner until he is removed from this register based on the decision of the court. Therefore, it is necessary to include this method of protection in the Law.

In conclusion, it should be noted that the protection of private property and the protection of the rights of owners by a separate and special law ensure the democratization of the foundations of the market economy and the rights and interests of entrepreneurs, and create conditions for the operation of a reliable protection system and legislative mechanism.

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Rezyume: *Ushbu maqolada fuqarolar xususiy mulk huquqining tushunchasi va mazmuni va xususiy mulkdorlar huquqi va qonuniy manfaatlarini himoya qilish va uni takomillashtirish masalalari atroflicha tadqiq qilingan.*

Резюме: *В статье рассмотрены вопросы понятие и содержание права частной собственности граждан, а также вопросы защиты и совершенствования прав и законных интересов собственников.*

Kalit soʻzlar: *xususiy mulk, mulk huquqi, xususiy mulk huquqi buzilishi, xususiy mulkni himoya qilish*

Ключевые слова: *частная собственность, права собственности, нарушение прав частной собственности, защита частной собственности*

BORROWED WORDS INTO KOREAN AND THEIR NOTATION

Jumaniyazova F.I.

Karakalpak State University named after Berdakh

Summary: *Borrowing words from other languages enriches the vocabulary of a language, introducing new stems, phrases, and terms, it facilitates communication and understanding between different language communities, especially in the context of globalization and the spread of English as a global lingua franca. In this article we focus on the word borrowing process into Korean and its notation.*

Key words: *word borrowing, introducing stems, phrases, terms, Korean, notation*

Loan words refer to vocabulary that comes from another language and is assimilated into Korean. Loan words are further classified into borrowed words and naturalized words. Korean include loan words as following; 버스 ‘bus’, 컴퓨터 ‘computer’, 피아노 ‘piano’, and 커피 ‘coffee’. Proper nouns such as person names and place names of foreign language are also considered as foreign words. Chinese characters, which are foreign words, are also included as loan words, but Chinese characters are treated as special and are not classified as foreign words in the classification. If Chinese character words are included as loanwords, it can be said that Korean loanwords are divided into Chinese character words and non-Chinese character loanwords. A foreign word is ‘a word from a foreign language’ or ‘a word from another language’, and a loan word is ‘a word that is currently a national word or a native word, but whose etymology is a foreign language’. The phonetic value of words borrowed from the native language changes to fit the phonological system of the native language, and sometimes the meaning becomes distant from the meaning of the original language. Loan words in a native language have value only as words in the native language, and it is natural for a loan word in a native language to not work in a foreign language or to be mistranslated. Then, as awareness of the origins of a borrowed word fades, it may become a naturalized word. A representative example is brushing teeth. Not considering this change in meaning may be related to the need for cognitive closure. Depending on the degree of assimilation, foreign languages are further divided into ‘naturalized words’, ‘borrowed words’, and ‘foreign words’. Each is explained as follows;

Naturalized words; When the word is completely assimilated into the Korean language, you don't even feel like that the word is from a foreign language, and you can use it freely, but there are no suitable words to replace it. Representative examples include ‘가방’ (Japanese-Dutch origin), ‘고무’ (Japanese-French or Dutch origin), and ‘뽕’ (Portuguese origin). There are no words to replace them, and just as compound words are freely created within the Korean language, they do not feel like foreign words but rather feel like native words. Among Chinese characters, there are quite a few naturalized words that have undergone changes in pronunciation and have come to look like native words because they do not correspond to the Chinese characters from which they originate. Representative examples include ‘배추 (백채)’, ‘상추 (상채)’, ‘고추(고초)’, ‘창자 (장자)’, ‘가난 (간난)’, and ‘잠깐 (잠간)’. The National Institute of the Korean Language also considers ‘잉어’, ‘붕어’, and ‘상어’ to be among these. ‘고등어’ is a slightly unusual case. It was originally an expression that was transliterated from pure Korean to be written in Chinese characters, but this became a spoken word, and even went through a double change, moving away from the original Chinese character due to changes in Chinese characters.

A **borrowed word** (calque, loan translation) is a word that feels like it came from a foreign language, but there is no suitable word to replace it. Representative examples include 커피 (coffee), 컴퓨터 (computer), and 햄버거 (hamburger).

A **foreign word** is usually introduced along with its original sound (original pronunciation), but due to the limitations of the language ability, the foreign word is not necessarily introduced in accordance with the original pronunciation and becomes a foreign word. In fact, it is introduced without being based on original pronunciation and becomes a foreign word. There are many examples for foreign words in Korean, such as 'democracy' → 'democracy', 'AC/DC' → '민주주의' (AC/DC Band) is also a way to accept foreign words as loanwords.

History of borrowing foreign words into Korean. The majority of Korean foreign words are words derived from English due to the fact that they have been greatly influenced by American culture and before that, when English was used as an international language. Foreign words originating from Japanese once accounted for the majority due to the influence of the Japanese colonial period, but through public rejection and a steady purification movement, today they account for a smaller percentage than English.

Rules for writing borrowed words in Korean. The Korean language has a foreign language notation system and a Romanization system, which are linguistic regulations for writing foreign words and loan words in a consistent way. The foreign words notation system is used to describe foreign words that are not loan words (used literally) when a foreign word enters the usage and its widespread use has expanded significantly, and from this point on, the foreign word notation system is followed, but the original sound system is basically adopted. So, if you know the foreign original sound of the Japanese language, that is, the sound is written in Korean according to the Romanization system, and when it is translated into Korean, the foreign language notation according to the original sound is followed.

Below is an example of changes according to Romanization.

- 와인 - wine [waɪn]
- 프라이팬 - frypan ['fraɪpæn]
- 컴퓨터 - computer [kəm'pjʊ:tə(ɹ)]
- 엘리베이터 - elevator ['eləveɪtə(ɹ)]

Borrowing Japanese words basically follows the Romanization system and is close to the original sound, but in certain classes, it does not follow the Romanization system, but considers it a foreign word and follows the loanword notation system. From the mid-1990s (please check the exact time), the Romanization system was not followed, and the long sound 'おう' was written as 'おう' as spelled, rather than maintaining the 'o' vowel until the end, as in actual Japanese pronunciation, rather than the original sound (phoneticism). We often see foreign word spellings that are guided by original spelling (morphism). Sometimes, regardless of whether it is a native language or a Chinese character, borrowing is done according to the Korean Chinese character sound. For example, 할인 and 일기토 are such examples.

In the case of borrowing Chinese words, there is a debate as to whether to use the Korean Chinese character pronunciation, which has been a foreign language for a very long time, or to use the original Chinese pronunciation as the standard. Before the current loanword notation, that is, according to the custom of considering a foreign language, the Romanization system was followed, so most Chinese borrowings were based on Korean Chinese character sounds, but after the loanword notation, before the Xinhai Revolution, they were based on Korean Chinese character sounds, and after the Xinhai Revolution, based on the original Chinese sounds. Writing it down has become a rule. However, there are quite a few people who are opposed to this and always follow the Korean Chinese character pronunciation using the Romanization system, which was the method used before the introduction of the foreign language notation system. Also refer to the controversy over Chinese Hangul notation.

There are many reasons in Korean (e.g., cases where the pronunciation is roughly guessed without knowing the original sound and the borrowing becomes solidified (so it does not feel special),

cases where the spelling leads to it, cases where sounds from other languages are borrowed rather than the local original sound, etc. There are quite a few transcriptions that do not follow the original sound due to interpretations from an agglutinative perspective, etc. 할로윈 - Halloween [hælʌwɪn], 영: [hæləʊ i:n]

Even when borrowing a language that is well known to English, it does not seem that English always prefers original phoneticism. The standard notation according to original soundism is 'Halloween', but the English language tends to prefer 'Halloween'. A significant number of loanwords tend to depend more on the social nature of the language than on the original sound. Simply put, if it has become a 'word already used in society', it is not easy to change it even if you later find out that it is different from the actual pronunciation. Also, even if it is used that way, awareness of its etymology fades and it becomes naturalized.

Among these loan words, some are recognized as official spellings by the National Institute of the Korean Language and some are not, and criticism is sometimes raised that the rules and spelling rules for foreign words reviewed by the National Institute of the Korean Language do not reflect the linguistic reality in the spoken language.

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Rezyume: Boshqa tillardan so‘zlarni o‘zlashtirib olish tilning lug‘at boyligini boyitadi, yangi o‘zaklar, iboralar va atamalar o‘zlashtiriladi, bu turli til jamoalari o‘rtasida muloqot va tushunishni osonlashtiradi, ayniqsa globallashtiruv va ingliz tilining global lingua franca sifatida tarqalishi sharoitida. Ushbu maqolada biz koreys tiliga so‘zlarni olish jarayoni va uning yozuviga e‘tibor qaratamiz.

Резюме: *Заимствование слов из других языков обогащает словарный запас языка, вводя новые основы, словосочетания и термины, облегчает общение и взаимопонимание между различными языковыми сообществами, особенно в условиях глобализации и распространения английского языка как глобального лингва-франка. В этой статье мы сосредоточимся на процессе заимствования слов в корейский язык и его обозначениях.*

Kalit so'zlar: *so'z olish, kirish o'zamlari, iboralar, atamlar, koreyscha, notation*

Ключевые слова: *заимствование слов, введение основ, словосочетаний, терминов, корейский язык, обозначения*

HISTORY OF THE CITY OF KYAT IN HISTORICAL SOURCES.

Xakimniyazov J.X.

Karakalpak State University named after Berdakh

Summary: *The article provides information about the ancient city of Qat from the works of medieval tourists, scholars and geographers. For example, Abu Rayhan Beruni, Al Maqdisi, Al Istakhri, Ibn Hawqal, Ibn Fadlan, Timurids and the city of Qat in recent times cited sources. The importance of the place of the city of Qat in the trade and cultural relations of the Islamic world in the Middle Ages has been proved.*

Key words: *Afrigids, Qat, Fir, Khorezmshahs, Mamuniys, Timur's state, Khorezm waters, Tuprokkala, Sheikh Abbas Uali.*

Khorezm dates back to the 3rd century AD and was founded on the Afrigit dynasty. The new Shah of Khorezm in III moved the capital of the country to Kiyat and restored his residence. Abu Rayhan Beruni, who was born in the city of Kiyat, moved the capital to the city of Kiyat in the six hundred and sixteenth year of Iskander's history (305 AD) and built a fortress on the top of Al-Fir. After Khorezm begins the history of the kingdom of Afrig and his descendants [1, 71]. If the name of the capital of the country - Tovari - is called "Madinat al-Fir", al-Istakhri, Ibn Haukal and Makdisiy - "Kyat" or "Kas", Abu Rayhan Beruni calls it "Fil" or "Fir". For example ibn Hawkal "Its (Khorezm's) capital was Dorjash, after its destruction people will build another city, they will call it Kas. [2. 154., 7. 150]. Today it is known all over the world as the city of Kiyat.

The capital of the country Tuprokkala was the dynastic residence of the kings of Khorezm in B.C.-c., and in the IV century the capital was moved to Kyat (Kas, Kyat) - to the city of Pil (Phil, Fir), according to our scientists [9, 287-288]. Academician Ya. D. Gulomov believes that the new ruler of Khorezm in the III century dug the channel Kat, and then built a new city there and moved his residence there [2, 117].

Archaeologist and scientist Khodjaniyazov believes that it is necessary to look for traces of the capital of Afrigiler in the vicinity of Tuprokkal and Kyat kala, this conclusion was reached as a result of research conducted in the vicinity of Akshakhan kala in recent years. For example, the area of Akshahan fortress is (56 hectares) and is a powerful military fortress dating back to the 4th century BC. In the heart of the city of Tuprokkala, which was the palace and dynastic centre of the kings of Khorezm, is the site of Pil Kat (Kas), the capital of the country in the early 4th century AD, and their special area is Akshahan surrounded by a long fortress wall. The fact that the city has a developed infrastructure gives reason to believe that it was the capital of Khorezm.

Such names of cities as "Kat", "Kas", "Kiyat", known in the scientific community, translated from the ancient Khorezmian language mean "desert field". The word "Vara" in the "Avesta" is similar to the words "Pil" or "Fir" and means ancient castles, walls, fortifications, city buildings (constructions) [4, 25-27]. As Abu Rayhan Beruni writes, "The city of Al-Fir Khorezm is a wall made of mud clay and stone bricks, consisting of three-tiered fortress walls, located one inside the other, differing in size and height" [1, p. 71]. [1, c. 71].

The fact is that there are few written reports about our history dating back to the 5th-8th centuries A.D. After the occupation by the Arabs, the previous material-cultural and written sources and religious teachings of our people will be destroyed and banned. Abu Rayhan Beruni writes that Arabs led by Qutaybah ibn Muslim, who invaded Khorezm, burned written sources and expelled scholars from their native land [1, 71].

After Kutaybani's conquests the territory of Khorezm was divided into Northern and Southern parts. The northern part is governed by emir Gurgancha, appointed by Kutayba, and the southern part, the centre of which is the city of Qat, is governed by Khorezm Shahs, from the Afrigiler dynasty. In 995, at the beginning of autumn, the commander of Gurganj Mamun ibn Muhammad (995-997) with his numerous troops occupied the capital of southern Khorezm, Kat, and proclaimed himself

"Khorezmshah". The capital of the country was moved from the city of Qat to Gurganch (now Old Urgench) [10, 47].

Abu Rayhan Beruni says that "Jaihun destroyed it (the city of Qat) every year, and finally, in the one thousand three hundred and fifth year of Iskandar's history (997), he completely destroyed it and nothing was left". [1, 71]. According to sources of that time, a large bazaar was built in the city of Qiyat, a Juma mosque was built in the central part, and next to it Shah Mamun built a palace. The mosque had wooden columns set on human-sized stone bases. After the rest were flooded by the Amu Darya, the wooden columns were taken to the city of Khiva [12.].

In his work "History of the Seljuks" Mirkhond mentions the Seljuk sultan Alp Arslan (1063-1072) and his campaigns. He reached Kyat and restored all the buildings that had been destroyed and also rebuilt the Juma Mosque [6. 40].

Qat, the capital of Khorezmshahs, became a major city during the Mamunid, Ghaznavid and Seljuk periods. Especially during the reign of Khorezmshahs (1097-1231), its territory expanded and the city became prosperous. The city of Qat has mosques, madrasas, hammams, and caravanserais. Al Makdisi, an Arab geographer and traveller, wrote that "the city (Kyat) is very beautiful, and there are many mature scholars and literary scholars in it" [7, 178, 185-185]. [7, 178, 185-188]. The bazaar of the city was always filled with gold goods of merchants from India, China, Iran, Rum, Damascus, Baghdad and Bulgars.

In a work of fiction called "Khudud-ul Olam" ("Borders and Territories of the World"), written by an unknown author at the end of the 10th century, the capital of Khorezm, Kyat is the gateway to Turk. This city is one of the trading centres of Turk, Turkistan, Maverannahr and Hazara. Its ruler is called Khorezmshah. It is mentioned that its inhabitants are fighters for the faith [15, 44]. Apples from Ghazna, grapes from Samarkand, pomegranates from Kuvan, Chinese silk and fabrics for which Bukhara is famous were brought to the bazaar of Kyat. Melons were taken from Kyat because there were no such tasty melons in other regions. In historical sources, melons covered with snow and ice were transported abroad in special lead containers. Other melons were wrapped in special shiny paper and taken to Baghdad and the palaces of Arab caliphs [10, 47]. Ibn Batuta Qat, who came to Khorezm in 1333, mentions melons. He writes that when he came to India, he was surprised to see melons from Qat.

In early 1221, the Mongol invasion finally turned the city of Kyat into more ruins. Many surrounding towns would be destroyed and the living conditions of people in many villages would be disrupted. Ibn Batuta mentions that many flourishing, culturally rich towns near the outskirts of Kyat and Kyat itself were destroyed before the arrival of the Mongols [14, 132-133].

During the Mongol period, the Khorezm state was further divided into two parts: Northern Khorezm with the centre in Urgench (Kona-Urgench), Tillya Horde and Southern Khorezm with the centre in Kyat, ruled by the ulus Chagatai. On the Chinese map made in 1329-1331 and published by Palladius, borders of uluses Zhoshi and Chagatai pass between cities "Ke-ti" (Kyat) and "Hulatszi-mu" (Khorezm-Urgench). [2. 172]. After the death of Berdibek Khan in 1359, the Kungirat Sufis, taking advantage of the internecine discord that began in the Golden Horde, restored the independent rule of their new dynasty in northern Khorezm. Later they, having conquered the cities of Kyat and Khiva, united the lands of Northern and Southern Khorezm.

Amir Timur, who had created a country free from the Mongols, sent messengers to ask the earlier ruler of Khorezm, Hussein, to return the cities of Kyat and Khiva, which belonged to Chagatai's ulus, in order to unite the whole of Maverannahr. After fruitless negotiations, military action was undertaken and both cities were annexed to Maverannahr. During this period, the city of Kyat was a fortress with powerful fortress walls. In the second half of the 14th century, Sharafatdin Ali Yazdiy and Nizomiddin Shomiy wrote about the great importance of the city of Kyat as a strategic and strong fortress in their books "Zafarnama" [3, 73-74; 11, 92-93]. The architectural monuments in the cities of Kyat and Khiva, namely: the mausoleum of Sayyid Alauaddin in Khiva, the mausoleum of Sheikh Abbas Wali in the city of Kyat, are striking in their decoration and architecture. This shows how high the domestic and cultural life was in Khorezm during the Timurid period.

After Timurid rule, the city of Kyat continued to be a cultural and trade centre. The ruler of Khorezm and historian Abulgazi Bahadurkhan (1644-1665) fought for the throne of Khorezm together with Asfandiarkhan on the side of the Khan of Khorezm Arabmuhammed, and after defeat from other sons of the Khan of Khorezm Habash Sultan and Elbars Sultan (with the help of Naimans and Uigur tribes) found refuge first in the city of Kyat, and then in the palace of the Bukhara Khan Imamkulikhan [2, 117].

According to the Khiva historian Munis, during the reign of Anushakhan (1663-1687) due to the construction of the Zharmysh canal on the right bank of the Amu Darya, the city of Kyat was left without water. Therefore, in order to satisfy the water needs of the city's inhabitants, he ordered to dig the Zharmysh canal on the left bank of the Amu Darya River, where he built a new city of Kyat, where most of the inhabitants of the old city of Kyat moved. Anushakhan gathered on these banks the population living in the old cities of Southern Khorezm and tried to strengthen his state [2, 117]. The residents of the old town of Kyat then settled around the mausoleum of Sheikh Abbas Wali, and by the 20th century a large population had appeared in the area.

In 1873, the town of Petro-Alexandrovsk was founded as a military garrison near the present town of Turtkul. The area of the present Beruni district is called Shabbaz (Sheikh Abbas Wali) and Biybazar district. In 1873, A.L. Kuhn visited the old town of Kyat during his visit to the Khanate of Khiva, and wrote that Sheikh Abbas Wali, a small fortress located on one fourth of the old town [5, 51]. There is also information about the existence of a minaret and mausoleum of Sheikh Abbas Wali in the fort. In addition, this information was recorded by M.I. Ivanin, L.N. Sobolev, N. Karazin, participants of the Amu Darya expedition [13, 68].

In the middle of the 20th century, A. I. Terenozhkina mentions that the preserved walls of old Kyat date back to the beginning of the 18th-20th centuries. G.P. Snesev collects folklore materials about the old town of Kyat and Abu Rayhan Beruni [6, 51-52].

In 1963, specialists of the Institute of History, Language and Literature of ANUz Branch KK conducted scientific research. The city is built of mud flats, the total area is 44 hectares, the western border is 621 m, the southern border is 712 m, the length of the northern and eastern borders is 660 metres. The walls were fortified with semi-oval towers every 33 metres. The castle had gates on four sides. Caves 50-60 metres wide were excavated from the mine. Thanks to archeological researches on the found clay vessels two periods of existence of a fortress concerning IX-X and XII-XIV centuries are allocated [6, 52-54]. The few finds of ceramics from the XV-XVII centuries indicate that during these periods the population began to decline due to environmental reasons.

Finally, the capital of the Afrigis era, the city of Kyat (Kiyat, Kas) was considered the largest city of its era from the 3rd-4th centuries to the end of the 11th century. (Makdisius mentions that the city of Kyat is similar in size to Nishapur). The well-known orientalist scholar O. G. Bolshakov analysed written sources and says that the total area of the city (both Medina and Rabat) was not less than 500 hectares) it was considered a developed capital city. According to records, the city of Kyat was flooded by the Amu Darya River more than once. According to Beruni, in 997 the city was washed away by the water of the Amu Darya. Soon a new town appeared around the city of Kyat. For example, in the time of Amir Timur, the city was a fortress surrounded by powerful walls and ditches 50-60 metres wide. As a result of low water on the right bank at the end of the XVII century, the inhabitants of the city moved to the new Kyat on the left bank (on the left bank of the river) [13, 68-69]. The settlement of Sheikh Abbas Wali appeared on the place of the old town.

The above-mentioned reports prove that Kyat, Al-Fir-Fil played an important role in the economic, political and cultural life of the Great Silk Road in the early and developed Middle Ages, and this country was one of the centres of transit trade. It is known from sources that Asireze contributed greatly to the widespread development of international and domestic trade. The city of Kyat played a political role as the capital of the Khorezm state. It is shown that Khorezm played an important role in the development of medieval urban culture and urbanisation processes.

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Rezyume: Maqolada qadimiy Qat shahri haqida o'rta asr sayyohlari, olimlari va geograflarining asarlaridan ma'lumotlar berilgan. Jumladan, Abu Rayhon Beruniy, Al Maqdisiy, Al Istaxriy, Ibn Havqal, Ibn Fadlon, Temuriylar va Qat shahri keyingi paytlarda manbalar keltirgan. Qat shahrining o'rta asrlarda islom olamining savdo va madaniy aloqalarida tutgan o'rni qanchalik muhimligi isbotlangan.

Резюме: В статье представлены сведения о древнем городе Кат из трудов средневековых туристов, ученых и географов. Например, Абу Райхан Беруни, Аль Макдиси, Аль Истахри, Ибн Хаукаль, Ибн Фадлан, Тимуриды и город Кат в последнее время цитировали источники. Доказана важность места города Кат в торговых и культурных связях исламского мира в средние века.

Kalit so'zlar: Afrigidlar, Qat, archa, Xorazmshohlar, Ma'muniylar, Temur davlati, Xorazm suvlari, Tuproqqal'a, Shayx Abbos Uali.

Ключевые слова: Афригиди, Кат, Фир, хорезмшахи, мамунии, государство Тимура, воды Хорезма, Тупроккала, шейх Аббас Уали.

**APPLICATION OF COMPULSORY MEASURES OF MEDICAL NATURE, APPOINTED
ALONG WITH PUNISHMENT**

Fayzullaeva T.X.

Karakalpak State University named after Berdakh

Summary: *This work discusses the issues of the use of coercive medical measures alongside with the punishment of people who have committed crimes, suffering from alcoholism, drug addiction or drug addiction.*

Key words: *Punishment, coercive measures of medical nature, alcoholism, drug addiction, substance abuse .*

In the event of a crime committed by persons with a mental disorder in a way that does not exclude alcoholism, drug addiction or intoxication, or sanity, if there is a medical conclusion, the court may prescribe medical coercion measures against them, along with the appointment of a penalty[1].

Medical coercion measures against convicted persons are used for the purpose of their treatment. The basis for the enforcement of compulsion measures by medical means is the judgment or judgment of the court, which has entered into legal force.

When individuals with a Narcological disease (chronic alcoholism, drug addiction and poisoning)[2] commit crimes, the coercive measures applied to them are aimed at losing the opportunity and desire to consume alcohol and various substances that affect the psyche of a person. This measure of influence is considered to be a measure to combat Narcological disease

It is found that if an individual is addicted to alcoholic beverages, has lost a sense of norm, that is, has lost control over the amount of alcohol consumption, mental and somatic disorders appear in it, as well as signs of violation of social, moral norms are felt in it, the person is sick with alcoholism[3].

Addiction is an individual's physical-mental dependence on the drug[4].

Toxicomania is an individual's silent-mental dependence on synthetic or unnatural drugs, equivalent to drugs according to psychotropic substances and psychoactive effects on the psyche[5, P.18]. It should be noted that mandatory medical treatment is used only for those who have a persistent recurrent Narcological disease (chronic alcoholism, drug addiction and poisoning).

Convicted persons with the use of compulsion measures in a medical way are registered in the admission Department of penal institutions by a doctor-narcologist or a doctor-psychiatrist and undergo a medical examination within 3 days. Based on the conclusion of the medical examination, a stationary or outpatient follow-up is assigned.

In the event that during the period of inpatient or outpatient observation, a person has a disease that prevents him from applying coercive measures medically towards him, the application of coercive measures medically in accordance with the conclusion given by the Medical Commission is subject to a temporary suspension.

The use of medically coercive measures, accompanied by criminal punishment for persons suffering from Narcological disease (chronic alcoholism, drug addiction and poisoning), is allowed when an individual's illness is chronic in nature and he is not deprived of the opportunity to realize his actions and control them.

Mandatory medical treatment for persons suffering from drug addiction (chronic alcoholism, drug addiction and poisoning) is prescribed along with criminal penalties. When deciding on the issue of applying mandatory treatment in this case, the court formalizes it in its separate ruling. In this case, in the conviction, the court will indicate the need for mandatory treatment of the person, but issues related to him will be resolved in a separate ruling. Any type of coercion measure may be applied to these individuals medically.

Due to the fact that the mandatory treatment of persons suffering from a narcotic disease

(chronic alcoholism, drug addiction and poisoning) is carried out along with the execution of the prescribed punishment, there are specific features of the organization of treatment[6, P.15-16]. If a person is sentenced to a sentence not related to imprisonment, he is treated on a general basis in a medical institution, that is, in specialized treatment and preventive institutions of the Ministry of health of the Republic of Uzbekistan. Also, if medically forced measures are sentenced to imprisonment, their treatment is carried out at the place of serving the sentence, if necessary, they are treated in medical institutions on a general basis.

It is worth noting that the criminal law does not specify the grounds for the appropriation of the mandatory period of treatment prescribed by the court. The course of treatment from alcoholism, drug addiction or poisoning is continued every year without extension, but until complete recovery. At the end of the full course of treatment, in accordance with the submission of the administration, Administration of the execution of punishment and the removal of mandatory treatment of a health institution, the court may cancel mandatory treatment measures on the basis of a medical conclusion.

The plenum of the Supreme Court of the Republic of Uzbekistan adopted The Decision No. 23 of December 12, 2008 "on judicial practice of applying medically induced coercion measures against persons with mental illness". But the plenary resolution did not provide explanations on the issues of using such measures in relation to persons suffering from alcoholism, drug addiction or poisoning.

In accordance with Article 95 of the Criminal Code, the duration of treatment from Narcological illness (chronic alcoholism, drug addiction and poisoning) is continued until the complete recovery of the individual without an extension of each year. At the complete end of the course of compulsory treatment, the penitentiary institution, administration and health institution, in accordance with the current legislation, submit a submission to the court to remove the mandatory treatment of the convicted person. Mandatory treatment measures are canceled by the court on the basis of a medical conclusion that there is no need for this treatment. The change in the type of mandatory treatment assigned is carried out in the general procedure, according to the provisions of Article 95 of the JC.

Medically, coercive measures do not result in a conviction, unlike criminal punishment. If a medically coercive measure was used with a penalty for persons suffering from a narcotic disease (chronic alcoholism, drug addiction and poisoning), the deadline for the appointment of coercion measures is not taken into account when calculating the period of conviction.

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Rezyume: Жиноят содир этган алкоголизм, гиёҳвандлик ёки захарвандликка чалинган шахсларга жазо билан бирга тиббий йўсиндаги мажбурлов чораларини қўллаш масалалари кўриб чиқилган

Резюме: В данной работе рассмотрены вопросы применения принудительных мер медицинского характера наряду с наказанием лицам совершившим преступления, страдающим алкоголизмом, наркоманией или токсикоманией.

Kalit so'zlar: Жазо, тиббий йўсиндаги мажбурлов чоралари, алкоголизм, гиёҳвандлик, токсикомания.

Ключевые слова: Наказание, принудительные меры медицинского характера, алкоголизм, наркомания, токсикомания.

**THE RELATIONSHIP BETWEEN ESCROW AGREEMENT AND LETTER OF CREDIT
UNDER THE LEGISLATION OF THE REPUBLIC OF UZBEKISTAN**

Klicheva B.M.

Karakalpak State University named after Berdakh

Summary: *This article provides a comparative legal analysis of settlements on letters of credit and the contract of conditional deposit (escrow) under the legislation of the Republic of Uzbekistan.*

Key words: *Comparison, escrow agreement, letter of credit, difference, legislation of the Republic of Uzbekistan*

In the context of this research I think it is important to compare two contractual relations, as there is an opinion that the introduction of escrow agreement is unnecessary and that this agreement can be regulated by analogy, i.e. by similarity with other, or rather similar contractual relations [1, 144].

As expressly stated in Article 796 of the Civil Code of the Republic of Uzbekistan, a letter of credit is an agreement between several parties, under which the bank (letter of credit bank) undertakes to make a payment to the beneficiary (seller) subject to the provision of certain documents confirming the fulfilment of the terms of the contract [2]. The procedure is as follows First, the principal applies to its bank to open a letter of credit. The letter of credit bank notifies the beneficiary of the creation of the letter of credit, which creates transparency and certainty in the transaction. The beneficiary then provides documents to prove that the terms of the transaction have been fulfilled, such as delivery notes and invoices. The letter of credit bank thoroughly verifies that the submitted documents comply with the terms and conditions of the letter of credit. After successful verification, the bank makes the payment to the beneficiary.

As Semikova P.V. notes, the letter of credit is a foreign instrument reflected in the Civil Code of the Russian Federation and is used in its limited form, when in foreign practice there are many other types of settlements by letter of credit, which in comparison can be said about the legislation of the Republic of Uzbekistan, where the Civil Code of Uzbekistan uses covered (deposited) and non-covered letters of credit [3, P.-64].

As A.A. Gorokhov states in his scientific paper Revocable and irrevocable letters of credit: in the calculations it is mentioned that in case of changes in terms or cancellation of a revocable letter of credit the issuing bank is obliged to notify the beneficiary of funds not later than the next business day. In case of irrevocable letters of credit, the changes are considered valid or the letter of credit is considered cancelled from the moment the executing bank receives the consent of the beneficiary. Partial acceptance of the amendments to the terms of the irrevocable letter of credit by the beneficiary is also possible [4, P.72].

Irrevocable letters of credit may be confirmed, which means that at the request of the issuing bank the executing bank may confirm an irrevocable letter of credit. In this case, the executing bank assumes an additional obligation to make payment to the beneficiary upon presentation of documents corresponding to the terms of the letter of credit. In international foreign trade practice, where the guarantee of payment is important, the uncovered irrevocable confirmed letter of credit is most often used.

Despite the seemingly quite smooth mechanism, letters of credit are associated with certain risks. For the buyer, there is a risk of non-compliance of goods, which may lead to legal disputes. The seller, in turn, may face delayed payment or refusal of payment if the documents do not match. It is therefore important that both parties prepare the documents carefully and comply with the terms of the letter of credit.

Letters of credit play a key role in ensuring reliable settlements in both international and domestic trade. Helping to reduce risks and increase trust between the parties, creating an effective mechanism for the fulfilment of financial obligations. Competent understanding of letter of credit

terms and its procedure is the basis for successful completion of commercial transactions and strengthening of business relations in the dynamic economy of Uzbekistan. Taking into account the modern development of financial technologies, letters of credit remain relevant and in demand in the sphere of trade and business.

When discussing and comparing the two instruments, attention is often drawn to certain similarities between the letter of credit and escrow. Letter of credit and escrow are important financial instruments that play a key role in securing settlements and minimizing risks in commercial transactions. These mechanisms help parties fulfil their obligations by creating trust and reducing the likelihood of financial loss. Similarities arise in that the letter of credit and escrow act as collateralized legal vehicles to achieve their objectives.

A letter of credit is a banking commitment in which the letter of credit bank guarantees payment of a certain amount to the beneficiary (seller), subject to the provision of pre-agreed documents. This achieves several key objectives: the seller can be assured that he will receive payment if he fulfils the terms of the contract.

Conditional escrow is a mechanism whereby funds or assets are held in a special account until the terms of the transaction are fulfilled. This creates additional safeguards for both parties. Key advantages include: escrow protects the interests of the parties as the funds remain under the control of a third party (such as a bank).

The parties define in advance the conditions under which the funds will be transferred, which helps avoid misunderstandings.

Keeping the funds with a third party reduces the likelihood of unauthorised access.

According to the scholar Bychkov A. the scope of application of a letter of credit is much wider than an escrow account for several reasons: 'the 'range' of actions that a bank can perform to fulfil a letter of credit is much more diverse than just transferring money to the beneficiary [5, P.99].

A similar point of view is expressed by Dorofeeva Y.V., noting the wide application of escrow agreement as under this agreement any property can be deposited, not only non-cash funds, which is absolutely impossible to do under the letter of credit [6, P.100].

Letter of credit and escrow are effective tools that contribute to the reliability of settlements in commercial transactions. Correct application of these mechanisms can significantly reduce risks and strengthen trust between the parties, which is the basis for successful business in modern conditions.

Consequently, on the basis of the above-mentioned it can be concluded that, firstly, apart from the contract of escrow from the letter of credit is not regulated by the legislation of the Republic of Uzbekistan, but is only mentioned as a term, which in turn puts into uncertainty the future of those contractual relations that were concluded with the use of the term escrow. Secondly, the bank's obligation under the letter of credit arises on the basis of a unilateral transaction - the order of the payer, the bank's client under the bank account agreement. The recipient of funds in the emergence of this obligation does not participate and may not even be a client of this bank, which cannot be said the same about the contract of escrow (escrow) is a tripartite contract, where the rights and obligations arise from three parties. Thirdly, the most important difference is that a letter of credit is a bank guarantee of payment upon fulfilment of conditions, whereas an escrow is a contract in which a third party holds funds or assets until the conditions are fulfilled by the parties, i.e. the third party also acts as a custodian.

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Rezyume: *Mazkur maqolada Uzbekiston Respublikasi qonunchiligiga asosan akkreditivlar va shartli deponentlash shartnomasi (eskrov) bo'yicha hisob -kitobni amalga oshirish kisiy tahlil qilingan.*

Резюме: *В данной статье проводится сравнительно-правовой анализ расчетов по аккредитивам и договору условного депонирования (эскроу) по законодательству Республики Узбекистан.*

Kalit so'zlar: *Taqqoslash, eskrov shartnomasi, akkreditiv, farq, O'zbekiston Respublikasi qonunchiligi*

Ключевые слова: *Сравнение, соглашение о депонировании, аккредитив, разница, законодательство Республики Узбекистан*

APPLICATION OF HIGH-SILICON WASTE IN THE PRODUCTION OF ADDITIVE CEMENTS OF JSC UZMETKOMBINAT AND JV LLC «Uz-Shindong Silicon»

Mukhitdinov D.D., Iskandarov M.I., Akhmedova D.U.

Scientific laboratory and testing center "Strom" of the Institute of General and Inorganic Chemistry of the Academy of Sciences of the Republic of Uzbekistan, Tashkent

Summary: *This article provides information on the effect of adding microsilica metallurgy waste as an active mineral additive to cement up to 20%, as well as the results of its physical and mechanical properties and influence on the physical and chemical properties of cement.*

Keywords: *metallurgical waste microsilica, active mineral additive, physical and chemical properties, cement additive, physical and mechanical properties.*

Active mineral pozzolanic additives have been purposefully used for many decades to modify Portland cement-based compositions to increase the strength, durability, impermeability and chemical resistance of the resulting materials and structures. One of the most active and widely used pozzolanic modifiers in the cement industry is ultra-dispersed ferrosilicon production waste, which is called microsilica (MS), "white soot", "silica ash", etc. It contains up to 95% pure amorphous silica, which is microscopic spherical particles with an average specific surface area of about 20 sq. m/g and a size of 0.01–0.1 μm , which is 100 times smaller than the average grain size of cement [1–3]. This highly active mineral additive consists mainly of silicon oxide with an admixture of aluminum, iron, calcium, magnesium, potassium, carbon, and sulfur oxides. When introduced into the composition of Portland cement, it exhibits the ability to actively react with lime, released during hydrolysis of C_3S hydration and hardening of Portland cement (PC) with the formation of water-insoluble hydrate compounds of the type calcium hydrosilicate CSH (I) according to the reaction: $\text{SiO}_2 + \text{Ca}(\text{OH})_2 + n\text{H}_2\text{O} = (1-1.5) \text{CaO} \cdot \text{SiO}_2 \cdot (0.5-2.5) \text{H}_2\text{O}$. As a result, an additional amount of calcium silicates is formed in the "cement - water" system and a constrained state is created due to the involvement of the active part of the siliceous additive in the process of forming the structure of cement stone, thereby giving this structure increased density and strength during hardening of cement. In addition, the addition of ultrafine silica increases the degree of hydration of cement and thereby improves the technological and operational properties of concrete. Laboratory studies on the use of MS as an active additive for concrete, conducted by M.S. Dubensky and A.A. Kargin, S.A. Emralieva showed that the relationship between the amount of the additive introduced and the increase in the strength of the mortar and concrete stone is linear. With an increase in its introduction in the amount of 5 to 25%, a gradual increase in the compressive strength of concrete was noted, which, with a dose of MS of 25%, almost 2 times exceeds the strength of concrete on pure PC [4, 5].

In Uzbekistan until 2016 there was no production of ferrosilicon, and therefore, the issue of recycling waste - microsilica (MS) - did not arise. 2017 In the city of Angren, a plant for the production of ferrosilicon from local quartz rocks was put into operation JV Uz-Shindong Silicon LLC, where, along with the main products, 9-10 tons of MK are generated daily, and during the year its amount reaches about 3.3 thousand tons. If we take into account that on the territory of Uzmetkombinat JSC there is also a ferrosilicon production plant with a capacity of 15 thousand tons per year, then the total volume of waste in the form of MS exceeds 10 thousand tons per year, which poses a solution to environmental problems associated with the disposal of MS waste for ferrosilicon manufacturers. In this direction, in the testing laboratory of the Scientific and Research Center "Strom" of the Institute of General Chemistry of the Academy of Sciences of the Republic of Uzbekistan, comprehensive studies are being conducted to determine the physical, chemical and technological properties of MK and its influence on the process of hydration and hardening of PC.

From the data in Table 1 it follows that the chemical composition of the MS JV LLC Uz-Shindong Silicon is represented by a predominant content of silicon oxide (SiO_2) in the amount of 89.86%, in small quantities there are oxides of aluminum - 0.97%, calcium CaO - 1.41%, magnesium

MgO - 0.34%, iron Fe₂O₃ - 0.38%, sulfuric anhydride SO₃ - 0.73% and alkaline oxides R₂O - 2.62%, which indicates the presence in the composition of the original sand of impurities of aluminosilicate compounds, calcium and magnesium carbonates, feldspar, gypsum, etc.

Table 1. Chemical composition of starting materials

Name of material	Mass fraction of oxides, %								
	Losses during calcination	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	CaO	MgO	SO ₃	R ₂ O	others
PC clinker JSC "Bekabadcement"	17.04	50.25	7.90	2.70	11.26	1.77	0.51	-	8.64
MS JV LLC "Uz-Shindong Silicon"	3.24	89.86	0.97	0.38	1.42	0.34	0.73	2.62	0.44
Microsilica JSC "Uzmetkombinat"	2.61	92.70	0.76	1.08	0.28	0.22	0.37	1.58	0.42
Gypsum stone	H ₂ O at 400°C 19.1	1.52	0.13	0.14	33.04	0.20	43.46	-	2.55

Chemical composition of MS JSC Uzmetkombinat differs from MK of JV LLC Uz-Shindong Silicon by a higher content of silicon dioxide SiO₂ (92.7%) with small impurities of other oxides: (CaO-0.28; Al₂O₃-0.76; Fe₂O₃-1.18; MgO-1.20; R₂O-1.54; etc. - 0.42)%. In terms of SiO₂ content, the presented MK samples comply with the requirements of StateST Uz 901-98 "Additives for cements. Active mineral additives and filler additives. Specifications" imposed on siliceous filler additives for cement. Ultradispersed MK contains mainly X-ray amorphous SiO₂. It contains impurities of crystalline silica and calcium-magnesium aluminosilicates Ca (Fe, Mg, Al) Si₂O₆. The study of the MS structure showed that in the same section of the MC under study, the percentage content of each element has a slight difference. For example, the content of various elements in three MS samples is: Ca - (16; 15; 18)%, O - (58.2; 56.2; 57.0)%, Si - (37.7; 36.1; 37.7)%, etc., which is apparently due to the inconsistency of the chemical composition of the quartz-containing raw materials supplied to the plant for processing. When calculating the Student criterion, the value $t = 13.47 > 2.07$ was obtained, which characterizes MS as an active mineral additive.

In obtaining additional cements with the addition of MK, Portland cement clinker and gypsum rock, in the ratios given in Table 2, were subjected to joint grinding to a fineness estimated at 10-12% residue on sieve No. 008. The content of gypsum rock in the batch was constant (5%), and the amount of PC clinker varied in the range (75-90%) taking into account the amount of MS introduced after grinding (5-20%).

Table 2. Effect of MS on the strength properties of Portland cement

Name and ratio of components (mass%):			W/C	The ultimate strength of samples under bending/compression (MPa), through:		
Clinker	Gypsum	MS		3 days	7 days	28 days
MS JV LLC "Uz-Shindong Silicon"						
95	5	-	0.39	4.0/20.5	4.6/28.8	6.3/41.2
90	5	5	0.38	5.1/22.7	6.1/32.1	7.9/48.5
88	5	7	0.40	5.5/25.4	6.2/35.5	9.1/47.5
85	5	10	0.41	5.4/18.7	5.8/32.5	8.7/55.3
80	5	15	0.41	4.9/17.4	5.5/27.5	6.6/47.3
75	5	20	0.41	4.2/16.7	4.3/22.5	2.8/45.5

MS JSC "Uzmetkombinat"						
95	5	-	0.37	4.9/17.2	5.2 /29.6	7.0/41.3
90	5	5	0.30	4.9/19.1	5.2 /29.9	7.3/41.4
85	5	10	0.32	5.2/19.1	5.5/30.6	7.4/45.8
80	5	15	0.34	3.9/12.7	4.7/26.7	6.2/36.7
75	5	20	0.36	3.4/12.7	4.4/21.8	6.3/32.8

It was found that introduction of up to 20% MS of Uz-Shindong Silicon JV LLC has a positive effect on the physical and mechanical properties of PC, increasing its strength both in bending and in compression. The difference in the strength indicators of cement without additives and cement with the addition of 5% MS by the 28th day is 1.6 MPa in bending. Increasing the amount of MS to 7% in the initial period sharply increases the strength of PC, and by the 28th day it remains at the level of cement with 5% MS. With an increase in the MS dose, the picture of formation of strength indicators of additional cement sharply changes in the opposite direction, i.e. in the initial period (3 days) a decrease in the strength indicators of the samples is noted, and by the 28th day - their sharp increase both in bending (9.92 MPa) and in compression (59.89 MPa). With a further increase in the MS content to 15-20%, some decrease in the strength indicators of additive cements was noted, however, they are significantly higher (55.4-56.8 MPa) than those of non-additive PC (43.1 MPa). Apparently, such an effect is achieved by filling the pores of the cement stone with spherical microparticles of MS and hydrosilicate gel, additionally formed in the process of hydration of the additive cement and a decrease in the capillary porosity and permeability of the cement stone, and it is known that the increased density and low permeability of the cement stone ensures its high resistance to the effects of frost and aggressive mineral salts.

MS of JSC Uzmetkombinat, in a dose of 5% does not reduce the strength indicators of cement stone and they remain at the level of non-additive PC during all periods of hardening, and in an amount of 10% by 7 and 28 days of hardening, an increase in the strength of cement stone is noted. A further increase in the MK content in cement to (15-20)% per 1 brand reduces its strength, which is explained by a higher content of amorphous SiO₂ in MS of JSC Uzmetkombinat, which has a plasticizing effect and, reducing the water demand of the cement mortar, slows down the process of hydration of C₃S with the release of Ca(OH)₂.

Thus, the fundamental possibility of obtaining additional PC grades 400-500 with the addition of ultrafine MS has been established, for the implementation of which the Organization Standard OS 00186200-12:2019 "Condensed microsilica. Technical conditions" was developed and put into effect by the order of JSC Uzmetkombinat.

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Rezyume: Ushbu maqolada metallurgiya chiqindisi mikrokremsnezemni tsementga faol mineral qo'shimcha sifatida 20 % gacha qo'shib, tsementning fizik-kimyoviy xossasiga tasiri va fizik-mexanik ko'rsatkichlari natijalari o'rganilganligi haqida ma'lumot berilgan

Резюме: В данной статье приведены сведения об эффекте добавления отхода металлургии микрокремнезема в качестве активной минеральной добавки в цемент до 20%,

а также результаты его физико-механических показателей и влияния на физико-химические свойства цемента.

Kalit so‘zlar: *metallurgiya chiqindisi mikrokremnezem, faol mineral qo‘shimcha, fizik-kimyoviy xossasi, tsementga qo‘shimcha, fizik-mexanik ko‘rsatkichlari*

Ключевые слова: *отхода металлургии микрокремнезем, активная минеральная добавка, физико-химические свойства, добавка в цемент, физико-механические показатели.*

**CULTURAL AND LINGUISTIC FACTORS INFLUENCING THE VARIATION IN
SOMATIC PHRASEOLOGY**

Khabipova R.

Karakalpak State University named after Berdakh

Summary: *The article deals with the study of somatic phraseology in the Karakalpak and English languages. Somatic phraseology in the Karakalpak and English languages offer valuable insights into the cultural perceptions and expressions of bodily experiences. The Karakalpak culture, characterized by its prioritization of physical well-being and intimate connection with nature and animals, has cultivated a diverse repertoire of somatic expressions that symbolically depict various bodily sensations or actions. In contrast, English somatic expressions tend to center around emotions and psychological states.*

Keywords: *Somatic phraseology, expression, communication. metaphorical, linguistics, conceptualization, psychological conditions lexicalt.*

Humans use their senses to perceive the world around them, with different organs serving specific sensing purposes. The body's various parts allow individuals to engage in different tasks. Throughout life, the human body has been a subject of study, inspiring us to investigate it through expressions involving body part names. In the field of medicine, body parts are known as “somatika,” derived from the Greek word “soma,” meaning body. Therefore, in linguistics, the term “somatism” is used to describe body part names. [1,103]

Somatic phraseologies are intricate linguistic constructs that involve the combination of multiple words to create expressions with specific meanings and structures. These phraseological units exhibit a consistent lexical arrangement and syntactic structure, with the coherence of the words playing a crucial role in the overall composition. The level of figurative language used in somatic phraseologies further enhances their expressive power [2:51].

The concept of “phraseological somatism” was first introduced by E.M. Mordkovich in his work on the Russian language titled “Semantic-thematic groups of somatic phraseologisms.” Mordkovich’s exploration of this linguistic phenomenon sheds light on the interconnectedness of somatic phraseological units and highlights the importance of understanding the semantic and thematic aspects of these expressions [3].

Logan Smith, an English academic, echoed the perspective of E.M. Mordkovich on somatic phraseologies by highlighting the extensive range of phraseological expressions in the English language that incorporate body parts. Smith emphasized how these somatic phraseologies enrich and embellish the language with their figurative language, adding depth and vividness to communication. By recognizing the significance of somatic phraseologies in English, Smith contributed to the appreciation and understanding of the intricate linguistic constructs that play a vital role in expression and communication.

F. Wack’s pioneering research on somatisms laid the foundation for further exploration and categorization of somatic phraseological expressions. By identifying three distinct groups of somatisms based on their semantic functions, Wack provided a framework for understanding the diverse ways in which body-related expressions are used in language.

The unique semantic structure of somatic phraseological compounds allows them to convey meaning as a whole, rather than as individual lexical units. This holistic processing of somatic expressions contributes to their distinctiveness and effectiveness in communication.

Key attributes of somatic phraseological combinations include their completeness in conveying meaning, widespread presence in language, incorporation of national-cultural-historical elements to create figurative and emotional expressions, and metaphorical utilization of body-related facets to enhance the overall impact of the phrase within a sentence.

Overall, the study of somatic phraseologies sheds light on the intricate ways in which language creatively incorporates bodily references to enrich communication and express complex ideas and emotions.

It is time to analyse some phrases related to the word head in English and Karakalpak languages [4;202]. In the English phrase heads will roll which has its Karakalpak counterpart in *bastan ayiriw* (literally heads will fall), the head is taken to mean life because conventional knowledge tells us that in the past, people who had committed a serious crime were sometimes executed by decapitation. Also, people who were in high positions in society and had to bear significant responsibility, were sometimes executed if they failed to perform their duties to the satisfaction of their superiors. An interesting extension of this phrase is the English expression to put a price on somebody's head which can again be found in Karakalpak as *Basi ushin siyliq* (literally to want someone's head). Another example of this metonymy is the English phrase to put one's head on the block for someone which can also be found in Karakalpak as *Basi menen juwap beriw* (literally to put the head on the block for someone). As can be seen, all the mentioned phrases in which the head is used to conceptualize life, are based on people's experiences which they have carried with them in the course of history and which are reflected in idiomatic language. The English phrase to turn/stand something on its head whose equivalent can be found in the Karakalpak phrase *Uydi basına kòteriw* (literally to stand something on the head) is a nice example of combining conventional knowledge and metonymy as a basis of motivation of this phrase. The meaning of this phrase, to completely and radically change something, and give it a new sense or negate it is based on our conventional knowledge that logically, the human body is positioned in such a way that the head is up and the feet are on the ground. While gathering instances of somatic phraseological units, the subsequent semantic categories pertaining to both languages have been identified. Here is given examples to some of them:

1) Somatic phraseological units denoting person's characteristics: - light hearted, thick-headed, etc. - *Aq końil, kewili keń*

2) Somatic phraseological units denoting psychological conditions, emotions and feelings of people {to be sick at heart/ *Júregi awriydi*; to break one's heart- *júrekti jaralaw*; to touch the heart – *júrekten aliw*; smb's heart sink – *júregi jarildi*; to hang down one's head – *Basın joǵaltıw* ; to have no face – *bez bet*.

3) Somatic phraseological pertaining to physical human connections, sentiments towards one another:

a) positive interrelations (to take to one's heart-*Júregine aliw*; to set one's heart on (upon) - *júreginińzdi (ge) baǵdarlaw ushın*; to gladden smb's heart -*kewilin kòteriw ushın*);

b) negative interrelations, attitudes (to harden one's heart- *júreginińzdi qattılastırıw*; to grind one's teeth-*tislerin g'ijirlatiw*; to lay hands on smb - *qolın qoyıw*) Somatic phraseological units denoting human actions:

a) mental activities (put your heads together- *basınızdı birlestiriw*; to enter smb's head-*baslaw*; not to make head or tail of smth-*hesh nárseni tusinbew*)

b) seeing activities (to take smb's eyes off smth- *kózin geypara zattan úziw*, to meet smb's eyes- *birewdiń názeri menen toqnasiw*; to open one's eyes -*kózlerin ashıw*; to keep an eye on smb- *birewdi baqlaw*);

c) speaking activities (To hold one's tongue/ to open one's lips-*tınısh bolıw, indemew, aytpaw*; bite one's lips-*isenimshi bolıw*; not to find in one's heart- *isendiriw, ózińizdi májbúrlew* (geypara zat qılıwǵa), *qarar qabıllaw* (geypara zat qılıwǵa); to wag one's tongue-*paydasız sóylew; ósek qılıw*); d) hearing activities (with all smb's ears-*birewdiń barlıq qulaqları menen*, be all ears *dıqqat penen tılań*). Upon examination of chosen somatic idioms, disparities and resemblances in languages have been identified, leading to the subsequent deductions:

1) There exists a cluster of somatic phraseological expressions in the English language.

2) In both languages, idiomatic expressions incorporating body parts substantially amplify the figurative language and impactfulness of the narratives.

3) They can be classified into several groups according to their semantic meanings.

4) In order to express emotions, passion and strong feelings English speaking writers use somatic phraseological units with somatism “heart”, while Karakalpak writers express emotions with the words “soul” (jan), “mood” (końil). For example: light - hearted – aq końil, to take to heart – júregine jaqın aliw, etc.

5) In Karakalpak and English languages there are several similarities in denoting some phenomena. For example, smb’s hair stands up on end –shashı tik turdi, to widen one's eyes – kozi qarasinan shıqtı, an apple of an eye – kozdıń qarashiğı, etc.

The examination of somatic phrases in English and Karakalpak provides valuable insights into how the concept of the body is reflected and expressed in language across different cultures. The shared feature of incorporating bodily references in phraseological units highlights the universal influence of the body on language and communication.

By comparing somatic phrases in English and Karakalpak, researchers can identify both similarities and distinctions in how the body is regarded and expressed in these languages. These findings can shed light on cultural attitudes towards the body, as well as linguistic conventions and metaphorical expressions related to bodily parts.

The analysis of somatic phrases across languages can also reveal common themes and concepts that transcend cultural boundaries, as well as unique cultural perspectives that shape the use of body-related expressions. This comparative study can deepen our understanding of how language reflects and shapes cultural beliefs, values, and experiences related to the body. Overall, exploring somatic phrases in different languages allows researchers to uncover the intricate interplay between language, culture, and the human body, providing a rich source of information for cross-cultural communication studies and linguistic research.

The use of body-related expressions to convey emotions, sensations, or experiences, known as somatic phraseology, offers valuable insights into the linguistic and cultural perspectives of a society. Analyzing somatic phraseology in different languages, such as Karakalpak and English, allows for a deeper understanding of how cultural beliefs and values influence the expression of bodily experiences. This article will delve into somatic phraseology across various themes like pain, hunger, tiredness, fear, and joy, comparing examples from both Karakalpak and English to highlight similarities and differences in the conceptualization and expression of these bodily experiences.

The examination of somatic phraseology in the Karakalpak and English languages offers valuable insights into the cultural perceptions and expressions of bodily experiences. The Karakalpak culture, characterized by its prioritization of physical well-being and intimate connection with nature and animals, has cultivated a diverse repertoire of somatic expressions that symbolically depict various bodily sensations or actions. In contrast, English somatic expressions tend to center around emotions and psychological states. Furthermore, distinct cultural nuances are discernible in the utilization of somatic phraseology, with Karakalpak expressions frequently incorporating references to animals or natural elements, while English idioms often draw upon body parts or actions. These disparities underscore the unique cultural values, beliefs, and attitudes towards the body within each linguistic context. [5:57].

In the context of pain, both the Karakalpak and English languages employ metaphorical expressions to convey intense pain. However, the specific metaphors employed vary between the two cultures. For instance, in Karakalpak, the phrase “Basi atiliw” metaphorically conveys intense pain by evoking the imagery of a burning head. Conversely, the English expression “to break someone's heart” underscores the emotional and psychological dimensions of pain, accentuating the depth of anguish and distress experienced. [6, 50-51].

The exploration of somatic phraseology in relation to hunger in the Karakalpak and English languages reveals intriguing cultural perspectives on the experience of extreme hunger. In Karakalpak, the metaphorical expression “Qarnı piyazdıń qabıǵınday bolıw” creatively associates extreme hunger with the stomach and onion, symbolizing the intense physical sensation of hunger. The use of the onion in this expression may reflect the importance of food and sustenance in Karakalpak culture, as well as the vivid imagery evoked by the pungent aroma and taste of onions.

Conversely, in English, the phrase “as hungry as a wolf” draws upon the imagery of a wolf’s voracious appetite to convey a strong feeling of hunger. This metaphor emphasizes the primal and instinctual nature of hunger, highlighting the physical aspect of the sensation and underscoring the urgency and intensity of the hunger experienced. These contrasting metaphors shed light on the cultural attitudes towards hunger in the Karakalpak and English languages, with Karakalpak phraseology emphasizing the physical sensations and sustenance associated with extreme hunger, while English idioms evoke animalistic imagery to convey the intensity and urgency of hunger. Overall, these somatic expressions offer valuable insights into the cultural perceptions and representations of hunger within each linguistic context. [7, 166-170].

The use of leaden legs in this expression conveys a sense of physical and mental fatigue, highlighting the burden and difficulty of moving or functioning when extremely tired. In both Karakalpak and English languages, these metaphorical expressions serve to vividly capture the experience of extreme exhaustion by drawing on physical sensations and imagery. The Karakalpak phrase “Halı qalma” conveys a sense of complete depletion of energy, while the English expression “Walking on leaden legs” evokes the heaviness and sluggishness associated with extreme tiredness. [8;67]

These somatic metaphors provide insight into the cultural attitudes towards tiredness in each language, with Karakalpak emphasizing the loss of energy and vitality, and English focusing on the physical and mental strain of exhaustion. Through these metaphorical expressions, speakers in both languages are able to convey the profound impact of extreme tiredness on the body and mind, offering a glimpse into the shared human experience of fatigue across different cultures.

In the topic of fear, both languages once again employ metaphorical expressions to describe fear. In Karakalpak, the phrase “Jüreк jarılıw” metaphorically represents fear by using the image of a heart burst to convey a sense of danger and threat. Similarly, in English, the phrase “shaky hands” emphasizes the psychological aspect of fear, suggesting a state of immobility and paralysis due to fear. Lastly, in the topic of joy, both Karakalpak and English languages use metaphorical expressions to convey immense happiness. In Karakalpak, the phrase “Bası aspańǵa jetiw” metaphorically represents immense joy by associating it with the head and sky. In English, the phrase “happy heart” conveys a state of extreme happiness, emphasizing the emotional aspect of joy.

In conclusion, somatic phraseology provides valuable insights into linguistic and cultural perspectives on bodily experiences. Through the analysis of somatic phraseology in Karakalpak and English languages according to different topics, we can observe how cultural beliefs and values shape the ways in which people express their bodily sensations and emotions. By examining these linguistic and cultural expressions, we can gain a deeper understanding of the similarities and differences between these two cultures.

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Annotatsiya: Maqolada qoraqalpoq va ingliz tillarida somatik frazeologiyalarni o'rganish masalalari ko'rib chiqiladi. Qoraqalpoq va ingliz tillaridagi somatik frazeologiyalar madaniy idrok etish va jismoniy kechinmalarni ifodalash haqida qimmatli tushunchalarni beradi. Qoraqalpoq madaniyati o'zining jismoniy farovonligi, tabiat va hayvonlar bilan yaqin aloqada bo'lishi ustuvorligi bilan ajralib turadi, u turli tana sezgilari yoki harakatlarini ramziy ravishda aks ettiruvchi somatik iboralarning xilma-xil repertuarini o'stirgan. Bundan farqli o'laroq, ingliz somatik iboralari hissiyotlar va psixologik holatlarga to'g'ri keladi.

Аннотация: Статья посвящена изучению соматической фразеологии в каракалпакском и английском языках. Соматическая фразеология в каракалпакском и английском языках предлагает ценную информацию о культурном восприятии и выражении телесных переживаний. Каракалпакская культура, характеризующаяся приоритетом физического благополучия и тесной связью с природой и животными, культивировала разнообразный репертуар соматических выражений, которые символически изображают различные телесные ощущения или действия. Напротив, английские соматические выражения, как правило, сосредоточены вокруг эмоций и психологических состояний.

Kalit so'zlar: Somatik frazeologiya, ifoda, aloqa. metaforik, tilshunoslik, kontseptualizatsiya, psixologik aхвол, leksik.

Ключевые слова: Соматическая фразеология, выражение, общение. метафорический, лингвистика, концептуализация, психологические состояние, лексическая организация.

THE ROLE OF LANGUAGE AWARENESS IN KARAKALPAK CONTEXT

Bakhieva P.B.

Nukus State Pedagogical Institute named after Ajiniyaz

Summary: *The article deals with the attempt to identify the role of activities in teaching languages in developing language awareness, the effectiveness of these exercises in teaching the language. The role of language awareness in mother tongue and foreign language study has been demonstrated with examples in Karakalpak language to justify Karakalpak auditory.*

Key words: *language awareness, language acquisition, language teaching, activity, grammar, vocabulary.*

Language awareness is widely considered to be an important dimension of teachers' professional knowledge. Samples of professional competency statements and tasks commonly given to students and teachers are provided to illuminate the aspects of language awareness that are given prominence in teaching English. The paper examines the aspects of language awareness that are fostered by current practices in teacher education and professional development and discusses which aspects of language awareness are desirable for teachers to develop. Excerpts from studies of pre-service and in-service teachers are used to suggest that teacher Language Awareness (LA) is strengthened by L2 learning experience, and to argue for the value of language learning awareness. It is argued that LA has been through a pendulum swing from a cross-lingual focus to a focus on English only, and is now in the process of returning to a renewed and reinvigorated multi-lingual focus.

Language awareness emerged as a movement in the UK in the beginning of the 1980s, founded by the linguist Eric Hawkins, mainly as a reaction to dominant theories about language learning based on behaviorist principles of habit formation. Eric Hawkins is known as the father of language awareness supporting the explicit reflection on both native and foreign languages since 1960s. He suggested a "trivium" of language studies that consists of mother tongue study, foreign language study and language awareness work. In this model learners would be helped to develop skills and linguistic intuitions, use their mother tongue and foreign language effectively. In this case language awareness is beneficial to understand how language works and effects human life.

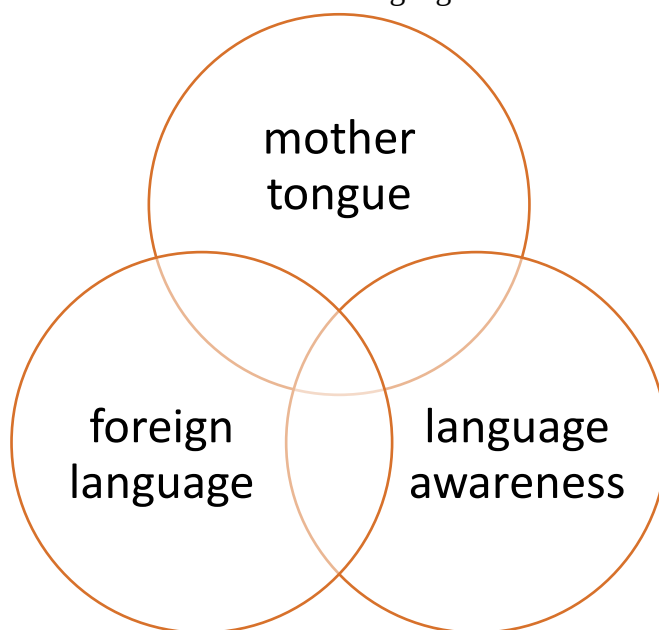


Figure1
"Trivium" of language study

Language Awareness in our context can become more effective, so that L2 acquisition will give strong experience to our learners and teachers. There many changes have happened in language policy of Educational System of Uzbekistan. It is highlighted that a complex system for learning and teaching of foreign languages focused on upbringing of comprehensively developed, educated and intellectual young generation of people, and further integration of the republic with the global community has been established within the frames of the Law on Education and the National Program for Personnel Training. Therefore paying attention on effective teaching should be closely conducted with Language Awareness. Knowing the language, feeling the language will help teachers and learners to learn the language effectively.

In recent years more ways of understanding language awareness have been suggested. Breidbach, Elsner and Young conceptualize LA by dividing it into three different dimensions: linguistic-systematic, cultural political and social-educational. The linguistic-systematic dimension of language awareness refers to the language itself; structure of language, language contrasts and regularities. The cultural-political dimension reflects the power and control operated through language in terms of language learning ideologies, policies or the use of language in public discourse and regards language awareness as a tool. The socio-cultural dimension concentrates on learners and teachers' beliefs, views and attitudes toward language and language learning [2:23].

Language awareness is aimed to raise learners' awareness of important linguistic features and help students construct their own grammar using personal exploration. As LA is essential in teaching, learning and using the language, there will be a need for increasing students' language awareness. In this case language awareness activities help to raise their own language awareness. Schmidt has explained the importance of language awareness as following: Students have to explore structured input and develop an awareness of certain linguistic features by performing some activities. Every language is learnt, taught and used completely by practicing more, doing various exercise and activities. Through activities learners raise their awareness of language that they are learning. The more do activities, the more aware of the language. As language awareness is essential in teaching, learning and using the language, there will be a need for increasing students' language awareness. Learners cognize in their mother tongue, develop ideas and speech, study grammar rules and while learning the foreign or second language they learn by heart the new words through the translation, compare the grammar rules, take their first language as a guide for acquiring the new language. Taking into consideration the given explanation, it can be identified that the prime point of gaining the language is practice which involves doing various kind of activities and put the language in active utilization. As activities work for the enhancement of the language acceptance and production, lead to revise and strengthen the language in practice, obtain background knowledge and enlarge the intuition. Schmidt has explained the importance of language awareness activities as following: "Students have to explore structured input and develop an awareness of certain linguistic features by performing some activities" [3:206].

Being aware of language and its use is important in all languages. We will look through the importance of language awareness in Karakalpak language through examples. Through examples we identify the effect of language awareness to the vocabulary, realize the meaning of the words from the context, choose appropriate word, know all the meaning of words and its use in sentences. The examples are related to vocabulary of Karakalpak language: the meaning of words in the sentences and their definitions. Vocabulary is all the words in language and it is central to language teaching because without sufficient vocabulary learners can't understand others and express their ideas. Without vocabulary nothing can be conveyed, so learners expand vocabulary and teachers use vocabulary learning strategies effectively. We learn to guess the meaning of words from the context, define the exact meaning of the word, understand and use correctly in a particular situation from the first example.

Example:

Bunsha suw ishe berip ku'shala jedin'be?-dedi g'arri balag'a (Q. x.e)

You are drinking too much water. Have you eaten kushala?

(from karakalpak national story)

In the sentence the word kushala is not clear not only non-native but also native speakers. But from the context we can realize kushala is something that makes people thirsty and guess kushala is food, vegetable or fruit that people can eat. If we need precise meaning of the word, we can look it up from dictionary.

Kushala is an acid plant grown in mountainous and hot territories, used as medicine for treatment. After knowing the definition it will be clear the objective of using and the meaning of the sentence. This sentence isn't used in everyday speech to say that somebody is drinking too much water without realizing the exact meaning of kushala. We can equalize this sentence with the sentence "Onshama sho'llep baliq jedin'be?" (You are so thirsty. Have you eaten fish?) and the last sentence is widely spoken in everyday speech. Baliq is a coldblooded vertebrate animal that lives in water, moving the help of fins and breathing with gills. They become available to eat after being cooked. Fried fish makes people thirsty and this sentence has become as a phrase to show exclamation for the people who become thirsty and drinking too much water. According to the meaning of the last sentence kushala may be thought to be a meal as baliq, but kushala is plant and both of them can make people thirsty. "Onshama sho'llep baliq jedin'be?" is more common and widely used than "Bunshama suw ishe berip kushala jedin'be?" but both of them are told to people who are thirsty and drinking much.

A word can define various meanings and we can identify from the context which meaning the word expresses. Through the following example we can realize the variety of meanings of a word, choose and use appropriate meaning in sentences.

O'mirinde shayqalg'an jas qara tal,

A'miwdarya suwlarinan na'r alar

(I.Yusupov)

Young willow waving in life

Gaining its strength from Amudarya

(Karakalpak poet I.Yusupov)

The current meaning of na'r ali'w is "to eat". We use another meaning such as "take a pleasure", "strength" according to the meaning and use in the context. "Na'r ali'w" is more literal and usually used in poetry and prose. It strengthens the meaning and makes the composition more effective and expressive. In this poem na'r ali'w doesn't mean to eat, it means get power. We can realize it from the context while reading the poem.

We have explained the importance, use of language awareness and integrate students' language awareness through introducing them such kind of examples. By increasing students' awareness, they are better able to understand, appreciate and use the language. Abovementioned theoretical justifications represent the value and significance of Language Awareness and presented grammar explanations and activities prove the practical essence and necessity of Language Awareness in mother tongue and foreign language teaching.

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Rezyume: *Maqolada til o'rganish jarayonida tilni rivojlantiruvchi mashqlarning til tushunchasini rivojlantirish vazifalarini aniqlash masalalari tahlil etilgan, bu mashqlarning tilni tushunishga, o'rganishga va qo'llay bilishga foydali ekanligi asoslangan.*

Резюме: В работе предпринята попытка определить роль развивающих упражнений при обучении языкам в развитии у учащихся языкового сознания, обоснована полезность этих упражнений в обучении, понимании и употреблении языка.

Kalit so'zlar: til tushunchasi, tilni bilish, tilni o'qitish, grammatika, leksika

Ключевые слова: языковое сознание, языковое владение, языковое обучение, грамматика, вокабуляр.

UDK 821.161.1

THE OPPOSITION OF EAST AND WEST IN I.A. BUNIN'S STORY "CLEAN MONDAY"

Xudayberganova U.K., Bektursinova A.M.
Karakalpak State University named after Berdakh

Summary: This article is devoted to the analysis of the story "Clean Monday" by the outstanding Russian writer of the twentieth century, the first Nobel Prize winner in Russian literature Ivan Alekseevich Bunin. The purpose of the study is to analyze the images of the East and the West in the story, determining their place in the lives of the main characters. Historical and comparative methods were identified as research methods.

Keywords: Bunin, story, East, West, opposition, contrast, comparison.

Introduction. Ivan Alekseevich Bunin occupies a special place in Russian literature due to his profound philosophical works, saturated with symbolism and multi-layeredness. The artistic model of the world in his work is a complex interaction of various cultural, historical and spiritual traditions. Bunin often addresses the themes of the transience of human life, fate, loneliness and internal struggle, which reflects his interest in the philosophical questions of existence. In his works, the heroes seek the meaning of life through an appeal to culture and spirituality, which is especially clearly seen in the story "Clean Monday".

Research material. As the research material, we chose the story "Clean Monday", which is a vivid example of the opposition of two main images in literature: East and West.

Research methods. The historical method was used as research methods, which allowed us to analyze in detail the history of the creation of the analyzed text, as well as the comparative method, which allowed us to compare the images of the East and the West in the story "Clean Monday" by I.A. Bunin.

Discussion. The key elements of Bunin's artistic model of the world are cultural images and symbols expressing a person's desire to understand and accept themselves in a world filled with contradictions. In the context of the story "Clean Monday", such a model of the world is revealed through the opposition of two cultural worlds - the East and the West.

The story "Clean Monday", written in 1944 in exile, became one of Bunin's last works. In it, the writer addresses the theme of searching for inner harmony and spiritual renewal, which is symbolized by the Orthodox holiday - the beginning of Lent. The plot centers on the complex and contradictory relationship between the hero and his beloved, whose desire for spiritual search and inner purification becomes the central motif of the story.

Bunin's work during this period reflects his nostalgia for his lost homeland, as well as his awareness of the spiritual crisis of the modern world. In "Clean Monday" he combines motifs of the past and present, culture and spirituality, which makes this story an important link in his creative legacy. The main character of the story "Clean Monday" is a mysterious and ambiguous woman whose inner world is full of secrets and contradictions. Outwardly, she appears before us as an attractive and independent girl, capable of attracting attention with her charm and intelligence:

А у нее красота была какая-то индийская, персидская: смугло-янтарное лицо, великолепные и несколько зловещие в своей густой черноте волосы, мягко блестящие, как черный собольи мех, брови, черные, как бархатный уголь, глаза; пленительный бархатистопунцовыми губами рот оттенен был темным пушком [1].

...обоняя какой-то слегка пряный запах ее волос, думая: «Москва, Астрахань, Персия, Индия! [1]

К нам подошел с бокалом в руке, бледный от хмеля, с крупным потом на лбу, на который свисал клочок его белорусских волос, Качалов, поднял бокал и, с деланной мрачной жадностью глядя на нее, сказал своим низким актерским голосом:

— Царь-девица, Шамаханская царица, твое здоровье! [1]

However, behind the external beauty lies a deep spiritual life, which the heroine hides from those around her, including from her loved one - the main character of the story.

Her interests go beyond the usual secular life. She studies spiritual literature, visits churches and shows interest in religion and philosophy, which eventually leads to her decision to go to a monastery:

Недавно я ходила в Зачатьевский монастырь — вы представить себе не можете, до чего дивно поют там стихиры! А в Чудовом еще лучше. Я прошлый год все ходила туда на Страстной. Ах, как было хорошо! Везде лужи, воздух уж мягкий, на душе как-то нежно, грустно и все время это чувство родины, ее старины... Все двери в соборе открыты, весь день входит и выходит простой народ, весь день службы... Ох, уйду я куда-нибудь в монастырь, в какой-нибудь самый глухой, вологодский, вятский [1].

В Москву не вернусь, пойду пока на послушание, потом, может быть, решусь на постриг... Пусть бог даст сил не отвечать мне — бесполезно длить и увеличивать нашу муку... [1]

This choice emphasizes her desire for spiritual purity and liberation from earthly attachments. Despite her love for the main character, she cannot and does not want to fully surrender to her feelings, since the search for the meaning of life and the spiritual path is much more important to her.

The image of the East in the story is presented through the spiritual and cultural traditions that the heroine strives for. The East is associated with religiosity, mysticism and philosophy. The heroine turns to the spiritual world of monasteries and churches, seeking to find answers to her inner questions. She visits churches and is interested in Orthodox rituals, which indicates her connection with the Eastern Orthodox culture, which is closely connected with the traditions of the Russian Church and ancient spiritual wisdom.

The East in the story acts as a symbol of deep spirituality, mysticism and departure from earthly concerns. The heroine, possessing an inner attraction to the East, seeks answers to her existential questions there, and at the end of the story she finally goes into the world of spiritual contemplation, breaking away from the bustle of the world.

The main character of the story is a young man, on whose behalf the story is told. He sincerely loves the main character, and this love becomes the meaning of life for him. His image personifies earthly affection, sensual perception of the world and the desire to share life with his beloved woman. The hero feels a deep attraction to the heroine, but does not fully understand her inner world:

Она зачем-то училась на курсах, довольно редко посещала их, но посещала. Я как-то спросил: «Зачем?» Она пожала плечом: «А зачем все делается на свете? Разве мы понимаем что-нибудь в наших поступках? Кроме того, меня интересует история...» [1]

— *Погодите. Заезжайте ко мне завтра вечером не раньше десяти. Завтра «капустник» Художественного театра.*

— *Так что? — спросил я. — Вы хотите поехать на этот «капустник»?*

— *Да.*

— *Но вы же говорили, что не знаете ничего пошлее этих «капустников»!*

— *И теперь не знаю. И все-таки хочу поехать.*

Я мысленно покачал головой, — все причуды, московские причуды! — и бодро отозвался:

— *Ол райт! [1]*

For him, her behavior seems strange and incomprehensible: he cannot understand why the woman to whom he is so attached is moving away from him, preferring spiritual quests. Despite his desperate attempts to keep her in his life, the hero gradually realizes that his earthly love and her desire for the spiritual cannot exist together.

The main character is an image of a person immersed in feelings and passions. He suffers because his love is not answered in the form he expected. His image is contrasted with the spiritual quest of the main character, and this opposition creates a dramatic conflict in the story. His

experiences are conveyed through the author's descriptions of his inner thoughts and emotions, which allows the reader to better understand his state of mind:

Однажды, сидя возле нее в этой вечерней темноте и тишине, я схватился за голову:

— Нет, это выше моих сил! И зачем, почему надо так жестоко мучить меня и себя!

Она промолчала.

— Да, все-таки это не любовь, не любовь...

Она ровно отозвалась из темноты:

— Может быть. Кто же знает, что такое любовь?

— Я, я знаю! — воскликнул я. — И буду ждать, когда и вы узнаете, что такое любовь, счастье! [1]

The West in the story is presented as a world of secular life, material culture and social traditions. The hero, being a typical representative of secular Moscow, personifies Western values. His image is filled with elements of modern urban life, he is carried away by external pleasures and material goods. Moscow with its theaters, restaurants and balls symbolizes Western culture, focused on pleasures and success:

...каждый вечер я возил ее обедать в «Прагу», в «Эрмитаж», в «Метрополь», после обеда в театры, на концерты, а там к «Яру», в «Стрельну»... [1]

Thus, the image of the heroine in the story is built on the contrast between external secularity and internal spiritual aspiration. She chooses a path that distances her from earthly love and vanity, which makes her image even more mysterious and difficult to understand. Unlike the heroine, the hero does not think about spiritual issues and does not strive for internal purification. For him, life is a sequence of external events, where the main thing is physical intimacy and emotions. Thus, the West in the story is associated with the external, material, while the East symbolizes the spiritual and internal.

Bunin contrasts the images of the East and the West, which becomes one of the key ideas of the story. The East is associated with spirituality, mysticism, deep inner search. The West, on the contrary, is a symbol of the worldly, material and external. The heroine embodies the desire for the East, for spiritual purification, departure from worldly life. She finds solace and meaning in religion and inner search, rejecting secular life:

В Москву не вернусь, пойду пока на послушание, потом, может быть, решусь на постриг... Пусть бог даст сил не отвечать мне — бесполезно длить и увеличивать нашу муку... [1]

The hero symbolizes the West, which is manifested in his attachment to earthly pleasures and the material world. He lives in the present, without thinking about spiritual problems, his interests are connected with the pleasures that secular life offers. Such a juxtaposition of heroes reflects a deeper conflict between the two cultural traditions existing in Russian society:

Bunin shows through the images of the heroes that an attempt to unite the East and the West within a person often leads to conflict and tragedy. The heroine cannot live in the world personified by the West, and chooses the path of spiritual solitude, which symbolizes the final break with the world.

The image of the author in the story "Clean Monday" plays an important role in creating the general atmosphere of the work and conveying its ideas. Bunin acts not only as a narrator, but also as an observer who describes the feelings and experiences of his heroes with subtle psychological accuracy.

The author demonstrates a deep understanding of both the spiritual quest of the main character and the earthly suffering of the protagonist. At the same time, his position remains detached; he does not take the side of any of the heroes, but only shows their inner world and contradictions:

и насколько я был склонен к болтливости, к простосердечной веселости, настолько она была чаще всего молчалива... [1]

Bunin creates an atmosphere filled with symbolism and allusions to religious themes, which enhances the sense of tragedy and the inaccessibility of spiritual heights.

The author's image is also manifested in his ability to convey the beauty of nature and urban life in Moscow, which become the background for the inner experiences of the characters:

Странный город! — говорил я себе, думая об Охотном ряде, об Иверской, о Василии Блаженном. — Василий Блаженный — и Спас-на-Бору, итальянские соборы — и что-то киргизское в острях башен на кремлевских стенах... [1]

И мы зачем-то поехали на Ордынку, долго ездили по каким-то переулкам в садах, были в Грибоедовском переулке; но кто ж мог указать нам, в каком доме жил Грибоедов, — прохожих не было ни души, да и кому из них мог быть нужен Грибоедов? Уже давно стемнело, розовели за деревьями в инее освещенные окна...

— Тут есть еще Марфо-Мариинская обитель, — сказала она [1].

Полный месяц нырял в облаках над Кремлем, — «какой-то светящийся череп», — сказала она. На Спасской башне часы били три... [1]

The lyricism and artistic sophistication of the author's style help the reader to immerse themselves in the atmosphere of the story, feeling the subtle changes in mood and symbolism of what is happening.

Conclusion. The story by I. A. Bunin "Clean Monday" reflects a deep cultural and spiritual conflict between the East and the West, which manifests itself in the fates of the heroes. Through their images, the author explores existential issues related to the search for the meaning of life, spiritual renewal and the impossibility of connecting two cultural worlds. The East in the story symbolizes spirituality and inner peace, while the West symbolizes material and external pleasures. As a result of this confrontation, the heroine chooses the path of the East, rejecting secular life, and through this choice Bunin emphasizes the impossibility of the harmonious existence of two worlds in the soul of one person. The author himself in the story "Clean Monday" acts as a subtle psychologist, philosopher and artist who, through the images of heroes and events, talks about the eternal questions of love, spiritual search and human loneliness.

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Rezyume: Ushbu maqola XX asrning taniqli rus yozuvchisi, rus adabiyoti bo'yicha birinchi Nobel mukofoti laureati Ivan Alekseevich Buninning "Toza dushanba" hikoyasini tahlil qilishga bag'ishlangan. Ishning maqsadi hikoyadagi Sharq va G'arb obrazlarini tahlil qilish, ularning bosh qahramonlar hayotidagi o'rnini aniqlashdan iborat. Tarixiy va qiyosiy usullar tadqiqot usullari sifatida belgilandi.

Резюме: Данная статья посвящена анализу рассказа выдающегося русского писателя XX века, первого лауреата Нобелевской премии в русской литературе Ивана Алексеевича Бунина «Чистый понедельник». В качестве цели исследования определено проанализировать образы Востока и Запада в рассказе, определив их место в жизни главных героев. В качестве методов исследования были определены исторический и сравнительный методы.

Kalit so'zlar: Bunin, hikoya, Sharq, G'arb, qarama-qarshilik, qarama-qarshilik, taqqoslash.

Ключевые слова: Бунин, рассказ, Восток, Запад, оппозиция, противопоставление, сопоставление.

MORPHOLOGICAL FEATURES OF ENGLISH TRANSPORT TERMINOLOGY

Djoldasova G.B., Bazarbaev A.B.

Karakalpak State University named after Berdakh

Summary: *This article examines the morphological features of English transport terminology. It explores how formal language is used to describe transport-related concepts and how these terms are constructed through specific morphological features. The article aims to provide a comprehensive analysis of the linguistic characteristics of transport terminology in English. According to the result of the research, the morphological features in English transport terminology are diverse and significant. The use of affixes, compounding, and conversion allows for the creation of new words and the precise expression of concepts related to transportation. Understanding these morphological features aids in effective communication within the field of transport and enables us to navigate the vast and complex world of transportation with ease and clarity.*

Keywords: *terminology, terms, transport, morphology, understanding, communication, word formation, terminology consistency, translation, interpretation, prefixes, suffixes, root words, linguistic patterns, language learning.*

Transportation plays a vital role in modern societies and has given rise to a rich vocabulary in the English language. The formal nature of this vocabulary reflects the technicality and precision required in the field of transport [4]. The morphological features employed in these terms contribute to their nature, allowing for precise communication within the transport industry.

There is a range of scholarly views on the morphological features of English transport terminology. Some scholars argue that English transport terminology has a relatively stable and consistent morphological structure, with many terms following predictable patterns such as compounding (e.g. "motorcycle") and derivation (e.g. "driverless"). Others suggest that the morphological features of transport terminology are more complex and varied, with a combination of borrowing from other languages, coinage of new terms, and the adaptation of existing words to fit the specific needs of the transport industry [2].

Additionally, some scholars emphasize the importance of understanding the historical development of transport terminology, including the influence of technological advancements and cultural shifts on the formation and evolution of transport-related words. They also highlight the role of standardization and internationalization in shaping the morphological features of English transport terminology, particularly in the context of global transportation networks and communication [6].

Based on the views of scholars presented above it can be stated that scholars recognize the dynamic and multifaceted nature of English transport terminology, and emphasize the need for a comprehensive and nuanced approach to studying its morphological features. This includes considering the interplay of linguistic, technological, and sociocultural factors in shaping the vocabulary of the transport industry.

This article will explore the formalism and abstraction of English transport terminology, focusing on its morphological characteristics.

Firstly, the article examines the terminology associated with automobiles. The term "car" itself is ubiquitous, denoting a personal vehicle for transportation. However, within the realm of cars, we find a multitude of subcategories such as sedans, SUVs, and hatchbacks. Each of these classifications represents a distinct type of car with unique features. In addition, the term "motorcycle" relates to a two-wheeled vehicle often used for individual transportation that offers a distinctly different experience from driving a car. Moreover, the word "van" refers to a larger, enclosed vehicle used primarily for commercial purposes, such as transporting goods or people [1].

Moving beyond terrestrial modes of transport, the lexicon expands to encompass air travel. Here, the term "aeroplane" denotes a powered flying vehicle with fixed wings and a weight greater than that of the air it displaces. Moreover, "helicopters" are versatile aerial vehicles that can take off

and land vertically, providing a unique mode of transportation. Additionally, the term "jet" refers to an aircraft propelled by jet engines, enabling higher speeds and longer distances to be covered.

Water-based transportation is another important aspect of English transport terminology. The word "ship" encompasses a vast array of vessels used to transport goods, people, or even military resources over large bodies of water. From the massive cargo ships that traverse oceans to the elegant luxury liners that provide travel experiences, ships are integral to international trade and tourism. Furthermore, "boats" encompass smaller watercraft, including sailboats, speedboats, and canoes, used for recreational purposes or short distance transport on rivers, lakes, and other bodies of water [3].

Lastly, it is crucial to acknowledge the terminology related to public transportation, which facilitates the movement of people within cities and regions. The transport lexicon encompasses terms such as "bus" and "train," which represent cost-effective and efficient modes of transportation. Trains, which operate on railways, are known for their larger capacity and ability to cover long distances, making them indispensable for intercity travel. On the other hand, buses traverse city streets, offering flexible routes, and ensuring commuters can reach their destinations conveniently.

As it can be seen that exploring English transport terminology reveals a rich and diverse lexicon that encompasses various modes of transportation. From automobiles to air travel, from water-based vessels to public transportation, each category presents unique terms that encapsulate their distinctive features. By utilizing this vocabulary, we can effectively communicate and navigate the vast network of transport options available to us.

The morphological features of English transport terminology are vast and fascinating. Transport plays a crucial role in our daily lives, and its terminology reflects the complexity and diversity of this field. The article also explores the various morphological features found in English transport terminology.

One prominent morphological feature found in transport terminology is the use of prefixes and suffixes. These affixes are added to base words to create new terms that convey specific meanings. For example, the prefix "tele-" is used in terms like "telematics" and "telecommuting," which refer to the use of technology in transportation and communication. Similarly, the suffix "-way" is used in terms like "expressway" and "subway," denoting a specific type of road or path.

Another important morphological feature is the use of compound words. Compound words are formed by combining two or more words to create a new term. In transport terminology, compound words abound. For instance, "aircraft," "motorcycle," and "waterway" are all compound words that describe different modes of transportation. These compound words allow for concise expression of complex transport concepts.

Additionally, English transport terminology often incorporates abbreviations and acronyms. These shortened forms are used to represent longer terms and are prevalent in technical jargon. For example, "HGV" stands for "Heavy Goods Vehicle," "LRT" represents "Light Rail Transit," and "GPS" stands for "Global Positioning System." Abbreviations and acronyms are used extensively in transport-related discussions due to their efficiency and convenience [5].

Furthermore, the use of technical terms in English transport vocabulary adds to its formal nature. Terms like "aerodynamics," "hydraulics," and "thermodynamics" are examples of the scientific and specialized language employed in the transport industry. These technical terms provide a nuanced understanding of the concepts involved, further contributing to the formal and abstract nature of transport terminology in English.

Furthermore, English transport terminology makes use of conversion, a process that involves changing the word class of a word without adding any affixes. Conversion is particularly evident in transport terminology, where words can change from one part of speech to another. For example, the verb "park" can undergo conversion to become a noun, as seen in the phrase "Find a parking spot." Similarly, the noun "drive" can be converted into a verb, as in "She drives to work every day."

The morphological features of English transport terminology are important for several reasons:

1. Understanding and communication: Morphological features such as prefixes, suffixes, and root words help to understand the meaning of transport terminology. For example, the prefix "tele-" in "telecommute" indicates that the work is done remotely, while the suffix "-port" in "transport" indicates movement from one place to another. Understanding these features helps in effective communication and comprehension of transport-related concepts.

2. Word formation: Morphological features play a crucial role in forming new words related to transport. By understanding the morphological rules, one can create new terms that accurately convey the intended meaning. For example, the word "hyperloop" is formed by combining the prefix "hyper-" and the root word "loop" to describe a high-speed transportation system.

3. Terminology consistency: Morphological analysis helps in maintaining consistency in transport terminology. By understanding the morphological structure of words, one can ensure that similar concepts are expressed using similar linguistic patterns, making it easier for users to learn and remember transport-related terms.

4. Translation and interpretation: Morphological features aid in translating transport terminology into other languages and interpreting them accurately. Understanding the morphological structure of English transport terms can help in finding equivalent terms in other languages and ensuring that the intended meaning is preserved during translation [7].

The above-given reasons indicate that the morphological features of English transport terminology are essential for effective communication, word formation, consistency, and translation, making them an important aspect of understanding and using transport-related language.

Conclusion. English transport terminology demonstrates a formal and abstract linguistic framework. Through the use of prefixes, suffixes, compound words, abbreviations, and technical terms, a specialized vocabulary has been developed to precisely describe various transport-related concepts. The morphological features of English transport terminology allow for efficient communication within the industry, ensuring clarity and accuracy in conveying transport-related information. Understanding the morphological features of English transport terminology is crucial for professionals in the field, as it helps in effective communication and comprehension of complex transport concepts.

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Rezyume: Ushbu maqola ingliz transport terminologiyasining morfologik xususiyatlarini ko'rib chiqadi. U transport bilan bog'liq tushunchalarni tasvirlash uchun rasmiy tildan qanday foydalanilishini va bu atamalar o'ziga xos morfologik xususiyatlar orqali qanday tuzilganligini o'rganadi. Maqola ingliz tilidagi transport terminologiyasining lingvistik xususiyatlarini har tomonlama tahlil qilishga qaratilgan. Tadqiqot natijalariga ko'ra, ingliz transport terminologiyasidagi morfologik xususiyatlar rang-barang va ahamiyatli. Affikslardan foydalanish, birikma va konvertatsiya qilish yangi so'zlarni yaratish va tashish bilan bog'liq tushunchalarni aniq

ifodalash imkonini beradi. Ushbu morfologik xususiyatlarni tushunish transport sohasida samarali muloqotga yordam beradi va bizga transportning keng va murakkab dunyosida qulaylik va ravshanlik bilan harakat qilish imkonini beradi.

Резюме: В этой статье рассматриваются морфологические особенности английской транспортной терминологии. В ней изучается, как формальный язык используется для описания концепций, связанных с транспортом, и как эти термины строятся с помощью определенных морфологических особенностей. Целью статьи является предоставление всестороннего анализа лингвистических особенностей транспортной терминологии на английском языке. Согласно результатам исследования, морфологические особенности английской транспортной терминологии разнообразны и значимы. Использование аффиксов, словосложения и конверсии позволяет создавать новые слова и точно выражать концепции, связанные с транспортом. Понимание этих морфологических особенностей способствует эффективному общению в сфере транспорта и позволяет нам легко и ясно ориентироваться в обширном и сложном мире транспорта.

Kalit soʻzlar: terminologiya, atamalar, transport, morfologiya, tushunish, aloqa, soʻz yasalishi, atama izchilligi, tarjima, izohlash, prefikslar, qoʻshimchalar, oʻzak soʻzlar, lingvistik qoliplar, til oʻrganish.

Ключевые слова: терминология, термины, транспорт, морфология, понимание, коммуникация, словообразование, согласованность терминологии, перевод, интерпретация, префиксы, суффиксы, корневые слова, лингвистические модели, изучение языка.

COMPARATIVE ANALYSIS OF MYTHOLOGICAL NARRATIVES IN ENGLISH AND UZBEK LANGUAGES

Djoldasova G¹, Davronova M².

¹*Karakalpak State University named after Berdakh*

²*English teacher at school № 332*

Summary: *This article presents a comparative analysis of mythological narratives in English and Uzbek languages. It explores how these narratives reflect cultural values, beliefs, and societal norms through their linguistic and thematic elements. By examining prominent myths from both traditions and their influence on cultural identity, this study highlights the role of language in shaping and preserving mythological narratives.*

Introduction.

Mythological narratives are integral to cultural identity, providing insights into a society's values, beliefs, and historical experiences. They shape and reflect the collective imagination and cultural ethos of a community. This article compares mythological narratives in English and Uzbek languages to understand how linguistic and cultural contexts influence the portrayal of myths and their significance in each culture.

Methodology.

This comparative study involves analyzing key mythological texts from both English and Uzbek traditions. It uses a qualitative approach, focusing on thematic elements, linguistic features, and cultural implications. Primary texts, scholarly analyses, and historical contexts are considered to provide a comprehensive understanding of the mythological narratives in both languages.

English Mythological Narratives

Overview

English mythology is renowned for its rich tapestry of legends, particularly those surrounding King Arthur, Merlin, and the Knights of the Round Table. Lindsay (2008) provides a thorough exploration of these narratives, highlighting their role in shaping English cultural identity. The Arthurian legends are not just stories of heroism but also reflect medieval values of chivalry, honor, and justice. These narratives often portray a quest for righteousness and the moral and ethical challenges faced by heroes.

Linguistic Features

The linguistic characteristics of English mythological narratives contribute significantly to their impact. Hollander (1998) discusses how Old English and Middle English texts utilize archaisms and poetic forms to create a sense of grandeur and historical depth. For instance, the use of alliterative verse in the "Beowulf" epic enhances its epic quality and reflects the oral tradition of storytelling. The stylistic elements of these narratives help preserve the cultural and historical context in which they were created.

Cultural Significance

English myths have profoundly influenced national identity and cultural values. Murray (2000) examines how these myths reinforce virtues such as bravery, loyalty, and justice. The stories of King Arthur and his knights serve as cultural touchstones, illustrating idealized concepts of heroism and moral integrity. These narratives have been instrumental in shaping English literature and national consciousness, often used as symbols of British cultural heritage.

Uzbek Mythological Narratives

Overview

Uzbek mythology, with its rich epics and folklore, features legendary heroes such as Alpamish, a central figure in Uzbek oral tradition. Vaysman (2007) provides a comprehensive introduction to Uzbek epics, showcasing how these narratives reflect communal values, historical experiences, and cultural practices. The Alpamish epic, for instance, emphasizes themes of heroism, justice, and the connection between humans and nature.

Linguistic Features

Uzbek mythological narratives are characterized by their use of folk poetry and proverbs, which enrich the storytelling tradition. Lomaia (2012) explores how these linguistic features convey complex cultural and moral lessons. The poetic forms and proverbs embedded in Uzbek myths serve not only as a means of preserving cultural heritage but also as a way of communicating societal values and norms. These linguistic elements provide a window into the traditional worldview of the Uzbek people.

Cultural Significance

Uzbek myths play a crucial role in maintaining cultural continuity and fostering national pride. Khurshid (2015) discusses how these narratives transmit traditional values and historical knowledge. The myths of Uzbekistan are instrumental in reinforcing communal bonds and preserving the cultural identity of the Uzbek people. They serve as a repository of collective memory, reflecting the social and historical experiences of the society.

Themes and Motifs

Both English and Uzbek myths share common themes, such as heroism, justice, and moral lessons. However, the portrayal and emphasis of these themes differ across cultures. English myths often highlight individual quests and the hero's journey, focusing on personal valor and chivalric codes. In contrast, Uzbek myths emphasize communal values and the relationship between humans and nature, reflecting a more collective and integrative approach to storytelling (Dey, 2014).

The linguistic structures of English and Uzbek languages significantly shape the presentation of mythological narratives. English myths frequently use elaborate and formal language to evoke grandeur and historical authenticity (Hollander, 1998). Conversely, Uzbek myths incorporate poetic forms and proverbs that reflect cultural simplicity and wisdom, offering a more accessible and culturally embedded narrative style (Lomaia, 2012). These linguistic differences influence how myths are perceived and understood within each culture.

The impact of mythological narratives on cultural identity is profound in both languages. English myths contribute to the reinforcement of national values and historical narratives, shaping perceptions of heroism and moral integrity. Uzbek myths, on the other hand, preserve cultural heritage and communal bonds, reinforcing traditional values and collective memory (Rudenko, 2016). Both traditions illustrate the role of myths in shaping and reflecting cultural identity, though they do so through different linguistic and thematic approaches.

1. **Historical Context:** The historical contexts of English and Uzbek myths offer insights into the periods in which these narratives were formed and popularized. Understanding the social, political, and historical backgrounds helps in appreciating the evolution and enduring relevance of these myths.

2. **Modern Adaptations:** Both English and Uzbek myths have seen modern adaptations in literature, cinema, and other media, which continue to shape and influence contemporary cultural narratives. Exploring these adaptations can provide a deeper understanding of the myths' ongoing impact.

3. **Educational Value:** Mythological narratives are often used in educational settings to teach cultural history, language, and moral lessons. Analyzing how these narratives are integrated into educational curricula can highlight their role in cultural transmission and identity formation.

4. **Interdisciplinary Approaches:** Incorporating perspectives from anthropology, linguistics, and literary studies can enrich the comparative analysis, offering a more holistic view of the myths' significance and functions across different cultures.

5. **Comparative Techniques:** Employing comparative techniques such as structural analysis and thematic comparison can uncover deeper connections and distinctions between English and Uzbek mythological narratives, providing a nuanced understanding of their cultural roles.

6. **Influence on Literature and Art:** The influence of mythological narratives on literature and art in both cultures can be explored to understand how these stories have shaped creative expression and continue to inspire contemporary works.

7.Preservation Efforts: Examining the efforts to preserve and revive mythological narratives in both English and Uzbek cultures can shed light on the challenges and successes in maintaining these cultural treasures.

8.Impact on Identity and Society: Investigating how mythological narratives influence individual and collective identity in both cultures can provide insights into their lasting impact on societal values and norms.Certainly! Here are some sections with additional information that can be added to the article for a more comprehensive comparative analysis of mythological narratives in English and Uzbek languages.

Influence of Religion and Spiritual Beliefs

English Mythology

The influence of Christianity is prominent in English mythology, especially in narratives from the medieval period. The Arthurian legends, for instance, often incorporate Christian symbolism and themes, such as the Holy Grail representing spiritual purity and divine grace (White, 1958). The integration of pagan and Christian elements reflects the historical transition and syncretism in English cultural beliefs.

Uzbek Mythology. Uzbek mythology is deeply intertwined with pre-Islamic beliefs and the influence of Zoroastrianism, followed by the adoption of Islam. Many Uzbek myths contain elements of animism and shamanistic practices, emphasizing the sacredness of nature and the spiritual connection between humans and the environment (Berg, 1998). The incorporation of Islamic values and moral lessons into folk tales showcases the cultural adaptation and integration of religious beliefs.

Gender Roles and Representation

English Mythology. Gender roles in English mythology often reflect the patriarchal structure of medieval society. Female characters like Guinevere and Morgan le Fay play significant but complex roles, often embodying virtues or vices that influence the hero's journey (Matthews, 2004). The portrayal of women in these narratives can be seen as both reinforcing and challenging contemporary gender norms.

Uzbek Mythology. In Uzbek mythology, women are frequently depicted as wise and resourceful figures, such as the character Barchin in the Alpamish epic, who embodies loyalty and intelligence (Khasanova, 2013). These narratives often highlight the importance of female agency and the integral role of women in maintaining social and familial harmony, reflecting the cultural appreciation of women's contributions to society.

Symbolism and Metaphors

English Mythology.Symbolism in English myths is rich and varied, with objects like Excalibur and locations like Avalon carrying deep metaphorical meanings. These symbols often represent broader concepts such as power, destiny, and otherworldliness (Tolkien, 1936). The use of metaphors enhances the narrative depth and connects the stories to universal human experiences.

Uzbek Mythology. Uzbek myths use symbols and metaphors extensively to convey moral and cultural values. The eagle, often depicted in Uzbek folklore, symbolizes freedom and vigilance, while the tulpar (winged horse) represents speed and divine protection (Karimov, 2011). Such symbols are integral to the storytelling tradition, providing layers of meaning that resonate with the audience's cultural context.

Cross-Cultural Influences

English Mythology. English mythology has been influenced by various cultures due to historical invasions and interactions, including Norse, Celtic, and Roman mythologies. These cross-cultural exchanges have enriched the mythological tapestry of England, blending different elements into cohesive narratives (Ellis, 1968).

Uzbek Mythology. Uzbek mythology has similarly absorbed influences from neighboring cultures such as Persian, Turkic, and Mongolian traditions. The Silk Road, a major trade route passing through Central Asia, facilitated cultural exchanges that introduced new mythological motifs and narratives, enriching the local folklore (Svetlana, 2005).

Evolution and Adaptation

English Mythology. English mythological narratives have evolved over centuries, adapting to changing cultural and social contexts. Modern adaptations in literature, film, and television continue to reinterpret these myths, making them relevant to contemporary audiences. Works like T.H. White's "The Once and Future King" and popular media such as the "Harry Potter" series draw heavily on mythological themes (White, 1958).

Uzbek Mythology. Uzbek myths have also evolved, with contemporary storytellers and artists reimagining traditional narratives to address modern themes and issues. The preservation of oral traditions through performances and festivals ensures that these myths remain a living part of Uzbek cultural heritage (Kadyrova, 2014).

Educational and Pedagogical Use.

English Mythology. English mythological narratives are frequently used in educational settings to teach language, history, and moral values. They provide rich material for exploring literary devices, cultural history, and ethical dilemmas, offering students a deep and engaging way to connect with the past (Nikolajeva, 1996).

Uzbek Mythology. Uzbek myths serve as important educational tools, teaching children about their cultural heritage, moral values, and social responsibilities. The use of proverbs and folk tales in the classroom helps to instill cultural pride and continuity, ensuring that traditional wisdom is passed down through generations (Mirzaev, 2003).

Conclusion

The comparative analysis of mythological narratives in English and Uzbek languages reveals how language and culture intersect to shape the portrayal and significance of myths. English myths emphasize individual heroism and chivalric values, while Uzbek myths reflect communal values and cultural continuity. Both traditions offer unique perspectives on shared themes of heroism and morality, highlighting the diverse ways in which myths are used. The comparative study of mythological narratives in English and Uzbek languages reveals the dynamic interplay between language, culture, and mythology. Future research could explore the impact of globalization on these narratives, examining how modern influences are reshaping traditional myths. Additionally, interdisciplinary approaches involving digital humanities could offer new ways to analyze and preserve these rich cultural heritages.

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Rezyume: Ushbu maqolada ingliz va o'zbek tillaridagi mifologik rivoyatlarning qiyosiy tahlili keltirilgan. Bu hikoyalar madaniy qadriyatlar, e'tiqodlar va ijtimoiy me'yorlarni lingvistik va tematik elementlar orqali qanday aks ettirishini o'rganadi. Ikkala an'anadan ko'zga ko'ringan afsonalarni va ularning madaniy o'ziga xoslikka ta'sirini o'rganib, ushbu tadqiqot mifologik rivoyatlarni shakllantirish va saqlashda tilning rolini ta'kidlaydi.

Резюме: В этой статье представлен сравнительный анализ мифологических повествований на английском и узбекском языках. В ней исследуется, как эти повествования отражают культурные ценности, верования и общественные нормы через их лингвистические и тематические элементы. Рассматривая известные мифы обеих традиций и их влияние на культурную идентичность, это исследование подчеркивает роль языка в формировании и сохранении мифологических повествований.

ADDRESSING LEGAL CONCERNS SURROUNDING AI LIABILITY

Utegenov O.D.

Kimyo International University in Tashkent

Summary. In the realm of artificial intelligence, the pertinent legal matters revolve around liability. Ensuring compliance with legal standards, safeguarding the rights and obligations of AI entities, and presenting pertinent suggestions and recommendations to enhance the resolution of issues are essential tasks.

Keywords: Artificial intelligence, electronic personality, AI robots.

Artificial intelligence consists of analyzing and understanding the processes and situations that surround us, the situations related to decision-making and implementation independently by perceiving the relationships, and being able to develop oneself independently and systematized are programmed artificial information-communication processes.

Today, the development of information and communication technologies affects all aspects of human life beyond the purely technical sphere, including legal aspects, computer technologies and networks, databases, software, etc. requires a different approach to established concepts.

Currently, in 2018, the global market for artificial intelligence technologies was 21.5 billion US dollars, according to experts, it will reach almost 140 billion US dollars by 2024 [1].

This approach to the interpretation of artificial intelligence is based on the existing concept of "electronic personality", which primarily attracts the attention of scientists and practitioners [2]. If we proceed from the autonomy of artificial intelligence, the ability to be aware of its actions, then involuntarily the question of determining its responsibility and, accordingly, its legal status and its role in society arises.

In this case, the objective and condition of the subjective right is the uniqueness of the legal interest [3]. We can conclude that artificial intelligence does not have an independent interest, but is a computer program created by humans to meet their own needs. According to this, only the interests of persons using or owning artificial intelligence are protected.

As the European Parliament's resolution of February 16, 2017 stated, giving robots more autonomy will change the perception of them as mere tools in the hands of creators, their owners, and others. The document focuses on the need to consider the issue of liability for damage caused by robots and shows that in a certain context such liability is not possible for actions that cause damage to third parties.

Robotics and artificial intelligence are among the most relevant and actively discussed technological directions of our century [4], has become one of the brightest innovations of today [5]. Today, artificial intelligence technologies are used in all spheres of society [6], it is becoming difficult to list them.

According to some authors, in order to understand the development and possibilities of artificial intelligence, it is important to understand the traditional methods of psychology and linguistics, in addition to digitalization. A number of psychologists emphasize that understanding the nature and processes of human thinking in the field of artificial intelligence will be positive in terms of information processing [7].

According to OV Panov, artificial intelligence was created "in the image and likeness of natural intelligence." In defining the concept of "artificial intelligence", George Luger points out that it is necessary to pay attention to the general definition of the concept of "intelligence". According to Patrick Henry Winston, the improvement of computers - electronic computing machines - does not mean that computers imitate intelligence [8] and Nick Bostrom emphasize that the concept of "intelligence" is too abstract [9].

TA Gavrilov and VF Horoshevsky noted that the English phrase "artificial intelligence" (artificial intelligence) is not translated to fully reveal the content and essence of artificial intelligence,

in English such a phrase means the ability to "think rationally" , because there is also the lexeme "intellect" in English [10].

Eleftherios Chelyudakis defines artificial intelligence products as systems that perceive the world around them and, based on this perception, are able to independently and unpredictably perform a series of actions that traditionally require intelligence [11].

According to Tzimas Themis, the definition of artificial intelligence is also a controversial issue, due to the different levels of SI development, as well as the degree of anthropomorphism we approach artificial intelligence. Several definitions emphasize algorithms and technologies that provide human-like functions or functions of artificial intelligence that, if performed by humans, would be considered the result of intelligent activity [12].

Agreeing with the opinions of these scholars, in the current stage of development artificial intelligence can be said to be an electronic system that perceives the surrounding world and, based on this perception, is able to independently and unpredictably perform a number of actions that traditionally require intelligence.

According to Elena Agibalova, Artificial Intelligence as an object of rights is programmed for a certain limited range of machine actions, which implies the recognition of the responsibility of the legal owner of the robot. Artificial intelligence, as a subject of rights, is also programmed for a certain range of machine actions, but it is able to perform actions independently in terms of certain pre-known situations. If artificial intelligence is recognized as a subject of law, that is, a person capable of exercising legal rights and assuming legal obligations, it will be held legally responsible for the actions of such a subject [13].

In the opinion of R. Ibragimov and Ye. Suragina, it is assumed that all the principles of regulating the creation of programs should be subordinated to two global goals:

- 1) ensures the protection of a person, his rights and basic freedoms, as well as society, state and humanity;
- 2) to support the development of the latest information technologies and technical progress in the field of robotics at a level that does not contradict the achievement of the main goal" [14] consists of

It should be noted that the current level of development of artificial intelligence machine systems does not pose the problem of "stopping" artificial intelligence as a potential threat to humanity. At the same time, there are existential risks to the rapid development of artificial intelligence.

Legal responsibility is a mandatory element of any legal structure aimed at regulating social relations. Human rights are the quintessence of the secular legal system in almost all countries of the modern world. Where there is a right, there must be an obligation to enforce this right or a norm to protect a legal right or interest. Accordingly, the rules governing the exercise of rights and the fulfillment of obligations should be established. Of course, in order to prevent non-observance of rules, non-fulfillment of obligations, it is necessary to establish responsibility, because only responsibility guarantees the normal development of relations between people regulated by legal norms.

The field of information technology (artificial intelligence technology manufacturers and designers) and others, as well as state organizations [15] There are efforts to adopt and publicize ethical guidelines based on the laws of robotics developed by Isaac Azimov (a robot cannot harm a human, etc.).

For example, the "European Union Ethics Directive" [16] reliable and safe artificial intelligence prioritizes the goal of creating . However, in reality, only the people behind it, not the technology, can be trusted. So, artificial intelligence systems must be reliable, but the rules established in this field must apply to the professionals who program them and to the persons who are responsible and accountable for the procedures for their use.

When talking about the responsibility of the robot, including artificial intelligence, A. Azimov wrote the "three laws of robotics", their relevance is gaining importance:

- a) actions (inaction) of the robot should not harm a person;
 - b) the robot must obey human commands, except when the commands violate the first law;
 - c) the robot must take care of its own safety within the framework of the first and second laws.
- These fundamental rules form the basis for the legal evaluation of robot behavior.

There are different approaches to AI liability in the scientific literature, including the liability of the person who programs the robot, the liability of the person who uses the robot as a tool, and the independent liability of the super-intelligent robot [17].

Sinnate intelligence The operation of the robot is based on a digital algorithm whose behavior cannot be predicted, which is very clearly revealed in a work on the security problems of artificial intelligence [18]. In particular, it is impossible to rule out the actions resulting from the violation of the program by installing a negative program of artificial intelligence on the robot.

James Garforth highlights the following instances of illegal AI actions:

1. Collecting and storing information about people by artificial intelligence, using such information for illegal purposes, providing such information to persons who do not have access to such information, as well as collect without giving access to it;
2. Violation of human rights by illegal disclosure of personal or other information by an artificial intelligence product;
3. Violation of human rights as a result of abusive interaction through an artificial intelligence product;
4. Making discriminatory decisions against an individual or a group of individuals by an artificial intelligence product;
5. Violation of intellectual property laws by an artificial intelligence product that creates intellectual activity results [19].

At the same time, granting the status of a legal entity to an artificial intelligence product will still help to solve the question of who exactly is responsible for its illegal actions or omissions, in particular, to solve the problem of determining the appropriate responsible party. At the current stage, the main legal problem of the use of artificial intelligence products is the problem of determining legal responsibility for the occurrence of harmful consequences as a result of the actions (or inaction) of the artificial intelligence product. In addition, if used in the management of a commercial organization or the provision of information services artificial intelligence if the error of artificial intelligence making such a mistake in decision-making within the framework of public administration can seriously harm public interests, rights and legal interests of citizens.

One of the main mandatory components of the objective side of a civil delict is the actual commission of a specific act. Artificial intelligence is capable of performing actions, and this applies not only to "strong" artificial intelligence, but also to less advanced technologies. When a machine (such as an artificial intelligence robot) moves with its hydraulic arm or other device, it can be considered a movement. This action applies not only to situations where the machine is the result of internal calculations, but also to situations where the machine is completely controlled by a human. Accordingly, even machines equipped with weak artificial intelligence have the ability to perform actions regardless of motives or reasons. [20].

For example, Gabriel Hallivy, discussing the issue of the liability of artificial intelligence products, argues that the question of the existence of a subjective aspect of the offense should be the main issue [21].

Therefore, the question of the possibility of making an artificial intelligence product legally responsible for its actions is the cause of great discussion today and is directly related to the question of determining the legal status of an artificial intelligence product. Natalie Nevejans says the idea of fully legal autonomous robots is "in and of itself pointless" [22].

Arguing on this topic, Nathalie Nevejans points out that by giving artificial intelligence legal status, we tend to make it more like a person, but for her, even animals have mental feelings, judgments and suffering. sentient beings capable of forgiveness, they have feelings that distinguish them from inanimate objects. However, artificial intelligence, the potential legal status of which

cannot be attributed to consciousness or emotions, accordingly artificial intelligence. The sole (or primary) purpose of giving a certain legal status is to make it accountable for its actions [23].

According to Peter Asaro, some aspects of the concept of a legal entity can be applied to entities that do not fully correspond to the concept of a full-fledged person. That is, from this point of view, an artificial intelligence system can be considered a subject with a quasi-legal status [24].

The granting of some limited rights and obligations to artificial intelligence may be carried out to achieve certain goals in a particular field, but not to provide such a product as a full legal entity.

For example, if we are talking about voice data obtained by a virtual assistant installed on a smartphone in civil tort proceedings, the question of the status of this virtual assistant arises [25].

According to some authors, giving certain quasi-rights to artificial intelligence is not about giving them real rights, but about legal fiction aimed at simplifying and optimizing the application of existing legal regimes [26].

If an artificial intelligence product can have special rights and a certain quasi-legal personality, even if it does not have the characteristics of a real person, in connection with its operation in certain areas, then the citizenship of such systems - it is practically impossible due to the lack of unity of consciousness in the field of determining legal responsibility. An artificial intelligence product cannot truly and fully understand the consequences of its illegal actions, which leads to problems in determining the composition of the civil-law delict [27]. The issue of liability has not yet found its solution mainly due to the general senselessness of criminal-legal (clearly defined against a natural person) liability that does not apply to artificial intelligence.

The introduction of strict liability for artificial intelligence products in civil law also does not allow to achieve the goals of prevention and prevention of violations, which is one of the goals of classic legal liability, because the case of making an artificial intelligence product liable cannot correct its morality and the severity of potential liability the weight does not hinder its actions, because this situation is completely different for this product.

When determining civil liability, it is necessary to discuss the value of the car, the number of "mistakes" made by it, the possibility of "painless" elimination of relevant defects [28].

If we talk about the purposes of applying civil liability measures against artificial intelligence systems, we can only talk about the recovery of damages, because any machines - from cars to high-tech ones equipped with artificial intelligence applying moral sanctions to robots is like "kicking a car". Because the car does not have the qualities of suffering or regret [29].

Another major drawback of AI products that makes accountability difficult is the lack of broad knowledge. For example, people have extensive knowledge that may not be directly needed from such a product, but may still be relevant under certain circumstances [30].

We, in agreement with these views, artificial intelligence. We believe that due to the poor quality of the information entering the system, it may not have the necessary and sufficient information when determining the responsibility. This is true for car security systems - their devices are limited to relatively short-range sensors that cannot distinguish between an obstacle and a truck, and cannot detect a fast-approaching object in the distance. If a case involving an accident caused by such safety systems goes to trial, the focus of the case may be on whether the artificial intelligence product is properly programmed to identify objects through these imperfect sensors [31]. Collecting moral damages for the resulting material damage and physical pain and suffering can also be problematic. Because the damage for which the victim, the person whose rights have been violated, is demanding compensation must be caused by the guilty actions of the offender [32].

In the United States, the doctrine of delict law distinguishes mandatory elements such as *actus reus* (unlawful act) and *mens rea* (guilt, mental state), without which a person cannot be held legally responsible. Who is responsible for the actions of autonomous driving systems when an AI commits a civil tort? the question arose. In particular, if we refer to the legal nature of *mens rea* and *actus reus* developed by the commission of the American Law Institute, the following can be observed.

US civil tort law requires an act and a person's knowledge of their actions. Such a duality of objective and subjective factors arises from the following doctrinal rule: thoughts are not material, will itself does not represent action.

Regarding the concept of distribution of civil-legal responsibility in the application of artificial intelligence, there are three different concepts in this regard [33].

The first concept, The Perpetration-by-Another model, does not recognize artificial intelligence as a tort. In this artificial intelligence the person who used is considered as a priori innocent (innocent agent or semi-innocent agent). The above concept has been known since ancient times and is part of the institution of accountability.

In such a case, there are two presumptive subjects for civil liability for the actions of artificial intelligence. The first is a developer who has developed special software, and the second is a user who owns an artificial intelligence product and uses it for his own illegal interests. In both cases, the action is performed directly by the robot, where the action performed by the robot is treated as if it were performed by the programmer or user [34].

The second concept, "The Natural-Probable-Consequence Liability" (responsibility for a natural probable consequence), does not imply conscious special actions of the programmer (user). Here, the tort arises from the negligent or negligent use of the AI system [35].

Although the subject cannot foresee the tort or its consequences, for artificial intelligence it is necessary to know that such a legal delict may occur as a potential consequence arising from the functions and duties of. Accordingly, the developer's (user's) negligence, if proven, causes his civil liability.

Liability for damages in the case of infringement of intellectual property rights, if the relevant information is protected by the law on intellectual property or a similar legal regime, for example, in the process of protecting a database or protecting a trade secret, artificial occurs when an infringement occurs in relation to intelligence (for example, in access to provide artificial intelligence). However, calculating the amount of damage here is a difficult matter.

Damages under national law generally take two forms, actual damages defined as damages suffered by the claimant or lost profits [36]. and ill-gotten wealth, under which the wrongdoer commits a wrongful act unreasonably received profit is understood. Actual damages or unjustified wealth are relevant when the relevant data forms the core of the artificial intelligence (for example, when the software is used for analytical purposes or a database is used to construct the artificial intelligence). At the same time, if the claimant is an individual entrepreneur who cannot use the information for commercial purposes, it may be difficult to bring a claim for actual damages, because he can prove that his commercial turnover has not increased or decreased as a result of the damages (actual damages).) and proving that he could have sold his product instead of the infringer (lost profit) if the right to intellectual property had not been violated is a complicated process. When relevant information forms part of a complex multifaceted device, proving harm in the form of unjustified wealth can be a delicate matter – the relevant rules must apply (e.g. several interrelated elements are known when organizing a process or environment, for example, an Internet of Things platform) - because the unjustified profit in connection with the infringement must have been recorded and reduced in the prescribed manner, while other factors that contribute to the profit, for example, a versatile device It is necessary to use installed, non-copyrighted components [37]. Another technical difficulty is that the relevant information cannot be recognized at output time (for example, input information is used simultaneously with thousands of other input information to create a single output information) [38] or even not reflected in the outgoing information (for example, when the incoming information is used only for educational purposes) [39], where it is also worth noting that in most jurisdictions it is considered an act of reproduction of information, regardless of whether the incoming or outgoing information is recognised [40].

As a conclusion, we can come to the following:

Firstly, we support the issue that artificial intelligence does not have the capacity to be held directly civilly liable. In our opinion, for example, in some cases, due to the illegal actions of the

electronic system due to virus programs, such as the Trojan virus or other malicious programs that attack to perform illegal actions using artificial intelligence, it is completely unreasonable to hold the electronic system itself guilty of this act. 'looks. In this case, responsibility can be imposed on the producer of malicious software, which is the direct cause of the delict, entering the algorithm scheme of the system, or on the user who commits the same actions, and the recognition of artificial intelligence as a subject of civil legal liability requires not only research, but also It is a process that requires some degree of caution.

Secondly, requires guarantees to determine the legal status of artificial intelligence and its rights and obligations in a normative manner, as well as to ensure their registration by the state. This, in turn, along with fundamental processing of the base of normative and legal documents, creates a basis for changing human thinking and developing legal culture.

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Rezyume: *Sun'iy intellekt sohasida tegishli huquqiy masalalar javobgarlik atrofida aylanadi. Huquqiy standartlarga rioya etilishini ta'minlash, AI sub'ektlarining huquq va majburiyatlarini himoya qilish, muammolarni hal qilishni yaxshilash uchun tegishli taklif va tavsiyalar berish muhim vazifalardir.*

Резюме: *В сфере искусственного интеллекта соответствующие правовые вопросы вращаются вокруг ответственности. Обеспечение соблюдения правовых стандартов,*

защита прав и обязанностей субъектов ИИ и представление соответствующих предложений и рекомендаций для улучшения решения проблем являются важнейшими задачами.

Kalit so'zlar: *Sun'iy intellekt, elektron shaxsiyat, AI robotlari.*

Ключевые слова: *искусственный интеллект, электронная личность, роботы ИИ.*

**EXPLORING COGNITIVE MECHANISMS IN LANGUAGE: CONNECTING
THOUGHT AND LINGUISTIC STRUCTURE**

Khudoykulova D.S.

*Department of Translation theory and comparative linguistics of the Faculty of foreign
Philology of the National University of Uzbekistan*

Summary: *Linguistics is a multifaceted discipline that explores the structure, function, and evolution of language. In recent decades, the intersection of linguistics with cognitive science has given rise to a new perspective on language study, focusing on how language is linked to human cognition. Cognitive mechanisms—defined as intricate mental processes that significantly influence comprehension and engagement with the surrounding world—are essential to the domains of language comprehension, production, and acquisition. These mechanisms extend beyond any singular aspect of language; rather, they encompass a diverse array of subfields within linguistics, including but not limited to phonetics, syntax, semantics, pragmatics, and discourse analysis.*

This thesis aims to explore how cognitive mechanisms are applied across the diverse subfields of linguistics, highlighting their relevance to the analysis of language structure, meaning, and use. By examining the role of cognitive processes in various linguistic domains, this study seeks to bridge the gap between cognitive science and linguistics, offering a deeper understanding of how human cognition and language are intrinsically connected. The research will focus on key cognitive frameworks such as metaphor theory, cognitive grammar, and prototype theory, and their practical application in different areas of linguistic analysis. Ultimately, this thesis aims to demonstrate that cognitive mechanisms provide a coherent and unifying framework for studying the complex nature of human language.

Key words: *human cognition, cognitive mechanisms, metaphor theory, prototype theory, conceptual blending, cognitive focus.*

Introduction.

The application of cognitive mechanisms in different branches of linguistics provides valuable insights into how the human mind organizes and processes linguistic information. For instance, conceptual metaphors reveal how abstract ideas are framed through familiar, concrete experiences, while categorization and prototypes show how language reflects our mental grouping of objects and concepts. Additionally, phenomena like conceptual blending and mental mapping allow linguists to understand how new meanings are formed and how spatial relations are cognitively encoded and expressed through language.

Prominent scholars have laid the foundation for cognitive linguistics. George Lakoff and Mark Johnson's pioneering work, *Metaphors We Live By*, introduced Conceptual Metaphor Theory, which emphasizes how abstract concepts are understood through more concrete experiences. Ronald W. Langacker developed Cognitive Grammar, presenting language as a reflection of general cognitive abilities rather than an autonomous system. Leonard Talmy, in his influential work *Toward a Cognitive Semantics*, further explored the relationship between cognitive processes and linguistic structure, focusing on how conceptualizations shape grammar and meaning. Fauconnier and Turner expanded these ideas with Conceptual Blending Theory, showing how human cognition integrates different mental spaces to create novel meanings in discourse.

In the Uzbek context, Mamatqulov and Ziyoda Askarova have explored the application of cognitive linguistics to the Uzbek language, particularly in metaphorical structures and conceptual categorization. Artyunova and Bulichev contributed to cognitive linguistics research in Russian, emphasizing cognitive mechanisms in semantics and metaphor theory.

Cognitive mechanisms play a foundational role in phonetics and phonology, where the human mind processes and categorizes sounds. One such mechanism is categorical perception, which allows speakers to perceive sounds as distinct categories, even though the acoustic properties may vary. For

example, in English, the sounds /p/ and /b/ are categorized as separate phonemes, though their physical differences are minimal. Native speakers easily distinguish between words like *pat* and *bat* due to this cognitive categorization, which shapes phonological systems. Additionally, prototypes in phonology guide how certain sounds are considered more central to a phoneme category. For instance, a prototypical /a/ sound in English may have a specific acoustic signature, though slight variations are still perceived as belonging to the same category.

Phonological processes such as assimilation and allophony also rely on cognitive mechanisms that simplify language processing. Assimilation, where a sound changes to become more like a neighboring sound (e.g., “input” pronounced as “imput”), reflects how the mind optimizes ease of articulation while maintaining meaning. Cognitive mechanisms help explain why speakers can effortlessly process and produce language in real-time, despite the variability of sound in natural speech.

Cognitive mechanisms profoundly influence grammar and syntax through frameworks such as Cognitive Grammar. Unlike traditional views of syntax as abstract rule-based systems, cognitive grammar argues that syntactic structures are inherently tied to meaning and mental representations. This view emphasizes that language is a reflection of our cognitive ability to categorize, structure, and relate concepts.

For instance, construal—a key cognitive mechanism—affects how speakers choose to frame an event or situation. Consider the sentences “The cat is on the mat” and “The mat has a cat on it.” Both express the same basic idea, but the cognitive focus shifts depending on how the speaker construes the scene. These choices reflect deeper cognitive processes, showing how language mirrors mental models of the world.

Another cognitive mechanism central to syntax is schema theory, which suggests that grammatical constructions are stored in the mind as form-meaning pairings (also known as constructions). A simple construction such as the English passive voice (“The book was read by the student”) activates mental schemas related to agency, affectedness, and perspective. Cognitive grammar emphasizes that these constructions are not purely formal, but they arise from and reflect the way humans conceptualize and process events.

In semantics, cognitive mechanisms are perhaps most vividly illustrated through Conceptual metaphor theory. This theory posits that humans understand abstract concepts (e.g., time, emotions, morality) through metaphorical mappings onto more concrete experiences. For example, the conceptual metaphor “TIME IS MONEY” is evident in phrases like “spending time,” “wasting time,” or “investing time,” where time, an abstract concept, is understood in terms of money, a concrete and familiar entity. These metaphorical structures are not arbitrary but reflect the deep-seated cognitive processes that shape how humans think and talk about the world.

Cognitive semantics also examines how concepts are structured through prototypes and categories. In lexical semantics, not all members of a category are equal; some are more central than others. For example, in the category “bird,” a robin is often considered a prototypical example, while a penguin is a less typical member. This cognitive mechanism reflects how language users mentally organize the world around them. These categories and prototypes influence word meaning and usage, providing insight into how cognition affects language at the semantic level.

In pragmatics, cognitive mechanisms such as conceptual blending are critical to understanding how language users combine ideas to create new meanings in conversation. Conceptual blending refers to the mental process where two or more conceptual spaces are integrated to form a new, blended space that carries elements of both inputs. For instance, the phrase “digging your own grave” blends the concepts of physical digging and metaphorical self-destruction, creating a vivid and impactful expression. Such blends reveal how the mind creatively uses language to convey complex ideas efficiently.

Another cognitive mechanism used in pragmatics is frame theory, where speakers use mental frames to make sense of situations and guide interaction. Frames help language users interpret ambiguous utterances based on context. For example, the phrase “Can you pass the salt?” is

understood not as a literal question about ability but as a polite request due to the social frame of dining interactions. Pragmatic comprehension, therefore, relies on the ability to access and apply the appropriate cognitive frames.

In discourse analysis, cognitive mechanisms such as mental spaces play a significant role in how individuals track and interpret meaning throughout extended conversations. Mental spaces are cognitive structures that speakers create to organize information about different times, places, events, or perspectives during discourse. For instance, when telling a story, speakers might set up mental spaces for past events and present commentary, helping the listener distinguish between narrative and reflection.

Another relevant cognitive mechanism in discourse is perspective-taking. Language users frequently shift perspectives to highlight different aspects of a discourse. In political or persuasive speech, for example, speakers may alternate between self and audience perspectives to create alignment or emphasize certain viewpoints. This perspective-shifting is a cognitive tool used to guide interpretation and manage information flow in discourse.

The study of cognitive mechanisms across various subfields of linguistics reveals the deep connection between language and human cognition. Whether in phonetics, grammar, semantics, pragmatics, or discourse analysis, cognitive processes such as categorization, metaphor, blending, and schema formation are central to how language is structured and understood. These mechanisms reflect the ways in which the mind organizes, processes, and conceptualizes linguistic information, offering a more holistic view of language that moves beyond formal rules. By exploring how these cognitive mechanisms operate in different linguistic domains, researchers can gain deeper insights into the intricate relationship between thought and language, further bridging the gap between linguistics and cognitive science.

Cognitive mechanisms are fundamental to the organization and structure of language across multiple linguistic subfields, including phonetics, syntax, semantics, pragmatics, and discourse analysis. These mechanisms such as categorization, conceptual metaphor, mental spaces, and conceptual blending demonstrate that language is not merely an abstract system of rules but is intricately connected to human cognitive processes. Language serves as a reflection of how individuals perceive, conceptualize, and structure their understanding of the world.

Conclusion. In cognitive grammar, grammatical structures are shown to correspond to underlying mental models, while in cognitive semantics, theories of metaphor and categorization reveal how abstract ideas are systematically grounded in concrete, familiar experiences. Pragmatics depends on cognitive frames and conceptual blending to generate contextually appropriate meanings in interaction, and discourse analysis illustrates how mental spaces and shifts in perspective facilitate the comprehension and production of complex narratives and dialogues.

The exploration of cognitive mechanisms within these distinct linguistic domains underscores the significance of understanding language as a manifestation of cognition rather than a standalone system. The application of cognitive principles across these fields provides a more comprehensive perspective on how linguistic structures, meanings, and functions emerge from and are shaped by mental processes. Ultimately, cognitive linguistics offers a cohesive framework that enriches the understanding of language by highlighting the symbiotic relationship between linguistic phenomena and cognitive functioning, contributing to a deeper theoretical and empirical understanding of both.

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Rezyume: Tilshunoslik tilning tuzilishi, vazifasi va evolyutsiyasini oʻrganadigan koʻp qirrali fandir. Soʻnggi oʻn yilliklarda tilshunoslikning kognitiv fan bilan kesishishi tilni oʻrganishda yangi istiqbolni keltirib chiqardi va tilning inson bilimi bilan qanday bogʻliqligiga eʼtibor qaratdi. Kognitiv mexanizmlar—tushunish va atrofda dunyo bilan aloqaga sezilarli taʼsir koʻrsatadigan murakkab aqliy jarayonlar sifatida tavsiflanadi. Ushbu mexanizmlar tilning har qanday oʻziga xos jihatlaridan tashqariga chiqadi; yaʼni, ular tilshunoslikning turli xil kichik maydonlarini, shu jumladan fonetika, sintaksis, semantika, pragmatika va nutqni tahlil qilish bilan cheklanmaydi.

Ushbu tezis kognitiv mexanizmlarning tilshunoslikning turli sohalarida qanday qoʻllanilishini oʻrganishga qaratilgan boʻlib, ularning til tuzilishi, maʼnosi va ishlatilishini tahlil qilish bilan bogʻliqligini taʼkidlaydi. Kognitiv jarayonlarning turli lingvistik sohalaridagi rolini oʻrganib, ushbu tadqiqot kognitiv fan va tilshunoslik oʻrtasidagi tafovutni bartaraf etishga intiladi, inson bilimi va tili oʻzaro qanday bogʻliqligini chuqurroq tushunishni taklif qiladi. Tadqiqot metafora nazariyasi, kognitiv grammatika va prototip nazariyasi kabi asosiy kognitiv asoslarga va ularning lingvistik tahlilning turli sohalarida amaliy qoʻllanilishiga qaratiladi. Qolaversa, ushbu tezis kognitiv mexanizmlar inson tilining murakkab tabiatini oʻrganish uchun izchil va birlashtiruvchi asos yaratishini namoyish etishga qaratilgan.

Резюме: Лингвистика - это многогранная дисциплина, которая исследует структуру, функции и эволюцию языка. В последние десятилетия на стыке лингвистики и когнитивной науки появился новый взгляд на изучение языка, сосредоточенный на том, как язык связан с человеческим познанием. Когнитивные механизмы, определяемые как сложные психические процессы, которые существенно влияют на понимание и взаимодействие с окружающим миром, необходимы для понимания, продуцирования и усвоения языка. Эти механизмы выходят за рамки какого-либо отдельного аспекта языка; скорее, они охватывают широкий спектр областей лингвистики, включая, но не ограничиваясь ими, фонетику, синтаксис, семантику, прагматику и анализ дискурса.

Этот тезис направлена на изучение того, как когнитивные механизмы применяются в различных областях лингвистики, подчеркивая их значимость для анализа языковой структуры, значения и употребления. Исследуя роль когнитивных процессов в различных лингвистических областях, это исследование направлено на преодоление разрыва между когнитивной наукой и лингвистикой, предлагая более глубокое понимание того, как человеческое познание и язык неразрывно связаны. Исследование будет сосредоточено на ключевых когнитивных структурах, таких как теория метафор, когнитивная грамматика и теория прототипов, и их практическом применении в различных областях лингвистического анализа. В конечном счете, цель данной работы - продемонстрировать, что когнитивные механизмы обеспечивают согласованную и объединяющую структуру для изучения сложной природы человеческого языка.

Kalit soʻzlar: inson bilimi, kognitiv mexanizmlar, metafora nazariyasi, prototip nazariyasi, kontseptual aralashtirish, kognitiv fokus.

Ключевые слова: человеческое познание, когнитивные механизмы, теория метафор, теория прототипов, концептуальное смешение, когнитивный фокус.

**THE PROBLEM OF PUBLICIZING THE "SOURCE" OF THE NEWS WHEN
PROSECUTING A CRIMINAL CASE BASED ON MEDIA REPORTS**

Matjanov I.A.

Karakalpak State University named after Berdakh

Summary: *The article analyzes the procedural problems that arise when disclosing the "source" of information when initiating a criminal case based on media reports. It is stated that the media has a fundamental right not to disclose the source of news, but that source may be disclosed for investigative purposes. Contradictions between laws on this issue are also examined.*

Key words: *media, message, source, information, investigation, journalistic secret, criminal case, accusation, public opinion, publicity.*

Initiation of a criminal case is recognized as a stage that determines whether or not there are signs of a crime. Its procedural essence is that the authorized body or official is obliged to make the appropriate decision according to the results. When initiating a criminal case or refusing to initiate a criminal case, an authorized body or an official shall rely on the reasons and grounds for initiating a criminal case. Determining the reasons and grounds, formalizing them and obtaining relevant information are important tasks of this procedural institution.

In the process of analyzing the procedural rule that causes the initiation of a criminal case based on media reports, we must pay special attention to the concept of reasons for the initiation of a criminal case. Therefore, R.D. Rakhunov should be considered as a source that contains information about the crime [1, 31], M.A. Cheltsov mentions that in order to initiate a criminal case, it is necessary to have a source who informed about the crime [2, 353]. S.V. Boriko recognizes the reasons for initiating a criminal case as established by the criminal procedural law and sources from which an authorized body or an official can obtain information [3, 76]. A.A. Chuvilov shows that the reasons for initiating a criminal case are the basis for the initiation of criminal-procedural activity [4, 209].

According to B.N. Rashidov, the reason for initiating a criminal case is defined by the law and the source that provides information about the crime being prepared or committed to the official of the inspection body, the investigator, the investigator, the prosecutor before the investigation. The existence of a reason creates the obligation of these authorized persons to consider the issue of the need to initiate a criminal case [5, 392].

The authors of the pre-investigation textbook emphasize that it is not necessary to identify the perpetrators of the crime, prove their guilt, and fully investigate the case in order to make a decision to open a criminal case. According to the authors, the report of a crime and the presence of signs of a crime in it is the reason to initiate a case [6, 230].

Thus, the majority of authors use the term "source" as reasons for initiating a criminal case. Initiation of a criminal case, of course, is counted from the initial stages of the criminal process, and attention is paid to the existence of the symptoms of the crime in this period. Other decisive circumstances related to the crime are determined during the investigation and trial and are not considered the subject of the prosecution stage. And, it is required that the message and the information given during the initiation of the criminal case should be sufficient for the initiation of the criminal case.

Now, let's talk about media reports that serve as a reason to initiate a criminal case. In this regard, V. B. Kazakova's opinion is unique. The author proposed to use the phrase "free cause of criminal proceedings" instead of including "media reports" as a separate reason for initiating a criminal case. By this, he emphasizes that a universal cause is created in the initiation of criminal proceedings [7, 209].

E.S. Kuzmenko, in support of this opinion, states as follows: "Free reason is not said without a reason. The law does not limit the sources of crime reports. Any information about a crime is the reason for the initiation of a case... News that is spread in the mass media and reflects the symptoms

of a crime, regardless of the point of view of the author or editor who disseminated this information, leads to the initiation of a criminal case» [8, 127].

A.A. Kuznetsova mentions that the initiation of a criminal case based on media reports serves as an important idea in the implementation of public opinion in the criminal process, and emphasizes that by activating the criminal process, it prevents the procedural sphere from being disconnected from real life and community life. However, a number of authors emphasize that authorized persons should not act on the basis of public opinion [9, 212].

Of course, we should recognize the initiation of a criminal case based on media reports as an important means of increasing the efficiency of justice. True, the authors are quite right here, but the timely initiation of a criminal case based on these reports after a crime is published in the mass media - not only a quick reaction to the crime, prevention of crime and ensuring the inevitability of responsibility, but also an impact on the image of law enforcement activities is enough.

Proponents of not acting on the basis of public opinion by authorized persons have cited their opinions from the point of view of the procedural independence of the investigator, investigator, prosecutor and the court. Of course, sometimes the mass media has the characteristic of "exaggerating" certain events, but on the other hand, mass media reports reflect the opinion of society. Justice is for the people, for the people's interests. Failure to respond to media reports is a reason for public objection, and this objection is justified. The lack of communication with society through the mass media has a negative impact on the implementation of the idea of protecting human rights and interests, which is the main task of law enforcement agencies. Therefore, it is necessary to respond to media reports in a timely manner, if there is a reason and basis, to initiate a criminal case.

If one of the following conditions is present in media reports, it can be considered as a reason to initiate a criminal case:

- if there are clear facts about the commission of a crime in mass media reports;
- if the message is published in a newspaper or magazine, broadcast on radio or television;
- if the message is published on Internet media pages;
- if the source of the information about the crime is not clear, but it is widely distributed on the Internet and it clearly shows the signs of the crime and causes public objections.

This reason imposes the duty of the officials of the competent bodies conducting inquiry and investigation or the employees of the Information Service of these bodies to regularly monitor the messages published in the mass media. If a report is identified or provided, it should be acted upon. However, it is not possible to initiate a criminal case based only on a report, relevant information (materials, evidence) must be collected.

The media representative is obliged to submit all materials to the authorized person. In this case, there is no problem because the submission of materials is an obligation. In fact, the problem is related to other issues, namely the provision of personal information about the "source" (if any) - the citizen - who provided information about the crime to the mass media. Procedural legislation has not fully regulated this situation by using the phrase "other materials confirming the notice". It should be clarified whether other information to be provided includes disclosure of the source of the message.

Not to disclose the source of the news is a fundamental right of mass media. This situation is clearly regulated in Article 33 of the Law of the Republic of Uzbekistan "On Mass Media". The editors have no right to disclose the name of the source of information, data, facts or evidence, as well as the name of the pseudonymous author, without their written consent.

In most cases, such sources do not agree to reveal their identity for reasons of personal safety. Taking into account the fact that this source will participate as an important witness in the criminal case in the future and that necessary instructions can be obtained from him to make a legal, reasonable and fair decision on the case - naturally, the competent person can demand its disclosure. The situation is, of course, complicated, and the written consent of the relevant person is required to make the source of the message public. Without written consent, the source cannot be disclosed by law.

The editor's right not to disclose information about the source reporting the crime (obligation in certain cases), if the source requests it, reduces the effectiveness of cooperation with the media

within the framework of Article 327 of the Criminal Code. Of course, clarifying the identity of this source is extremely important for the investigative authorities, because instructions should be obtained from him. However, during the initiation and investigation of a criminal case, the editorial office "can participate in court on their behalf at the request of the source of information or the author who has put a pseudonym." However, in accordance with the rules of evidence in criminal proceedings, the testimony of a person that he directly heard, saw, understood and told with his own mouth is accepted as personal evidence. How can the editor participate in a criminal case on behalf of the person who gave him information?

So, here there are conflicting norms between the contents of the Criminal Procedure Code and the Law "On Amendments and Additions to the Law of the Republic of Uzbekistan on Mass Media".

V. A. Khaymenov conducted research and social survey on these issues. According to the results of the public survey: 100% of journalists of electronic media and 90% of program media were ready to present the materials related to crimes published in them at the request of law enforcement agencies. Journalists understood that a criminal case would be initiated and a crime would be exposed on the basis of these materials. 30% of prosecutors and 36% of investigators confirmed the fact that journalists are ready to disclose their source, 43% of prosecutors and 64% of investigators confirmed their refusal to disclose their source [10, 545].

The public opinion polls show that journalists are willing to disclose their sources if required by the authorities, because this has a positive side for the society as well, if not for the individual. However, the main reason why a journalist hides his source is the legal obligation not to disclose it.

Some authors do not support the journalist's right not to disclose the identity of his source on legal grounds. M.A. Fedotov says in this regard: "Anonymity should not serve to hide slander, falsification and other cases of public opinion manipulation under its shadow. Therefore, protecting the source of information is as harmful as not protecting it [11, 216].

Given that a whistleblower may be a witness to a crime, and sometimes the only witness, it is important to identify and, if necessary, remain anonymous to the investigation. However, there are no procedural norms aimed at making the source of the news public in the JPK. Also, there is no procedural rule forcing the editors to disclose the identity of the source, nor is there a document formalizing it.

However, the above situation should not be applied to all stages and forms of criminal proceedings. It is appropriate to use this situation during the period of investigation before the investigation of media reports. After the initiation of a criminal case based on the results of the pre-investigation investigation, proof is carried out according to general rules. In such cases, based on the general rules of evidence, the editor is obliged to disclose the source reported by the investigator, investigator, prosecutor or court.

After a criminal case is filed, an investigator or investigator is empowered to conduct search and seizure investigations through court sanction. Documents, letters and other correspondence may be seized from the editorial office during the investigation. Office computers and laptops, websites, social networks and their conversations can also be checked. The editors have no right to interfere with the conduct of these investigative actions. The editor-in-chief or the relevant employee may not refuse to testify in a criminal case, relying on the privilege of not revealing the identity of the source.

Thus, after receiving and registering reports about a crime in the mass media, procedural steps are taken to initiate or refuse to initiate a criminal case. It is not possible to act on unreceived and unregistered messages and data. The case is not based on the report, but on the facts established on the basis of this report.

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Rezyume: *Maqolada OAV xabarlari asosida jinoyat ishini qo'zg'atishda xabar «manba»sini oshkora qilishda kelib chiqadigan protsessal muammolar tahlil qilinadi. Xabar manbasini oshkora qilmaslik OAV ning fundamental huquqi ekanligi keltirilgan, ammo tergov maqsadida ushbu manba oshkora qilinishi mumkin. Shuningdek, ushbu masalada qonunlar o'rtasidagi qarama-qarshiliklar o'rganiladi.*

Резюме: *В статье анализируются процессуальные проблемы, возникающие при раскрытии «источника» информации при возбуждении уголовного дела по сообщениям СМИ. Указывается, что средства массовой информации имеют фундаментальное право не раскрывать источник новостей, но этот источник может быть раскрыт в целях расследования. Также изучаются противоречия между законами в этом вопросе.*

Kalit so'zlar: *ommaviy axborot vositalari, xabar, manba, ma'lumot, tergov, jurnalistik sir, jinoyat ishi, jinoyat ishini qo'zg'atish, jamoat fikri, oshkoralik.*

Ключевые слова: *СМИ, сообщение, источник, информация, расследование, журналистская тайна, уголовное дело, обвинение, общественное мнение, гласность.*

SOCIAL NATURE OF PROSECUTION OF CRIMINAL CASES BASED ON MEDIA REPORTS

Matjanov I.A.

Karakalpak State University named after Berdakh

Summary: *The article analyzes the social nature of initiating a criminal case based on media reports. It is also shown that the development of the media, especially online media, is, on the one hand, a positive situation, and on the other, can lead to negative consequences. Negative consequences may also affect the social nature of reports about crimes in the media.*

Key words: *media, message, information, social essence, negative consequences, criminal case, reason for initiating a criminal case.*

Responding to crime reports published in the mass media, receiving and registering them, checking them in a procedural manner and receiving relevant documents are the procedural obligations of the pre-investigation official, investigator, investigator and prosecutor. Media editors have no obligations other than to provide relevant information. Moreover, the editorial staff of the mass media does not have procedural rights.

A special feature of initiating a criminal case based on media reports about a crime is that they are not formalized through certain documents. The authorized person shall receive a procedural document on the publication of the message in the mass media and the results of the investigation based on it. It is through this document that media reports have an official status and enter the form of a document.

In accordance with Article 331 of the Criminal Procedure Code, an appropriate procedural document is issued when there is a legal reason and sufficient grounds for initiating a criminal case. The investigator, the investigator, the prosecutor, as well as the official of the pre-investigation body, examines the applications and messages about the crime committed or being prepared, and initiates a criminal case within the limits of their authority and territorial jurisdiction. The prosecutor can open a case on any crime.

Heads of each body listed in Article 39¹ of the Code of Criminal Procedure, while acting as the head of the body conducting the pre-investigation, may start the pre-investigation investigation or entrust its conduct to another official subordinate to him, initiate a criminal case or refuse to initiate a case, or file an application, has the right to transfer the message according to its relevance to the investigation.

However, some procedural problems may arise during the initiation of a criminal case against the officials conducting the investigation before the investigation. The issue concerns the powers of commanders of military units, formations, heads of military institutions and military schools, and captains of ships on long voyages. These persons are not considered to have a higher legal education, they are considered to have higher knowledge (military, technical) required by their profession. For this reason, procedural difficulties may arise during the initiation of a criminal case by these persons. Here, it is somewhat difficult to understand the legislature which empowered the said authorities to institute criminal proceedings or initiate criminal proceedings.

When making a decision to initiate a criminal case, it is not important that the composition of the crime is determined in full order. Circumstances, structure, guilt, motive, purpose, method, weapons and other important circumstances related to the crime are determined during the investigation.

On the basis of media reports, investigative actions are carried out without delay during the initiation of a criminal case. A quick group can be formed, activities can be carried out, and procedural tasks can be assigned to group members. If necessary, an expert or a specialist may be involved, and based on their conclusions and recommendations, the issue of initiating a criminal case may be

resolved. If, as a result of the investigation of the reports, there is a basis for the initiation of a criminal case, the investigator or investigator will initiate a criminal case on the basis of the F-1 document.

A decision on the initiation of a case is adopted, and it indicates: the reasons and grounds for the initiation of the case, the article of the Criminal Code, which provides for the crime for which the case was initiated, and the official who will take over the case from now on. A copy of the decision to open a criminal case is sent to the prosecutor, who must supervise the investigation of this case. After the initiation of the case, it is necessary to take immediate measures to prevent long-term crimes and to prevent the repetition of crimes, as well as to strengthen and protect traces of crimes, objects and documents that may be important for the case.

It is allowed to initiate a criminal case against a business entity based on facts related to business activity only with the consent of the prosecutor of the Republic of Karakalpakstan, the prosecutors of the regions and the city of Tashkent, or with the consent of the Prosecutor General of the Republic of Uzbekistan or his deputy.

When initiating a criminal case based on media reports and information, special attention should be paid to their social nature. V.T. Tomin, who conducted legal research in this direction, identified the following through social surveys: 70% of the investigators and 85% of the prosecutors stated that it is impossible to allow the dissemination of information about persons who may be considered guilty and other information in the mass media until the criminal case is initiated. 35% of journalists supported this opinion. The obtained results surprise V.T. Tomin, because the procedural law contains a norm of initiating a criminal case based on media reports. The author evaluates the state of not supporting the spread of information about a criminal case in the mass media before it is initiated as "withdrawing from communication with the mass media" and "protecting oneself from public scrutiny" [1, 177].

In fact, it is against the interests of the body to announce the activities of the investigation bodies to the general public during the period of interaction with the mass media. This is because there are concepts that are not intended for the general public, such as investigative secrets, plans, and images. Also, the mass media can take a critical approach to the work of the investigative bodies and pay attention to even the smallest mistakes made by the investigative bodies (sometimes it gives the impression that the mass media is deliberately looking for these mistakes).

The development of mass media, especially internet mass media, is a positive situation on the one hand, but on the other hand, it can have negative consequences. Negative consequences can also affect the social nature of crime reports in the media. "The expansion of freedom of speech and the emergence of many mass media inevitably lead to a decrease in trust in published materials. Initiating a criminal case on the basis of media reports can change from the status of a procedural obligation to the status of information about crimes only"[2, 45].

The risk of encountering unreliable information during the initiation of a criminal case based on media reports has a negative impact on the cooperation of investigative bodies with the media. And, in these cases, "the message spread in the mass media has only a guiding nature, and it is likely that it will lead to a decrease in the activity of reaction by the competent authorities to the reports about the crime" [3, 213].

Therefore, there is a possibility that the spread of news about crime in mass media will decrease the social significance of these news and the third paragraph of the first part of Article 322 of the Criminal Procedure Law will remain or be removed only officially. This situation occurred in the criminal procedural practice of the Russian Federation.

In this context, we should pay attention to which media outlets publish the most of the messages that lead to the initiation of criminal proceedings based on media reports. In general, more crime news and information is published in Internet media. For example, on the official page of kun.uz in April 2023, the content of information and information about crime can be classified as follows (about 50 news and information about crime and related procedural issues were published on the social network kun.uz with the status of official mass media for the month of April 2023) crime and related procedural issues are announced):

- criminal law issues (invasion, theft, fraud, pedophilia, gang, traffic accident, suicide, multi-million dollar gas theft, drug transit, amnesty, domestic violence and domestic violence, even terrorism);

- criminal-procedural matters (apprehension of the person who committed the crime, pre-trial investigation, initiation of a criminal case, detention, protection warrant, trial, sentence, acquittal, light punishment);

- criminological issues (criminalization, crime dynamics and factors affecting its future growth) are discussed.

Thus, the social nature and importance of prosecuting criminal cases based on media reports is increasing nowadays. The media can become an individual's only hope in certain situations and serve as an important means of bringing crime reports to the attention of law enforcement agencies. This situation is an important tool in solving a criminal case within the framework of the law.

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Rezyume: *Maqolada OAV xabarlari asosida jinoyat ishini qo'zg'atishning ijtimoiy mohiyati tahlil qilinadi. Shuningdek, OAV, ayniqsa internet OAV larning rivojlanishi bir tomondan ijobiy holat bo'lsa, boshqa tomondan salbiy oqibatlariga olib kelishi mumkin ekanligi ko'rsatib o'tilgan. Salbiy oqibatlar OAV da jinoyat haqida tarqatilayotgan xabarlarning ijtimoiy mohiyatiga ham ta'sir etishish mumkin.*

Резюме: *В статье анализируется социальная природа возбуждения уголовного дела на основе сообщений СМИ. Также показано, что развитие средств массовой информации, особенно интернет-СМИ, является, с одной стороны, позитивной ситуацией, а с другой, может привести к негативным последствиям. Негативные последствия могут сказаться и на социальном характере сообщений о преступлениях в СМИ.*

Kalit so'zlar: *ommaviy axborot vositalari, xabar, ma'lumot, ijtimoiy mohiyat, salbiy oqibatlar, jinoyat ishi, jinoyat ishini qo'zg'atish uchun sabab.*

Ключевые слова: *средства массовой информации, сообщение, информация, социальная сущность, негативные последствия, уголовное дело, повод для возбуждения уголовного дела.*

**FROM SILENCE TO ELOQUENCE: TRANSFORMATIVE METHODS FOR BOOSTING
ENGLISH SPEAKING COMPETENCE IN STUDENTS**

Temirxanova Z.

Karakalpak State University named after Berdakh

Summary: *This article discusses the ways of how storytelling, role play, task based language teaching, a small-group discussion can develop students' speaking competence and suggests ways to implement them in academic lyceums.*

Key words: *speaking skill, speaking competence, communicative competence, storytelling, role play, task based language teaching, small-group discussion*

Introduction

In the ever-evolving landscape of global communication, proficiency in English has emerged as a critical skill, transcending geographical and cultural boundaries. As the lingua franca of the modern world, English serves as a pivotal tool for academic, professional, and personal success. Within this context, the development of students' speaking competence in English has garnered significant attention in educational discourse. The ability to articulate thoughts, engage in meaningful conversations, and convey ideas fluently is not merely an academic goal but a fundamental necessity for navigating the complexities of contemporary society.

Effective English language teaching hinges on the successful cultivation of speaking skills, which are often perceived as the most challenging aspect of language acquisition. Unlike other linguistic abilities such as reading or writing, speaking necessitates real-time processing, immediate feedback, and spontaneous interaction. This dynamic nature of spoken communication presents unique challenges for both educators and learners. Consequently, innovative pedagogical strategies and methodologies are essential to foster an environment conducive to the enhancement of speaking competence.

The fundamental reforms being carried out in the continuous education system of our country are advancing the problems of creating the necessary conditions for not only for young people to learn a foreign language, but also to perform communicative activities in it, to use effective methods that demonstrate competence in the process of communication, and to be able to express themselves in all fields with a perfect knowledge of a foreign language. It is also important to develop the competence of academic lyceum students to think and speak a foreign language fluently.

This article delves into the multifaceted approaches to developing students' speaking skills in the context of teaching English. It explores various pedagogical techniques, including communicative language teaching, task-based learning, and the integration of technology, all aimed at creating immersive and interactive learning experiences. By examining the role of classroom interaction, feedback mechanisms, and the socio-cultural dimensions of language learning, this article seeks to provide a comprehensive understanding of the factors that contribute to effective speaking competence development.

Moreover, the article highlights the importance of teacher training and professional development in equipping educators with the necessary skills and knowledge to implement these strategies effectively. It also addresses the challenges faced by learners, such as anxiety, lack of confidence, and limited exposure to authentic language use, proposing practical solutions to overcome these barriers.

Materials and Methods

Speaking, as a type of speech activity, means expressing an idea orally. Speaking, an essential skill in oral communication, is one of the key speech activities. It involves the psychological process of expressing ideas. Initially, learners must be motivated to develop the intent to speak. Subsequently, the speaker selects appropriate words or grammatical structures from their memory, typically relying on their native language's readily available material. Ultimately, speaking involves the act of

conveying an idea and pronouncing words, which means using language in verbal communication. Speaking is one of language skills which is developed in language learning. Together with Listening, Reading, and writing, speaking is seen as one of four language skills. It is the way people communicate the language orally. Speaking is often an undervalued skill, possibly because almost everyone can speak and thus we tend to take it for granted. However, speaking deserves as much attention as literary skills, both in our first and second languages. The four skills are interrelated, and speaking is often considered difficult for EFL learners to master because students have to acquire other language components such as grammar, vocabulary, pronunciation, and fluency in order to be proficient English speakers. Thus, they can become nervous, be afraid of making mistakes, and lack confidence [13:159-182]. Also, the act of speaking can be challenging because it also involves an interactive process of constructing meaning that includes producing, receiving, and processing information [18].

We can express our opinion verbally/orally in two ways namely monologue and dialogue. Teaching monologue and dialogue is one of the main requirements of the curriculum. The teacher should know the main features of both forms. For instance, the usage of complete clauses and structural forms are essential for monologue, but ready models or elliptical sentences are essential for dialogue [9:162]

Speaking in English is regarded as the most challenging of the four language skills because it involves a complex process of constructing meaning. This process requires speakers to make decisions about why, how, and when to communicate based on the cultural and social context of the conversation. Additionally, it involves a dynamic interaction between speakers and listeners, necessitating the simultaneous production and comprehension of spoken discourse within time constraints.

A student who has mastered speaking skills well may have difficulties in acquiring speaking competence. Speaking competency is the ability of organizing and synchronizing both the knowledge of the language and the skills of the language in real-life use or other word, in real communication [15:29].

To teach speaking holistically and comprehensively, it is essential for teachers to understand the components of speaking competence and how these different aspects are interconnected. Johnson [10:155] describes speaking as a “combinatorial skill” that “involves doing various things at the same time”. Learning to speak in a second language entails enhancing the ability to utilize various components to produce spoken language that is fluent, accurate, and socially appropriate, all within the limits of the speaker's cognitive processing capabilities.

Figure 1 below illustrates a model of second language speaking competence, which comprises knowledge of language and discourse, core speaking skills, and communication and discourse strategies.

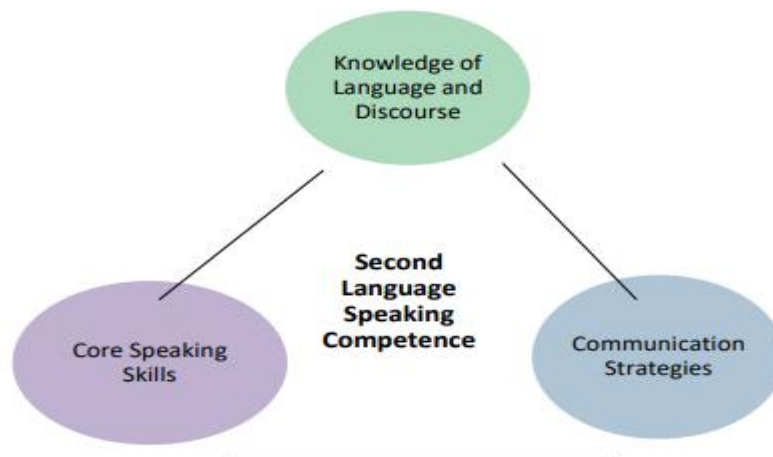


Figure 1: Components of second language speaking competence [4:53]

This model suggests that speaking lessons should not merely be occasions for practicing or "doing" speaking. Instead, they should be structured and supported learning opportunities that develop various components of speaking competence. Teachers must systematically guide learners by introducing integrated and sequenced activities that help them become aware of the knowledge, skills, and strategies needed for different types of interaction and discourse. Students may need guidance on specific language aspects, such as pronunciation features at the segmental or suprasegmental level, or support in dealing with affective factors like anxiety, nervousness, or embarrassment about speaking in another language.

It is clear from this that it is possible to develop speaking competence by mastering speaking skills. Apart from that, the key role of the speaking skill in developing learners' communicative competence has also become evident, as this skill requires learners to know how to produce utterances that are both linguistically correct and pragmatically appropriate. One of the earliest concepts of communicative competence was introduced by Hymes [8:269-293] who believed that the ability to communicate properly should be cultivated in language teaching. Students should learn to use a language in their daily communication to demonstrate their mastery of it.

Communicative competence - the ability of speaking appropriate things in different situations (what?, how? and when?) and the skill of expressing opinions fluently, coherently and logically in English. [2:12]. So, we can assume that students' speaking competence develops within communicative competence.

Effective learning methods will empower students to achieve proficiency in the language, whether through spoken or written expression [5]. Undoubtedly, mastering speaking skills, which are often seen as challenging, requires extensive practice. Kusnierek mentioned the teaching of speaking skills is depended in classroom whereby students have been exposed to the language and practise speaking within the lesson [11:73-111]. Kusnierek mentioned the teaching of speaking skills is depended in classroom whereby students have been exposed to the language and practise speaking within the lesson. Moreover, as mentioned by Torky [17], often teachers monopolize the lesson by continuously speaking and explaining concepts, which can demotivate students from actively participating and becoming proficient speakers during language lessons. Choosing effective language learning strategies for speaking skills can boost students' confidence and motivation to speak in English. This approach can help them enhance their speaking abilities without the fear of making mistakes.

We will consider the following methods of improving students' speaking competence in teaching English.

Storytelling. According to Stanley and Dillingham [16], storytelling is an engaging oral activity that captivates audiences by evoking multi-sensory emotions through narrating events in a story. It includes improvisation, facial expressions, and body movements to enhance the storytelling experience.

Fikriah [3:87-101] stated that storytelling builds confidence, develops language skills, encourages speaking and listening fluency, and increases motivation and interaction for the students. Employing the storytelling method makes the learning process more enjoyable for students. Not only do they develop language skills, but they also gain knowledge of history, information, science, and more through this engaging approach.

The storytelling method is a powerful tool in ELT for developing students' speaking competency. It engages students in meaningful and context-rich activities, builds their confidence, and improves their overall language skills in a holistic manner. The integration of storytelling in language teaching offers a dynamic and interactive approach that not only enhances speaking skills but also fosters a deeper cultural and emotional connection with the language.

Role play. Role play places learners in realistic situations, allowing them to practice using the language in contexts they are likely to encounter in real life. This contextual practice helps in mastering the practical use of the language.

Role play requires active involvement from all participants, making the learning process more engaging and dynamic. This active participation is crucial for developing speaking skills. Learners interact with their peers, which helps in reducing anxiety and building confidence in speaking. This interaction also provides immediate feedback from peers.

Role play activities is considered to be a good option to be implemented in teaching speaking and develop students' speaking skill [6:305-311]. Role play teaches vocabulary and everyday language to learners. These are significant elements learners need to develop their communicative competence. It can be concluded that, role play improves learners' speaking skills [1:27-33].

It is clear that the role play method is a versatile and effective approach for developing speaking competency, providing a practical, interactive, and engaging way for learners to improve their language skills.

A small-group discussion. Many researchers define a small group as having at least three but no more than twelve or fifteen members. When a group becomes too large, with more than twelve or fifteen members, it can hinder effective communication among group members. Ornstein and Lesley say [14:294] that small group occurs when the large group is broken up into subgroups according to ability, interest, project, or other criterion.

When people come together, they often engage in discussions, whether in casual interactions or during group activities where members assemble and interact with one another. According to Hoover, discussion is the process of talking things over among two or more persons, preferably face to face [7:110]. He emphasizes that the discussion process ideally involves a cooperative effort among several individuals working together as a group. This collaboration occurs through the exchange of thoughts and ideas orally, aimed at achieving a common group goal.

Small-group discussions in speaking activities are believed to enhance students' speaking competency, enabling them to communicate effectively in real-life situations. Additionally, individual learners can sharpen their problem-solving skills in speaking by observing and exchanging ideas with other learners in these discussions.

Class discussions are very wasteful in terms of the ratio of teacher or student-effort and time to actual language practice taking place; group discussions are relatively efficient. Moreover, this heightened participation is not limited to those who are usually articulate anyway; students who are shy of saying something in front of the whole class, or to the teacher, often find it much easier to express themselves in front of a small group of their peers.

Task based language teaching (TBLT). Task-based learning is viewed as a solution to meet the mentioned demands, particularly in creating an optimal environment for EFL (English as a Foreign Language) students to improve their speaking skills. TBLT is a learner-centered approach; it has primary focus on the task completion, uses analytical approach and specifies learners' real-life communication needs. Furthermore, TBLT has an outline as a set of activities used by the learner for a communicative purpose in order to achieve an outcome [19]. Task based learning is an approach in teaching speaking, the teacher asks the students to perform tasks that resemble authentic, "real-life" situations [12].

Studies show that students generally display more positive attitudes towards learning English when engaged in task-based activities. These activities tend to be more engaging and less stressful, fostering a better learning environment. For instance, the study on Palestinian secondary EFL students showed that TBLT not only improved speaking skills but also positively influenced students' attitudes towards learning English [20].

Overall, TBLT is a highly effective approach for developing students' speaking competency in ELT. It promotes practical communication skills, fosters positive learner attitudes, and can be adapted to suit various educational contexts and learner needs. The combination of engaging, real-life tasks and an emphasis on communicative competence makes TBLT a valuable methodology in modern language teaching.

Discussion

The development of speaking competence in English language learners is a multifaceted challenge that requires innovative and diverse pedagogical approaches. This article has explored several methods, including storytelling, role play, small-group discussion, and task-based language teaching (TBLT), each offering unique benefits in enhancing students' speaking abilities.

Storytelling has been highlighted as a powerful tool in English Language Teaching (ELT). By engaging students in narrative activities, storytelling fosters confidence and fluency in speaking. It allows students to express themselves creatively, enhancing both their linguistic and cognitive skills. The multi-sensory experience of storytelling, incorporating visual, auditory, and kinesthetic elements, ensures that learners are deeply engaged and motivated.

Role play is another effective strategy that immerses students in realistic scenarios, promoting practical language use. It encourages active participation, reduces anxiety, and builds confidence. By simulating real-life interactions, role play helps learners to practice vocabulary and everyday language, making it a valuable method for developing communicative competence.

Small-group discussion offers a platform for collaborative learning, where students can share ideas and solve problems together. This method enhances critical thinking and allows learners to practice speaking in a less intimidating environment compared to whole-class discussions. The exchange of ideas in small groups also fosters a sense of community and encourages quieter students to participate more actively.

Task-based language teaching (TBLT) focuses on using language as a tool to complete meaningful tasks. This approach is particularly effective in creating authentic learning experiences that mirror real-life communication. TBLT not only improves speaking skills but also positively influences learners' attitudes towards language learning by making it more engaging and relevant to their needs.

Each of these methods contributes to the holistic development of speaking competence by addressing different aspects of language use. Storytelling enhances creativity and narrative skills, role play provides practical language practice, small-group discussions promote collaborative learning, and TBLT offers real-life communication experiences. Together, they create a comprehensive framework for developing speaking competence in English language learners.

Conclusion

In conclusion, developing speaking competence in English language learners requires a combination of diverse and innovative teaching methods. Storytelling, role play, small-group discussion, and task-based language teaching each offer unique advantages that address various facets of speaking skills. These methods not only enhance linguistic abilities but also build confidence, reduce anxiety, and foster positive attitudes towards language learning.

To effectively implement these strategies, educators need to be well-trained and adaptable, creating an engaging and supportive learning environment. Overcoming challenges such as student anxiety and lack of confidence is crucial, and these methods provide practical solutions to these issues. By integrating these approaches into their teaching practices, educators can significantly improve their students' speaking competence, preparing them for successful communication in academic, professional, and personal contexts.

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Rezyume: *Ushbu maqolada hikoya qilish, rolli o'yinlar, topshiriq asosida til o'rgatish va kichik guruhlarda muhokama o'quvchilarning til kompetensiyasini rivojlantirish yo'llari ko'rib chiqiladi va ularni akademik litseylarda amalga oshirish yo'llari taklif etiladi.*

Резюме: *В данной статье рассматриваются способы, как рассказывание историй, ролевые игры, обучение языку с помощью задач, дискуссия в малых группах могут развивать речевую компетентность учащихся, и предлагаются способы их реализации в академических лицах.*

Kalit so'zlar: *nutq qobiliyatlari, og'zaki kompetentsiya, kommunikativ kompetentsiya, hikoya qilish, rolli o'yin, topshiriq asosida til o'rganish, kichik guruh muhokamasi.*

Ключевые слова: *умение говорить, речевая компетентность, коммуникативная компетентность, рассказывание историй, ролевая игра, обучение языку на основе задач, обсуждение в малых группах.*

**THE DEVELOPMENT OF INFORMATIVE AND ANALYTICAL WEBSITES IN
KARAKALPAKSTAN**

Esemuratova S.A.

Karakalpak State University named after Berdakh

Summary: *The article deals with the concept of Internet publishing and its differences from other types of mass media. In addition, the article talks about clone publications, which are electronic versions of traditional mass media. Furthermore, informational and analytical oriented websites in Karakalpakstan and their business were studied.*

Moreover, in the article, information about websites that have been systematized as mass media in Uzbekistan in the period from 2007 to 2021 is presented in the infographic form, and information about social branches and groups and channels of websites in Karakalpakstan is presented in a table view.

Key words: *internet publication, clone publication, website, social branch, internet-mass media.*

Journalism commenced to maintain its function as an information carrier on the Internet with the arrival of the Internet, with its possibilities. Electronic format of newspapers-magazines has been launched with its paper edition, and therefore, new websites were created without any format.

In Wikipedia, which is an Internet encyclopedia, the Internet publication is defined as in the following: “Internet publication is a website that aims to fulfill the mission of winning news on the Internet. Internet publications, like newspapers, are guided by the principles of journalism” [1]. This term is also referred to as web publication, internet media, and internet media in various contexts.

According to V.V. Kikhtan, in his time spreading news on the Internet, divides the websites into the following: “Analyzing the service of new branch journalism, three publications are growing on the Internet today: electronic versions of daily press (newspapers and magazines), online publications and information sites that do not have a paper version” [2]. The Internet is also being proliferated by electronic versions of traditional media outlets. These are called clone-editions. For example, <http://jetkinshek.uz> of “Jetkinshek” newspaper, we can refer to the website of Nukus FM radio <http://www.nukusfm.uz>. Materials published in clone publications, published in newspapers and magazines, broadcasted on radio and TV channels, are also shared through the website of the Internet branch.

From time to time, materials that have not been published by traditional means of communication may also be available on the Internet. On the other hand, the Internet publication means the websites that have been officially distributed on the Internet in the manner established by the regulations. One of the most important parts of the websites that have passed the system on the Internet are informational and analytical websites. Such websites report and analyze events that have occurred in society.

The typology of Internet publications does not differ from offline publications - informational sites, online magazines, literary, scientific publications, children’s and fantasy publications can also be published on the Internet.

The most unique branch publication in the world, which does not have its printed analogue, is the American newspaper “The Electronic Trib”, which was published by David Carlson in 1990. The first site in Russia was created in 1993, but these years the Internet has become a popular means of communication in the country. In 1992, electronic versions of “Известия” (“News”) newspaper began to appear on the Internet [4].

The website www.afisha.uz, which was designed as the first mass media in Uzbekistan, was added to the online mass media in 2007. From the informational and analytical oriented websites www.darakchi.uz passed the system in 2012 as an electronic format of newspaper materials, the

informational and analytical website www.daryo.uz, which did not have its paper version, passed the official state system in 2013. [5].

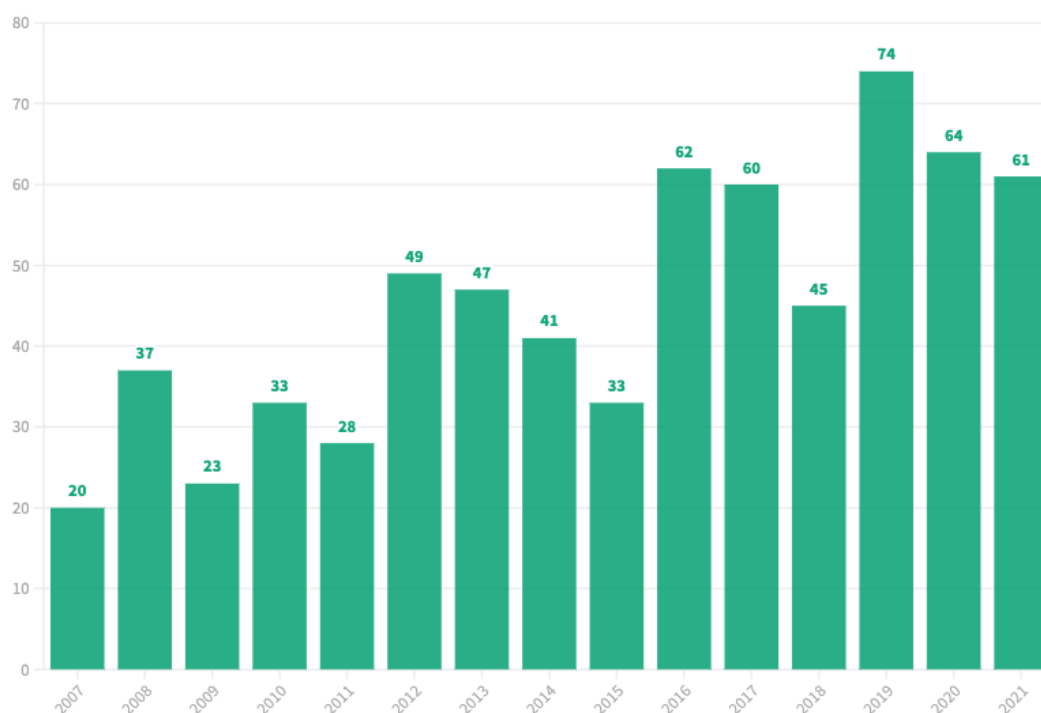
In Karakalpakstan, the online version of clone publications will be created in 2016. “Jetkinshek” newspaper, which began to be published in 1932, was updated in this year [6]. The online version of the “Karakalpak literature” newspaper, which was updated in 2011, was created in 2018 [7]. The first information-analytical website www.kruz.uz website was created in 2016.

In the Republic of Uzbekistan, the Regulation “On the Means of Mass Media” also, in accordance with the Resolution No. 214 dated October 11, 2016 “On the procedure and coordination of the transfer of instruments of media through the state system in the Republic of Uzbekistan”, on the Internet, only the sites that have passed the system as part of the winning message draw are officially counted.

In order to pass through the official system, the details of the website, the name, purpose and objectives, language and language, domain name, time of arrangement of materials, the financing address and information about the responsible persons should be provided.

According to the information provided by the Press and Information Agency of Uzbekistan as of January 1, 2015, the total number of public security agencies in the country is 1,392, 304 of them have built websites that have been officially registered as mass media. According to the data for 2021, in Uzbekistan, a total of 677 websites have been systematized as official mass media [9].

Infographic information about the number of websites that have been registered as mass media in Uzbekistan from 2007 to 2021



Informational and analytical websites make up a significant part of the websites that have passed the system in the nature of the current winning news draw. Informational sites should not be confused with official government or state government sites. Information is also provided on such sites. However, their message, their desperation and the events related to it were broadcasted, while informative sites provide information that is important for society.

The requirements are set for informational and analytical oriented Internet publications in the following:

- Operability;

- Reliability;
- Multimedia.

Operability is the most important requirement of Internet publishing. This requirement is inherent in the entire system of journalism, and most of the stories that appear on the Internet are easily broadcast on the air, and people expect more from the editors of the site.

Reliability is very important in the materials of the Internet. The reason is that fake information on the Internet might be seen more often than traditional media tools.

Also, it is possible to exchange multimedia only by connecting to the Internet, audio-video materials on informational websites, materials through hyperlinks, etc. The creation of original websites in Karakalpakstan dates back to the 2010s. In that year, the portal of the government of the Republic of Karakalpakstan was launched.

If the informative-analytical website www.kruz.uz site was launched in July 2016, 3 years later, on July 9, 2019, Press and Information Agency of the Republic of Uzbekistan announced as the official mass media of the country (Certificate number 1230). In the website, data mostly contain articles on society, culture, economics, and sports, published in Uzbek language.

Furthermore, on the site, the news of the regions of the Republic of Karakalpakstan is presented separately in the form of rubrics in the purpose of making it more convenient for readers.

The difference of the site from other informational sites is that the blogs of journalists and public journalists, as well as the articles on it, are separated by headings. The blogs of Furkat Yusupov, Dilafruz Aytbaeva, Shuhrat Saidahmadov, Bauirzhan Botabaev, Islam Turganbaev, Shakhnoza Bazarbaeva, Sevara Koptilewova, and Shohidbeks are among them.

We can consider this as a feature of columnism, which works closely with websites today. It differs from columnism in that columnists are not satisfied with a specific topic. However, the materials in the blogs were united by one theme, that is, social exercises.

The editor of the site F. Yusupov met with almost all district governors in Karakalpakstan, and interviews were regularly updated on the works, activities and news of the district. In order to make the website materials more accessible to the readers, Telegram messenger, Facebook and Instagram social networks have created their own groups and channels, where the articles published on the site have been arranged and published.

Starting from August 24, 2022, the site stopped its service and deleted all archive materials from the Internet. The website www.gazeta.uz reported about this in the article “Интернет-издание KRuz.uz объявило о закрытии” (Internet edition KRuz.uz announced the closure) [10]. However, on September 24, 2022, the site was rebranded and returned to the media front with a new logo.

After that, the next informational and analytical website www.makan.uz was created in 2016. During its 2 years of service, it has gained its readers, and on May 7, 2018, it was certified by the Press and Information Agency of the Republic of Uzbekistan as an official mass media (Certificate number 1230) [11].

On the site, articles in the Karakalpak language are regularly published on social, economic, tourism, and sports topics from Uzbekistan, Karakalpak and the world. If the materials of the social-political, cultural, sports and economic fields of the informational genre are presented, later, critical and analytical materials started to be published often.

The audio format of the materials published on this site will be launched, and students will be able to deliver their materials in audio format as well [12]. After that, the site was rebranded and changed its format a little.

After that, in 2016, the website www.karinform.uz started its work on the Internet. Social and political articles, like the previous sites, were published on this site. The site delivers news to its readers in the Karakalpak language. In 2019, it was registered as an official mass media (certificate number). This site has been rebranded in 2022 and changed its logo and site design.

The website www.kar24.uz was updated in 2019, and in 2020 (Certificate number 1664), it was registered as an official mass media. After two years of working, the site was rebranded and changed its design and logo. It was re-registered in 2022. In 2019, the site was recognized as the 2nd place winner of the “Golden Pen” national award in the online journalism category.

The website www.KarOne.uz has been registered through the state registration as mass media (Certificate number 1442) starting from August 30, 2021. This site provides government, society, health, world, sports, economy, and technology news. One of the distinctive features of this site in comparison with other informational sites, is that this site has a separate section for medical topics.

In the following table below, you can familiarize yourself with information about websites in the information and analytical systems that have been officially registered as mass media in Karakalpakstan.

The name of the site	Date of registration from the system	Telegram	Facebook	Instagram	Youtube
Kruz.uz	2019	+	+	+	+
Makan.uz	2018	+	+	+	+
Karinform.uz	2019	+	+	+	+
Kar24.uz	2020	+	+	+	+
Karone.uz	2021	+	+	+	

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7. <https://qqadebiyati.uz/ru/news/1468>
8. <https://daryo.uz/2015/01/23/ozbekistonda-304-ta-veb-sayt-internet-oav-sifatida-royxatdan-otkazilgan/>
9. <https://aoka.uz/category/27>
10. <https://www.gazeta.uz/ru/2022/08/24/kruz/>
11. <https://makan.uz/kk/article/4229>

Rezyume: Maqolada Internet nashriyotining tushunchasi va uning boshqa ommaviy axborot vositalaridan farqlari haqida so'z boradi. Bundan tashqari, maqolada an'anaviy ommaviy axborot vositalarining elektron versiyalari bo'lgan klon nashrlar haqida so'z boradi. Bundan tashqari, Qoraqalpog'istondagi axborot-tahliliy yo'naltirilgan veb-saytlar va ularning biznesi o'rganildi.

Bundan tashqari, maqolada 2007-2021 yillarda O'zbekistonda ommaviy axborot vositalari sifatida tizimlashtirilgan veb-saytlar to'g'risidagi ma'lumotlar infografik ko'rinishda, Qoraqalpog'istondagi veb-saytlarning ijtimoiy tarmoqlari va guruhlar va kanallari haqidagi ma'lumotlar jadval shaklida keltirilgan. ko'rish.

Резюме: В статье рассматривается понятие интернет-издания и его отличия от других видов СМИ. Кроме того, в статье говорится об изданиях-клонах, которые являются электронными версиями традиционных СМИ. Кроме того, были изучены информационно-аналитические веб-сайты Каракалпакстана и их бизнес.

Кроме того, в статье в инфографической форме представлена информация о веб-сайтах, которые были систематизированы как средства массовой информации в Узбекистане в период с 2007 по 2021 год, а в табличном виде представлена информация о социальных филиалах и группах и каналах веб-сайтов Каракалпакстана.

Kalit so'zlar: internet nashri, klon nashri, veb-sayt, ijtimoiy tarmoq, internet-ommaviy axborot vositalari.

Ключевые слова: интернет-издание, издание-клон, веб-сайт, социальный филиал, интернет-СМИ.

COPYRIGHT MARKS ON MUSIC POSTED ON THE INTERNET

Usmanov V.M.

Doctor of Philosophy in Legal Sciences (PhD) "Diplomat University" "International relations, associate professor of the department of economy and business, etc.

Summary: *This article deals with issues that are new to the Internet and are beyond the control of the authors. In fact, the issue of copyright protection in social networks, especially on the Internet, is a very complicated process. In this regard, it is proposed to make appropriate amendments and additions to the civil legislation. The relevance of legal protection of mass media sources is discussed. Let's try to describe the perspective of social networks .*

Key words: *Internet network, metrics, music, tone, magazine, radio, television.*

INTRODUCTION.

The nature, relevance, necessity and importance **of copyright to musical works posted on the Internet.**

Recently, there have been many cases of copyright infringement. In the past, copyright infringements occurred in books, magazines or ordinary social newspapers, but now these cases have also moved to the Internet. This is a natural state, of course. The reason is simple: our people are getting all their information from the Internet, and at the same time, it is becoming true that "21st century will be the age of the Internet". A natural question arises as to where the legislation and law enforcement agencies are looking. Why doesn't the law protect us, members of the author's community or simply performing? Although copyrights are protected by current legislation, there is a risk of mass violation of these rights of relevant entities in the absence of effective mechanisms to control the use of such objects.

In this regard, we are of the opinion that disputes about unauthorized access and "piracy" use of copyrighted musical works distributed on the Internet should be systematically considered by various courts (usually civil and criminal courts do not receive documents).

Copyright in musical works posted on the Internet public policy on provision. In this regard, the newly revised Constitution of the Republic of Uzbekistan in our country (April 30, 2023), **"About telecommunications"** (August 20, 1999), **Laws** of the Republic of Uzbekistan **"On principles and guarantees of freedom of information"** (December 12, 2002), **"On copyright and related rights"** (July 20, 2006), **"On mass media"** (new version, January 15, 2007) The Cabinet of Ministers of the Republic of Uzbekistan **"On approval of the regulation on the preparation of information resources and their distribution in data transmission networks, including the Internet "**(March 26, 1999) of the Cabinet of Ministers of the Republic of Uzbekistan **"On the procedure for providing and posting information to the government portal of the Republic of Uzbekistan on the Internet"** April 21, 2009, the Cabinet of Ministers of the Republic of Uzbekistan **" On measures to further improve information security on the World Wide Web"** Resolutions (September 5, 2018) were adopted.

Including new edited Uzbekistan Republic Constitution Article 53:

Har to whom scientific, technical and artistic creativity freedom, culture achievements use the right guaranteed. Intellectual property protection by law will be done.

State society cultural, scientific and technical development about care [1]

In our opinion, there are cases of copyright infringement by authors, performers, producers of phonograms and other owners of copyright and related rights based on the idea that any copyrighted work can be used on the Internet.

For this reason, a system of collective rights management organizations has emerged, which help copyright owners to claim compensation from the infringer instead of compensating damages in case of infringement of the exclusive right, help to determine the amount of damages and help to file lawsuits in courts.

Second, if the copyright is violated during the first distribution of a musical work on the Internet, all subsequent uses are illegal and should not only be suppressed, but should be the basis for compensating the copyright holders for material and moral damage. Musical works distributed on the Internet do not allow authors to properly exercise their rights, in particular, to present the results of their intellectual activity in high quality, to gain popularity, and to receive public recognition. And distribution of "pirated" music causes great damage to the state budget in the form of lack of tax and customs payments.

In order to solve these problems, it is necessary to regularly modernize the laws and other regulatory legal documents that regulate the procedure and conditions of distribution and use of the protected results of intellectual activity on the Internet. In addition, it is necessary to consider economic measures aimed at the formation of innovative interest and the introduction of benefits in the modernization of intellectual rights in civil society entities.

These cases show the relevance of studying the civil-legal aspects of the implementation and protection of copyright when musical works are distributed on the Internet, as well as the importance of the conclusions and proposals for the science and practice of civil law.

Research was conducted by a number of Russian scholars devoted to the study of musical works as an object of copyright. In particular, N. L. Zilbershtein [2] and Ionas Vladimir Yakovlevich [3] have written their scientific work on determining the authorship of music distributed on the Internet. They recognized not only musical works, but also melody as an independent object of copyright. Melody should be understood as an objective phenomenon that can be used independently of other elements of a piece of music.

To date, other problems of copyright in musical works are being studied by a number of scholars. In particular, the Russian scientist Savintseva Lada Alekseevna [4] conducted a "comparative analysis of copyright to musical works in the Russian Federation and Great Britain." He explains the scientific interest in this topic with the fact that he put forward the demands of comprehensive study of foreign legislation in order to take into account the existing positive experience in the integration into the world community, exchange of information in all spheres of public relations. At the same time, he defends the view that, without seeing the difference between literary and musical works, the same rules of law can be applied to them in general, that is, by studying the legal regime of musical works, one can observe the generality.

Another Russian scientist N.V. Ivanov [5] studied the issues of legal protection of the results of intellectual activity in the field of music in the Russian Federation and focused on the legal protection of musical works as objects of copyright, but also of musical performances.

In our opinion, it is necessary to develop practical proposals aimed at improving the norms of civil legislation of musical works distributed on the Internet, and to study its practical aspects. To achieve this goal, it is necessary to form a number of the following tasks:

- to determine the theoretical definitions of the musical work with text and without text, to present not only the specific characteristics of the result of this intellectual activity, but also to present the musical works distributed on the Internet, as well as to show their importance;
- Analysis of the content and characteristics of the use of copyright in musical works distributed on the Internet;
- To determine the features and shortcomings of the regulatory legal framework for the regulation of copyright to musical works distributed on the Internet;
- Development and introduction of suggestions on filling the list of civil legal methods of copyright protection of musical works distributed on the Internet.

In our opinion, the best way to control the distribution of musical works on the Internet in the current environment is to transfer the exclusive rights to the works to a trust.

In order to strengthen the protection of copyright to musical works, it is appropriate to expand the powers of organizations that manage rights on a collective basis, in particular, to give authors the opportunity to transfer a wider range of property rights to such organizations.

A piece of music without a text is an objectively expressed result of intellectual (creative) activity, based on the use of sounds of different pitches and metro [6]-rhythmic [7].

A musical work with text distributed on the Internet is the result of intellectual (creative) activity, has the characteristic of objectively expressed originality and reproducibility, and harmonizes the text with various tones. The elements of the composition allow each person to create a unique (only for him) set of ideas and images that affect auditory perception. Sounds and metro-rhythmic relationships and interrelationships that are accessible to the auditory perception of a person when they are performed and allow to perceive the author's plot. Melody [8] as a legal category, on the one hand, has a dual nature, it is an objectively expressed, monophonic, unprotected element of the content of a musical work, based on the use of modal-tonal sounds that differ in tone. Metro-rhythmic relationships and during their performance form a unique set of harmonious ideas and images, which, when implemented, enter the auditory perception of a person and allow him to create the plot of the work. On the other hand, music that is part of a musical work can be an independent subject of copyright.

An objective form of expression of a musical work distributed on the Internet is not only copyright, but also related rights, which should be defined as an independent object of protection, as well as musical notes in electronic format. Records available for use on the Internet (downloading, viewing, forwarding, sharing, etc.).

Recording of performances of musical works on the Internet should be recognized as an objective form of expression of a musical work incompatible with a material medium. At the same time, in cases where a musical work with a text presented in the form of sheet music is created by the intellectual work of two or more persons whose creative activity is not joint, it should be recognized as a compositional work.

In our view, it is necessary to differentiate the payment to the copyright holder for the use of the musical work over the Internet. For example, it may be open access to post a piece of music on the Internet to promote it. For the right to reproduce and distribute it, i.e. copying, including for commercial purposes, it is appropriate to charge an appropriate fee.

In order to strengthen the protection of copyright, it is proposed to complete the list of civil legal methods of protection of intellectual activity distributed on the Internet.

In our opinion, the legal significance of creating and maintaining a register of unscrupulous users of information and telecommunications should be a fixed term depending on the severity of the offense committed by him. It urges the Internet participant to act in good faith and to take extraordinary measures, including financial measures, to resolve the conflict with the author or his successor, which of course means paying compensation for material or moral damage to the owners of the copyright.

In order to increase the level of copyright protection for musical works distributed on the Internet, it is proposed to use a method such as placing an audio file on a licensed resource. And when it is launched for the first time, it will ask for a unique pin code for the file with an important condition, which must be purchased along with the music file. The cost of the pin may vary depending on the way the music is used.

Musical works with or without text distributed on the Internet must be capable of reproducing (making a copy of) the same work as the original.

According to the author, melody is an objectively expressed, monophonic, unprotected element of the content of a musical work, which is based on the use of modal tonal sounds that differ in their pitch, as well as metro-rhythmic relationships and relationships, which create their own identity during their performance. A coherent set of ideas and images available for auditory perception during their performance allows a person to create real or possible phenomena of the objective world.

Music that is part of a musical work can be an independent subject of copyright. In our opinion, the authors of the musical work:

1) the author of the main objectively expressed result of intellectual (creative) activity that forms the basis of a musical work; 2) the author of arrangements specially created for this piece of music; 3) the author of the text for the musical work, if such a text was created specifically for this musical work. If an already created literary work is adapted in the process of creating a musical work with text, it is protected as a literary work.

The author of each work, which is an integral part of a musical work with or without text, retains the exclusive right to his work, except for the cases where this exclusive right is transferred to other persons on the grounds provided by law.

In conclusion, it can be said that in order to modernize the current legal norms, deficiencies in the regulatory legal framework for regulating the copyright of musical works distributed on the Internet were identified, relevant proposals were developed and introduced.

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8. Tone (Persian — sound, melody, melody) — the smallest piece of melody, intonation as a means of musical expression. Melody is formed by the logical connection of several sounds, and in vocal music it corresponds to a poetic verse. Melodies combine to form larger structures - melodic phrases. The main (most characteristic) structure of the melody, etc. in the meanings, and in Indians, "ahangit" is used as a general expression of music, and in Persian-speaking peoples, it is also used in the sense of "composer" - composer. <https://qomus.info/encyclopedia/cat-o/ohang-uz/>
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Rezyume: Ushbu maqolada Internetda bo'lgan, unga yangi joylashtirilgan, mualliflar tomonidan nazorat qilinmaydigan masalalar haqida so'z boradi. Haqiqatdan ham ijtimoiy tarmoqlarda ayniqsa, internet tarmog'ida mualliflik huquqining himoya qilish masalasi judayam murakkab jarayon. Bu bo'yicha fuqarolik qonunchiligiga tegishli o'zgartish va qo'shimchalar kiritish taklif etiladi. Ommaviy axborot vositalari manbalarining huquqiy himoyasi dolzarbligi haqida so'z yuritiladi. Ijtimoiy tarmoqlarning istiqbolini tasvirlashga urinib ko'ramiz.

Резюме: В данной статье рассматриваются вопросы, новые для Интернета и находящиеся вне контроля авторов. На самом деле вопрос защиты авторских прав в социальных сетях, особенно в Интернете, – это очень сложный процесс. В связи с этим предлагается внести соответствующие изменения и дополнения в гражданское законодательство. Обсуждается актуальность правовой охраны источников средств массовой информации. Попробуем описать перспективу социальных сетей.

Kalit so‘zlar: Internet tarmog‘i, metrika, musiqa, ohang, jurnal, radio, televideniye.

Ключевые слова: Сеть, метрика, музыка, тон, журнал, радио, телевидение.

**DEVELOPMENT OF ARTIFICIAL INTELLIGENCE AND ITS IMPACT ON
EDUCATIONAL QUALITY IN PUBLIC SCHOOLS**

Muminov D.M.

Nukus State Pedagogical Institute named after Ajiniyaz

Summary: Artificial intelligence (AI) has rapidly evolved, significantly affecting various sectors, including education. This paper explores the development of AI and its influence on the quality of education in public schools. By analyzing historical advancements, current applications, and future prospects, this study highlights AI's role in enhancing personalized learning, automating administrative tasks, and providing data-driven insights into student performance. Through a thorough literature review and detailed methodology, the research examines how AI technologies are being integrated into educational settings and evaluates their outcomes. The results reveal that AI positively affects student engagement, teacher efficiency, and resource allocation while also presenting challenges such as ethical considerations and regulatory issues. The discussion emphasizes the importance of addressing these challenges to ensure the ethical and equitable integration of AI in education. The paper concludes with recommendations for policymakers, educators, and researchers to foster the responsible deployment of AI technologies in public schools, ensuring they contribute to improved educational outcomes and equity.

Key words: Artificial Intelligence, Education, Public Schools, Machine Learning, Personalized Learning, Administrative Automation, Data-Driven Insights, Ethical AI, Student Engagement, Teacher Efficiency

Introduction

Artificial intelligence (AI) has emerged as a transformative technology, redefining how various industries operate, including education. In public schools, AI's integration promises significant improvements in the quality of education by personalizing learning experiences, automating routine tasks, and providing actionable insights into student performance. However, these benefits come with challenges, particularly regarding ethical considerations, equity, and the need for robust regulatory frameworks. This paper aims to explore the historical development of AI, its current applications in public education, and the potential future impacts on educational quality. By addressing both the benefits and challenges of AI integration, this study provides a comprehensive overview of how AI can shape the future of public education.

Literature Analysis and Methodology

Historical Development of Artificial Intelligence

The journey of AI began in the mid-20th century, rooted in the quest to create machines that could mimic human intelligence. Alan Turing's seminal work in the 1950s laid the foundation, proposing the Turing Test as a measure of a machine's ability to exhibit intelligent behavior indistinguishable from that of a human (Turing, 1950). The 1956 Dartmouth Conference, often considered the birthplace of AI as a field, brought together pioneers who envisioned machines capable of performing tasks that require human intelligence, such as problem-solving and learning (McCarthy et al., 1956).

Throughout the 1960s and 1970s, AI research focused on symbolic reasoning and expert systems, aiming to encode human knowledge into machine-readable formats. However, progress was hampered by limitations in computational power and the inability to handle vast amounts of unstructured data. These challenges led to periods known as "AI winters," where funding and interest in AI research waned.

The resurgence of AI in the 1990s was driven by advancements in machine learning, particularly the development of algorithms that could learn from data.

This era saw the rise of neural networks and the beginning of deep learning, a subfield of machine learning that uses multi-layered neural networks to model complex patterns in data. By the

early 2000s, AI had entered a new phase, characterized by the availability of big data and increased computational power, enabling significant breakthroughs in natural language processing, image recognition, and autonomous systems (LeCun et al., 2015) .

Current Applications of AI in Education

AI's applications in education can be broadly categorized into three areas: personalized learning, administrative automation, and data-driven insights.

Personalized Learning: AI technologies enable the creation of personalized learning environments tailored to individual student needs. Intelligent tutoring systems (ITS) and adaptive learning platforms use machine learning algorithms to assess student performance in real-time and provide customized feedback. These systems can identify learning gaps and suggest targeted interventions, thereby enhancing the educational process (Woolf, 2009) .

Administrative Automation: AI-driven tools streamline various administrative tasks, such as grading, scheduling, and resource management. Automated grading systems can efficiently evaluate large volumes of student assignments, providing timely feedback and freeing up teachers to focus on instructional activities. AI-powered scheduling systems optimize resource allocation, ensuring effective utilization of classrooms, materials, and staff (Luckin et al., 2016) .

Data-Driven Insights: AI analytics tools provide educators with valuable insights into student performance and engagement. By analyzing data from various sources, these tools can identify trends and patterns that inform instructional strategies and policy decisions. For example, predictive analytics can help educators identify students at risk of falling behind and implement early interventions to support their success (Russell & Norvig, 2020) .

Methodology

This study employs a mixed-methods approach, combining quantitative and qualitative data to provide a comprehensive analysis of AI's impact on educational quality in public schools. The quantitative component involves analyzing data from AI-driven educational platforms and administrative systems to measure improvements in student performance, teacher efficiency, and resource utilization. The qualitative component includes interviews with educators, administrators, and AI experts to gain insights into the challenges and benefits of AI integration in education.

Data collection involved a systematic search of academic databases such as Google Scholar, IEEE Xplore, and ERIC, focusing on keywords related to AI in education. Selected studies were reviewed and synthesized to identify common themes, benefits, and challenges associated with AI integration. Additionally, case studies from schools that have implemented AI technologies were examined to understand real-world applications and outcomes.

Results

The integration of AI in public schools has produced several notable outcomes across various dimensions of educational quality:

Personalized Learning and Student Engagement

AI technologies have significantly enhanced personalized learning experiences, making education more adaptive and student-centered. Intelligent tutoring systems (ITS) and adaptive learning platforms have demonstrated the ability to cater to individual learning styles and paces. For instance, systems like Carnegie Learning's MATHia and DreamBox Learning have shown substantial improvements in student achievement by providing tailored instruction based on real-time performance data (Carnegie Learning, 2021). These platforms use AI algorithms to continuously assess student understanding and adjust the difficulty level of tasks accordingly, keeping students engaged and motivated.

Furthermore, AI-driven educational games and interactive learning environments have been effective in increasing student engagement. Tools like Knewton and Smart Sparrow incorporate elements of gamification to make learning more engaging and interactive, encouraging active participation and sustained interest in the subject matter (Knewton, 2021) .

Teacher Efficiency and Professional Development

AI technologies have also contributed to enhancing teacher efficiency by automating routine tasks such as grading and administrative duties. Automated grading systems, such as Gradescope and Turnitin, allow teachers to evaluate large volumes of assignments quickly and consistently, providing timely feedback to students and freeing up time for instructional planning and student interaction (Gradescope, 2021). These systems use natural language processing (NLP) and machine learning algorithms to analyze text and assess student work, ensuring accuracy and reducing the workload for teachers.

Moreover, AI-powered professional development platforms offer personalized training and resources for educators. Platforms like Coursera for Teachers and AI Coach provide customized professional development programs based on individual needs and teaching contexts, helping educators to continuously improve their skills and knowledge (Coursera, 2021).

Data-Driven Decision Making

AI analytics tools have enabled data-driven decision-making processes in schools, providing valuable insights into student performance and engagement. Predictive analytics platforms like BrightBytes and PowerSchool use machine learning algorithms to analyze data from various sources, such as student assessments, attendance records, and behavioral data, to identify trends and predict future outcomes (BrightBytes, 2021). These insights help educators and administrators to make informed decisions about instructional strategies, resource allocation, and policy development.

For example, predictive analytics can identify students at risk of dropping out or falling behind, allowing schools to implement targeted interventions and support measures to address these issues proactively. Additionally, AI-driven analytics tools can provide feedback on the effectiveness of teaching methods and curricular programs, helping educators to refine their practices and improve student outcomes.

Discussion

While the benefits of AI in education are evident, several challenges and ethical considerations must be addressed to ensure its responsible and equitable integration:

Ethical Considerations

The use of AI in education raises important ethical issues related to privacy, bias, and accountability. Ensuring that AI systems are transparent, fair, and respectful of student privacy is critical. Schools must implement robust data protection measures to safeguard student information and ensure compliance with privacy regulations, such as the Family Educational Rights and Privacy Act (FERPA) in the United States (U.S. Department of Education, 2021).

Moreover, AI algorithms can perpetuate existing biases if they are trained on biased data sets. It is essential to regularly audit AI systems for bias and take corrective measures to ensure that they provide equitable outcomes for all students. Developers and educators must collaborate to design and implement AI systems that are inclusive and fair, addressing potential disparities in access and outcomes (Barocas et al., 2019).

Equity and Access

Ensuring equitable access to AI technologies is a significant challenge. Schools in underserved communities may lack the resources and infrastructure needed to implement AI-driven solutions. Addressing these disparities requires targeted investments and policies aimed at bridging the digital divide and ensuring that all students benefit from AI-enhanced education. This includes providing necessary hardware, internet access, and training for both students and educators in underserved areas (Gates Foundation, 2020).

Teacher Training and Professional Development

To fully leverage the benefits of AI, educators must receive adequate training and professional development. Schools should invest in ongoing training programs that equip teachers with the skills and knowledge needed to effectively integrate AI tools into their practice. Professional development should also address ethical considerations and promote best practices for using AI in education. Teachers should be empowered to critically evaluate AI tools and make informed decisions about their use in the classroom (Holmes et al., 2018).

Regulatory and Policy Frameworks

The integration of AI in education necessitates the development of robust regulatory and policy frameworks to guide its ethical and responsible use. Policymakers must establish clear guidelines and standards for the deployment of AI technologies in schools, addressing issues related to data privacy, algorithmic transparency, and accountability. These frameworks should be developed in collaboration with educators, researchers, and industry stakeholders to ensure they are comprehensive and aligned with educational goals (EU AI Policy, 2021).

Conclusion

The development of artificial intelligence has the potential to revolutionize education, offering new opportunities to enhance the quality of teaching and learning in public schools. By providing personalized learning experiences, optimizing resource allocation, and supporting data-driven decision-making, AI can help promote educational equity and improve outcomes for all students. However, realizing these benefits requires addressing ethical considerations, establishing robust regulatory frameworks, and ensuring equitable access to AI technologies. Continued research and international cooperation will be essential to harnessing the full potential of AI in education and building a brighter future for students around the world.

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Rezyume: *Sun'iy intellekt (AI) tez rivojlanib, turli sohalarga, jumladan, ta'limga sezilarli ta'sir ko'rsatdi. Ushbu maqola sun'iy intellektning rivojlanishi va uning davlat maktablarida ta'lim sifatiga ta'sirini o'rganadi. Tarixiy yutuqlarni, joriy ilovalarni va kelajak istiqbollarini tahlil qilib, ushbu tadqiqot AIning shaxsiylashtirilgan o'rganishni yaxshilash, ma'muriy vazifalarni avtomatlashtirish va talabalar faoliyati haqida ma'lumotlarga asoslangan tushunchalarni taqdim etishdagi rolini ta'kidlaydi. Adabiyotlarni puxta o'rganish va batafsil metodologiya orqali tadqiqot AI texnologiyalari ta'lim sharoitlariga qanday integratsiya qilinayotganini o'rganadi va ularning natijalarini baholaydi. Natijalar shuni ko'rsatadiki, AI talabalarning faolligiga, o'qituvchilarning samaradorligiga va resurslarni taqsimlashga ijobiy ta'sir ko'rsatadi, shu bilan birga axloqiy mulohazalar va tartibga solish muammolari kabi muammolarni keltirib chiqaradi. Muhokama AIning ta'limga axloqiy va adolatli integratsiyasini ta'minlash uchun ushbu muammolarni hal qilish muhimligini ta'kidlaydi. Hujjat siyosatchilar, o'qituvchilar va tadqiqotchilarga davlat maktablarida AI texnologiyalarini mas'uliyat bilan qo'llashni*

ta'minlash, ular ta'lim natijalari va tenglikni yaxshilashga hissa qo'shishni ta'minlash bo'yicha tavsiyalar bilan yakunlanadi.

Резюме: Искусственный интеллект (ИИ) быстро развивается, существенно влияя на различные секторы, включая образование. В этой статье рассматривается развитие ИИ и его влияние на качество образования в государственных школах. Анализируя исторические достижения, текущие приложения и будущие перспективы, это исследование подчеркивает роль ИИ в улучшении персонализированного обучения, автоматизации административных задач и предоставлении основанных на данных сведений об успеваемости учащихся. Благодаря тщательному обзору литературы и подробной методологии исследование изучает, как технологии ИИ интегрируются в образовательные среды, и оценивает их результаты. Результаты показывают, что ИИ положительно влияет на вовлеченность учащихся, эффективность работы учителей и распределение ресурсов, а также создает такие проблемы, как этические соображения и вопросы регулирования. В обсуждении подчеркивается важность решения этих проблем для обеспечения этической и справедливой интеграции ИИ в образование. В заключение статьи приводятся рекомендации для политиков, педагогов и исследователей по содействию ответственному внедрению технологий ИИ в государственных школах, гарантируя, что они способствуют улучшению результатов обучения и обеспечению равенства.

Kalit so'zlar: Sun'iy intellekt, Ta'lim, Davlat maktablari, Mashinada o'rganish, Shaxsiylashtirilgan ta'lim, Ma'muriy avtomatlashtirish, Ma'lumotlarga asoslangan tushunchalar, Axloqiy AI, Talabalarning faolligi, O'qituvchilar samaradorligi

Ключевые слова: искусственный интеллект, образование, государственные школы, машинное обучение, персонализированное обучение, административная автоматизация, аналитические данные, этический ИИ, вовлеченность учащихся, эффективность работы учителей.

"PERSISTENCE " CONCEPT LINGVOCULTUROLOGICAL ANALYSIS

Jamoliddinova I.B.

Tashkent state Uzbek language and literature university

irodjamoliddinova8@gmail.com

Summary: *This in the article about the linguocognitive aspects of the concept the word goes. Including Uzbek language in linguistics and cultural studies of "perseverance". its formation as a concept is highlighted.*

Key words: *L invoculturology , concept, "perseverance" concept.*

S.A.Askoldov 's article "Concept and word" is recognized as the first research on the concept in world linguistics. In Russian linguistics, Y.Y.Prokhorov 's monograph entitled "In search of a concept" (" V poiskakh koncepta "), he distinguishes the following in the interpretation of the concept:

- linguocognitive phenomenon (Kubryakova, 1996);
- psycholinguistic phenomenon (Zalevskaya, 2001);
- abstract scientific understanding (Solomonik, 1995);
- of culture basic concept (Stepanov, 1997);
- Linguistic culture (Sl i shkin, 2000; Karasik et al Bsh ., 2001) » .

of the concept l ingvocognitive linguists such as Kubryakova , Shvedova, Telia, Popova, Sternin, Alifirenko, Krasnykh, Babushkin carried out research on ji letters. In particular, Kubryakova defines the concept as follows: "A concept is a term that serves to explain the mental or psychic resource units of our mind, reflecting human experience and knowledge; memory, mental lexicon, is the unity of the conceptual and linguistic system of the worldview reflected in the human psyche. " Telia explains this term as follows: "concept is knowledge that always forms a frame. Therefore, it does not simply express the signs of the object, but reflects all the knowledge about the essence of the language community .

The concept is also big in cultural studies is an important linguistic and cultural unit. Sh. Usmanova recognized that the concept as a linguistic and cultural unit expresses the specific aspects of the culture of this or that nation 26

Based on this, we can say that the linguo-cultural concept has an ethno-cultural nature and a functional significance of existence. have information that transmits of culture main is a unit. In this field, the concept is interpreted as an indicator of the people's culture. For example, in the Uzbek language, the concept of "perseverance" means the patriotism and family spirit of an Uzbek husband; In the concept of "faithfulness" the expression of an Uzbek woman can be revealed through certain methods and analyses.

The concept represents cultural universals and it exists in thinking, it combines cognitive-rational and emotional-psychic content. Linguistic-cultural concept serves as a worldview model for all language speakers , and the concept is considered a cultural factor influencing the formation of national character.

According to DUAshurova, "it is wrong to call all concepts a concept, but only concepts that play an important role in the spheres of world and national culture can be called a concept." A concept is a multifaceted and multi-layered mental structure. It also shows psychological, cognitive-semantic and linguo-cultural aspects at the same time. After all, the fact that the concept is described as an object of cognitive and linguo-cultural studies also proves this. Therefore, it is possible to evaluate the concept's classification by researchers into types as subjective, social, linguistic, cultural, and artistic concepts, as a different approach to the single essence. Zero , the language system is one of the most diverse phenomena that combines the above qualities

Cultural concepts are studied separately in Linguistics because the main concepts of culture are important in collective language consciousness. "Culture the main concepts mean abstract nouns,

in particular, conscience, destiny, fate, will, sin, law, freedom, country, patriotism, love, beauty, loyalty, kindness, hospitality, etc. AYGuri yevich divides cultural concepts into two groups: 1) "spatial", philosophical categories, that is, universal categories of culture - time, space, cause, change, movement, etc.; 2) social categories, i.e. cultural categories - concepts such as freedom, rights, truth, work, wealth, property.

And Maslova says that one more group should be included among these, that is, the category of national culture" 31 .

T. Yandasheva gives the following types of concepts:

1. " The world – time, date, morning night such as the homeland .
2. Nature – flowers , plants , trees , water , oil , soil such as
3. Man features – cleverness , stupidity old age , knowledge , beauty , youth such as
4. Spiritual concepts – conscience the truth justice such as
5. Social concept and relations - freedom , friendship and war such as
6. E is mobile concepts – happiness happiness , joy sadness
7. Scientific the conceptosphere of knowledge philosophy, philology, mathematics, biology , physics such as
8. The conceptual sphere of art - architecture, calligraphy, dance, music, painting, sculpture, etc.

The unification of concepts under one common name directly caused the emergence of the term conceptosphere in linguo-cultural studies. D.S.Likhacheva was the first to use the term conceptosphere. Some scientists use the phrase system of concepts they like it. This is evidence of people's knowledge and thinking about the world system and comes from experience and the process of how language is used.

In particular, the general view of the world in the representative of each culture consists of the following universal concepts - space, time, destiny, peace, fire, water, truth, law and love. According to the American psychologist D. Miller, each to himself in culture specific myths exist and cultures are formed directly on the basis of some myth. And this is direct forms a unique conceptosphere .

It is important to take these features into account during the analysis of concepts in a particular language . In general, the concept is the history of a certain nation as a linguistic and cultural unit and is a unique tool that informs the culture and the concept that it expresses the nation and people of members special from the features and describes based on linguistic capabilities. In general, the linguistic and cognitive definitions of the concept are closely related, since cognition is carried out through thinking, language and culture. Its main difference from the lexical meaning and concept is that it consists not only of meaning components, but also of the knowledge acquired in human life experience, the sum of information in the mind, and the encyclopedic knowledge about this or that subject-phenomenon.

In our research, we try to explore the concept of "perseverance" as a linguistic and cultural concept. After all, there is a valuable attitude of language owners to this concept, and its study in connection with Uzbek national culture is the goal of our scientific research. Here we also used the methods of cognitive linguistics, psycholinguistics, which is a cognitive, psycholinguistic or linguistic concept, but it is one essence. Only in different directions, a certain phenomenon is analyzed through a different prism.

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Rezyume: *Ushbu maqolada konseptning lingvokognitiv jihatlari xususida so‘z boradi. Jumladan, o‘zbek tili lingvomadaniyatshunosligida “qat’iyat”ning konsept sifatida shakllanishi yoritiladi.*

Резюме: *В данной статье рассматриваются лингвокогнитивные аспекты концепта. В частности, освещено формирование понятия «настойчивость» как понятия в лингвострановедении узбекского языка.*

Kalit so‘zlar: *Linvokulturologiya, konsept, “qat’iyat” konsepti.*

Ключевые слова: *линвокультурология, концепт, концепт «настойчивость».*

METHODS OF DEVELOPING HEURSTIC THINKING IN STUDENTS OF HIGHER EDUCATION INSTITUTIONS

Adjiyev N.N.

Teacher of the Samarkand branch of the Institute of retraining and advanced training of specialists in physical education and sports

Summary: *In this article, the methods and means of developing heuristic thinking in students of higher educational institutions, as well as the ways of its implementation, are described in detail.*

Key words: *education, methodology, education, method, rule, tool, thinking, student.*

To date, the content of education and its methodical system are being further improved. The researches and pedagogical practice carried out in recent years show that it is not enough to provide students with a certain level of knowledge, initial practical skills and qualifications in the educational process. In them, social experience, that is, the formation of competencies, is gaining special relevance. At the same time, it is extremely necessary to enrich the methodological structure of the educational process and create a favorable environment for the use of pedagogical technologies in order to ensure the effectiveness of education. Primary education is a favorable period for the comprehensive formation of a student's personality and the formation of thinking activity in them. Along with the development of speech, the activity of thinking also occurs in elementary school students. The student's initial skills of comparison, classification, generalization, and systematization are manifested in his ability to express his thoughts clearly, figuratively, and fluently in a logical sequence.

Heuristics is the organization of productive creative thinking (thinking) process.

Thinking is the highest form of human mental activity, the process of reflecting objective reality in the mind

Thinking is a concept that expresses reflection and thinking in order to come to a certain conclusion about a certain event.

In the conditions of current globalization, in the educational system of leading foreign countries, special, serious attention is paid to the issue of formation of creative qualities in pupils and students. The issue of learning serves not only at the enterprise level, but also for the training of specialists in higher education institutions and the improvement of their innovative activities. Creative thinking is an important skill that today's youth need to have and know, this skill will help them adapt to a world that requires a workforce that can meet the demands of the 21st century constantly and rapidly changing. In general, today's student is expected to work in the future in fields that do not even exist now, to solve new problems using new technologies. [1].

In today's fast-paced life, students use creative thinking to solve various interpersonal and social problems. Many students are losing interest in education. As a result, teachers are not thinking about organizing professional activities with the same enthusiasm as before. Although the governing bodies of the educational system are taking new measures to change the activities of students who do not want to learn, and teachers who do not want to teach such students, the situation remains unchanged. . What is the reason for this? Maybe the pre-planned lessons are not interesting for the students, maybe the fact that the educational content is set in a certain pattern does not give any stimulus or incentive for the students. Avoid pre-planning of educational activities, develop critical and creative thinking in students, force them to think creatively, come up with new ideas, change the attitude to education, encourage them to achieve success. can be a key factor in motivation. The missing factor in training sessions is creativity. The leader of our country emphasized that this issue is one of the urgent problems of today's education system, and the creation of new textbooks and educational literature in this regard. first of all, it is necessary to adapt educational programs, methodological manuals for teachers and teachers to advanced international programs. In order to develop analytical and creative thinking skills of children, it is necessary to create meaningful and understandable textbooks for them. Educators need to be able to distinguish creative thinking, know

the conditions suitable for such thinking, and know how to help students to think more creatively. A better understanding of how creative thinking occurs, in turn, helps teachers to understand that creative ideas in students need time to "incubate" during the educational process. [2].

When applying the heuristic teaching method, the teacher is required to search for new knowledge using various tools. The teacher conveys part of the knowledge to the students, and the rest is acquired by the students on the basis of finding answers to their questions in the process of solving knowledge tasks, they acquire knowledge independently. Dividing the problem set by the teacher into several points of view, students following the sequence in their execution is considered an important methodical aspect. Therefore, this method is also called a partial search method. In addition to acquiring as much information as possible from various fields of science, students should acquire the skills of independence and creative attitude to life. For this purpose, it is proposed to base teaching on methods in which one or another form of educational activity of students reminds of research, ends with "discoveries" for students, that is, they independently draw conclusions and solve some practical task. Heuristic educational technologies are pedagogical technologies that guide students to find the necessary knowledge, think creatively, work independently, apply knowledge and skills in new situations, and draw conclusions. The word "heuristics" is derived from the ancient Greek language and means "to search", "to discover". The term "didactic heuristics" differs in meaning from the term "heuristics". [3].

In a broad sense, heuristics is the science of creativity and creative activity of people in order to obtain new results in the sought-after fields: cybernetics, psychology, criminology, medicine, philosophy, etc. As a science, heuristics aims to explain, systematize and predict the processes of discovering new things. The purpose of didactic heuristics is to reveal the individual capabilities of students and teachers through their activities aimed at creating educational products. The history of the foundations of heuristic education is connected with the name of the ancient Greek scientist Socrates. In ancient Greece, heuristics was understood as a teaching method applied by Socrates. According to this method, the teacher led the student to independently find a solution to the problem by asking questions. Different approaches to heuristic teaching are reflected in the works of Plato, Archimedes, R. Descartes, A. Poincaré, Ya. A. Comensky, J. Dewey, and others. Since the second half of the 20th century, scientists such as Yu.K. Kulyutkin, O.K. Tikhomirov, I. Muller, P.Ya. engaged in Russian scientist V.I.Andreev systematized heuristic methods, studied the principles and rules of their application. A.V. Khutorskoy continued these studies, proposed a system of applying heuristic teaching methods to all subjects, developed the theory of heuristic education - didactic heuristics. [4].

Heuristic methods. Inversion technique is to look at the problem from another, unfamiliar angle. When searching for an idea, contrary to the traditional view, which is often determined by logic and common sense, the solution to a problem can be found by reversing the direction of the search. Often, in situations where logical thinking methods and procedures turn out to be ineffective, the opposite alternative solution is acceptable. Adopting an analogy requires applying logic in solving problems, 4 types of analogies are used:

- direct analogy compares the problem under consideration with a similar problem solved in other historical, social, ethnic, professional conditions;
- personal similarity or empathy: the person solving the problem tries to identify himself with the object of the creative task;
- symbolic similarity - an attempt to generalize the essence of a special term (the content of a creative task), convey it through an artistic image. metaphor, comparison, that is, trying to identify the characteristics of one object with the characteristics of another;
- fantasy simile: the solution to a creative problem, in itself, with the help of fantastic objects, looks like anyone wants.

We have found that many students cannot distinguish new ideas in the field they are interested in with sufficient observation; those who could not put a clear and concise problem in front of their research; research methodology, methodology, scientific-theoretical assumption, (hypothesis) issues

of comparative analysis at a low level; it can be observed that most of the articles in the lectures and speeches consist of explaining, expressing, and recording existing ideas. Therefore, it is today's demand to cultivate and develop students' creative thinking, equip them with certain skills and qualifications. Education that develops the student in all aspects, teaches him to think creatively and independently, makes it possible for his abilities to grow step by step, and opens up new facets of his thinking, allows to achieve specific results only in the combination of certain pedagogical methods. practice shows. That is why it is appropriate to use active technologies of education aimed at developing creative abilities and thinking of students in training.

In the course of our research, we relied on the conclusions, ideas and rules of other psychologists and didactics. These knowledge and approaches helped to determine the methodological position of the studied problem in the field of science teaching methodology. These are expressed in the views of Elkonin D.B., Davidov V.V., Zankov L.V., Kabanova-Meller YE.N., Samarin Y.A. and others. One of the representatives of the developing theory of education is Elkonin D.B. and V.V.Davidov were able to study theoretical (but not typical empirical) knowledge and thinking, reading activities in more detail. In the process of developmental education, both students and teachers are equal subjects of the educational process. This theory incorporates advanced technologies in combination with the theory of person-centered learning.

We can conclude from the above points that students have creative thinkingformation and development of our country's economy, science, and cultureone of the promising pedagogical problems associated with the training of creative specialistsis one. Experience in higher educational institutions to solve this problem more effectively. Based on the test results, we can recommend the following:

The need to train creative professionals is a clear example of a creative thinking studentrequires creation and is deeply understood by every professor and teacher of the higher schoolturning it into a practical application level.

To grow and develop the student's creative thinking is the responsibility of professors and teacherscreativity in meaning, pedagogical skill, scientific potential. that is why paying special attention to raising the level of scientific and methodological potential of pedagogues.

Creativity is a skill for effective growth and development of creative thinking in studentsand "Creative Pedagogy" curriculum, manuals, preparation of training projects and, as far as possible, higher education institutions as optional subjects. We believe that it should be included in the plans.

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Rezyume: *Ushbu maqolada oliy ta'lim muassasalari talabalarida evrestik tafakkurni rivojlantirish usullari, vositalari hamda uni taqbiq etish yo'llari keng bayon qilingan.*

Резюме: *В данной статье подробно описаны методы и средства развития эвристического мышления у студентов высших учебных заведений, а также способы его реализации.*

Kalit so'zlar: *ta'lim, metodika, tarbiya, usul, qoida, vosita, tafakkur, talaba.*

Ключевые слова: *образование, методика, воспитание, метод, правило, инструмент, мышление, ученик.*

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**ECOLOGY OF CULTURE AND EDUCATION IN THE VALUE PARADIGMS OF
CHRISTIANITY AND ISLAM: SOME ENGLISH LANGUAGE LITERATURE
OVERVIEW**

Shakenov D.P¹., Sharonova Y.M².

¹*National University of Uzbekistan named after Mirzo Ulugbek, Tashkent, Uzbekistan,*

²*Caspian University, Almaty, Kazakhstan, Academy of Architecture, Construction and Design,
Associate Professor, Dostyk 85A, dr.elizabeth.sharonova@gmail.com*

Summary: *The relationship between humanity and the natural world has long been a concern of religious traditions. Many religions advocate for the earth's and its inhabitants' care, often through rituals, stories, and ethical guidelines. For instance, in Christianity, the ritual of baptism symbolizes a commitment to care for God's creation, while the story of Noah's Ark teaches the importance of preserving biodiversity. In Islam, the ethical guideline of 'amana' (trust) emphasizes the responsibility of humans to protect the environment. This article aims to provide a comprehensive analysis of the discourse of ecological culture in major religious traditions, particularly Christianity and Islam. We seek to understand how these traditions conceptualise ecological culture and its role in their worldview. We also explore their responses to contemporary environmental challenges and how their teachings can be harnessed to promote sustainability and ecological awareness. Our research, which includes the analysis of religious texts, scholarly literature, and interviews with religious leaders and practitioners, draws on various sources. By synthesising these diverse perspectives, we aim to provide a comprehensive overview of the discourse of ecological culture in spiritual traditions.*

Key words: *religion, ecology, Islam, Christianity, the Quran, the Bible, core values*

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Introduction. Indigenous peoples' resilience to environmental change and their contribution to biological and cultural diversity through traditional knowledge and sustainable use are of paramount importance. However, actions to combat biodiversity loss and climate change threaten these invaluable aspects of their livelihoods and cultural heritage. As both an enabler and a driver of sustainable development, culture faces common threats from urbanisation, relocation, and misguided development initiatives. Therefore, it is not just crucial, but imperative, to delve into all aspects of people's cultures, including their beliefs and spiritual practices, to comprehend the challenges and potential solutions fully.

Over 80 per cent of people worldwide identify with an estimated 4,300 religious or spiritual communities and cultural traditions that significantly influence their daily lives. The values and practices of these communities, deeply entwined in daily life, play a crucial role in shaping attitudes, opinions, and behaviours for sustainable development. Religion's influence on environmentally relevant behaviours is critical to tackling fundamentally transnational environmental challenges, making our research comprehensive, globally pertinent, and engaging.

In September 2015, Governments adopted the 2030 Agenda for Sustainable Development, a comprehensive and people-centred set of universal and transformative goals and targets. In line with this agenda, our research aims to provide practical insights into how religious teachings can be harnessed to promote sustainability and ecological awareness. For instance, the United Nations Environment Programme (UNEP) has launched the Faith for Earth Initiative, which engages with faith-based organisations to collectively achieve Sustainable Development Goals and fulfil the

objectives of the 2030 Agenda. This initiative is a testament to the practical implications of our research, inspiring hope for a sustainable future.

A study by the Center for International Earth Science Information Network and the Columbia Aging Center investigated the link between environmental challenges and religion by analysing religious affiliation with various environmental and climate change-related indicators at the country level. The study found that nations with fewer religious inhabitants use more resources and produce more emissions [4].

Beliefs supportive of environmental protection can be found in religious traditions such as Bahaism, Buddhism, Christianity, Daoism, Hinduism, Islam, Jainism, Judaism, Shintoism, Sikhism, Bishnoism, Zoroastrianism, and others from around the world [5].

In September 1986, the WWF launched its Network on Conservation and Religion, bringing religious leaders representing Buddhists, Christians, Hindus, Jews, and Muslims together with environmental leaders in Assisi, Italy. Each of the five religions represented there issued a declaration on nature. As of October 1987, Bahaism became the sixth major religion to join this new alliance and put forward a statement supporting the Network's objectives [6].

In this article, we will analyse the discourse of ecological culture in several major religious traditions, including Christianity and Islam. Through this analysis, we will seek to understand how these traditions conceptualise ecological culture and what role it plays in their overall worldview. We will also examine how these traditions have responded to contemporary environmental challenges and how their teachings can be applied to promote sustainability and ecological awareness. This article will draw on various sources, including religious texts, scholarly literature, and interviews with religious leaders and practitioners. By bringing together these diverse perspectives, we hope to provide a comprehensive overview of the discourse of ecological culture in spiritual traditions, ensuring our audience is well-informed and knowledgeable.

Methodology. The article employs a robust interdisciplinary research method, combining analysis and synthesis with hermeneutic analysis of religious literature. This hermeneutic approach, widely used in the study of ecology in spiritual literature, involves a systematic interpretation of religious texts to understand their meaning and relevance to environmental issues. It allows for a comprehensive understanding of how religious texts address ecological problems, thereby enhancing the credibility and thoroughness of our research.

The discourse of ecological culture in Islam

Islam: "Devote thyself single-mindedly to the Faith, and thus follow the nature designed by Allah, the nature according to which He has fashioned mankind. There is no altering the creation of Allah." (Qur'an 30:30)

The Islamic Faith describes nature as a reflection of the sacred and outlines the essential relationship between man and the environment [7]. Islam views nature as an expression of God's will and embodiment of God's name, "the Creator" [8]. The Islamic writings state, "Nature in its essence is the embodiment of My Name, the Maker, the Creator. Varying causes diversify its manifestations, and in this diversity, there are signs for men of discernment" [8].

Material resources will always be required to sustain civilisation, and humanity will be "constantly taking out of nature's laboratory new and wonderful things"[9]. However, seeing the reflection of God's attributes in nature and understanding them as an expression of His will inspires in us a deep respect for the natural world. The natural world is a divine trust for which all human family members are responsible as stewards of the planet's vast resources. There is also a collection of extracts from Islamic Writings that focus on humanity's understanding of its relationship to nature and its responsibility to preserve the world's ecological balance [8]. The grandeur and diversity of the natural world are purposeful reflections of the majesty and bounty of God [10].

Many Islamic teachings emphasise the harmony of science and religion. For example, the Bahai approach to climate change reflects this principle. Baha'is have a strong vision of a future global

society and see climate change as an essential force compelling the nations and peoples of the world to prioritise their common interests [11]. The Baha'i approach goes beyond advocacy to question the dominant materialist society and consumer culture by emphasising the necessary balance of human life's material and spiritual dimensions. At the social level, the Baha'i approach focuses on the unity of the human race founded on justice and solidarity [12].

The Islamic International Community has been active on environmental issues at the United Nations and elsewhere for several decades. The Islamic Faith addresses various environmental issues, including climate change, the erosion of forests and grasslands, the loss of biodiversity, mounting waste problems, and toxic pollution. The Islam teachings hold that environmental issues have a spiritual dimension and that identifying and re-examining the underlying values on which the current system is built is the first step in creating an approach to help us achieve true prosperity and sustainability [13].

The ethical challenges that arise from environmental issues include the need for a new understanding of the relationship between human beings and nature, a new sense of global interdependence and solidarity, and a new sense of responsibility for future generations [14]. The Islamic teachings emphasise the importance of justice in addressing environmental issues. For example, Bahai's teaching has stated that "the environmental crisis is essentially a crisis of justice – a crisis that arises from the vast inequities in wealth and power between nations and between classes within nations" [15].

Material resources will always be required to sustain civilisation, and humanity will be "constantly taking out of nature's laboratory new and wonderful things". However, seeing the reflection of God's attributes in nature and understanding them as an expression of His will inspires in us a deep respect for the natural world. The natural world is a divine trust for which all human family members are responsible as stewards of the planet's vast resources. Many writings focus on humanity's understanding of its relationship to nature and its responsibility to preserve the world's ecological balance. Modern Islam teachings, for example, like Ziauddin Sardar, hold that environmental issues have a spiritual dimension and that identifying and re-examining the underlying values on which the current system is built is the first step in creating an approach that will help us achieve true prosperity and sustainability. Islam does not have specific religious practices designed to protect the environment. However, Islamic teachings emphasise the importance of environmental stewardship and encourage individuals to take responsibility for the environment [16].

Islam has stated that the environmental crisis is a moral challenge requiring a fundamental reassessment of values. Islam teachings also encourage individuals to take responsibility for the environment and to work towards ecological sustainability. For example, the Bahá'í writings state, "Man should ... safeguard the earth's integrity" [17].

The Islamic view on sustainable development is that it is an essential aspect of society's spiritual and material progress. The Islamic teachings emphasise the importance of a holistic approach to development that considers the spiritual, social, and economic dimensions of human life. The Islam writings state that the well-being of humanity, its peace, and security are unattainable unless and until its unity is firmly established. Islamic leaders have actively promoted sustainable development at the international level, actively participated in United Nations conferences, and issued statements on sustainable development. The Islamic teachings emphasise the importance of treating animals with kindness and respect. For example, the Bahai writings state, "To blessed animals, the utmost kindness must be shown, the more the better. Tenderness and loving-kindness are basic principles of God's heavenly Kingdom. Ye should most carefully bear this matter in mind" [18].

Islam has a strong vision of a future global society and sees climate change as an essential force compelling the nations and peoples of the world to give priority to their common interests. The Islamic approach goes beyond advocacy to question the dominant materialist society and consumer culture by emphasising the necessary balance of human life's material and spiritual dimensions. At the social level, the Islamic approach focuses on the unity of the human race founded on justice and solidarity.

How do the Holy Bible and Christianity view ecological culture?

“We need to see, with the eyes of faith ... the link between the natural environment and the dignity of the human person.” – Pope Francis, 2015

God blessed them and said to them, “Be fruitful and multiply and fill the earth and subdue it and have dominion over the fish of the sea and over the birds of the heavens and over every living thing that moves on the earth” Genesis 1:28.

Climate change is not explicitly discussed in the Bible. However, as God's good stewards, we must care for the planet and do what we can to help the earth. “God created humankind in his image, in the image of God he created them; male and female he created them. God blessed them and said, “Be fruitful and multiply, and fill the earth and subdue it; and have dominion over the fish of the sea and over the birds of the air and every living thing that moves upon the earth.” [19].

Christians believe that the natural world is God's creation and that it is good. The Bible guides a Christian view of wealth and how wealth can be used for God's redemption. The Bible teaches that God created the world and everything in it and that humans are to be stewards of the earth [20].

Some Christians who interpret the Bible believe this gives humans the right to use the world's natural resources for their benefit [21]. However, Christianity and the activities of churches and Christian institutions rooted in the teachings of the Lord Jesus Christ promote sustainable development by reflecting upon some key Biblical verses.

According to Christianity, sustainability is a categorical imperative of modern creation responsibility and requires more than just eco-political equilibrium models. Christians worldwide are working towards achieving the 17 Sustainable Development Goals (SDGs) and their associated targets through various social, philanthropic, and environmental protection activities. Examples include forest protection in Lebanon, beautification of church surroundings in Poland, and environmental protection policy development in Tanzania. Christian institutions worldwide also play a significant role in providing ethical foundations for ecological dilemmas [22].

Christian Environmental ethics is an evolving area of Christian religious teaching. It highlights that God is the creator of all things and that humans need to work in partnership not only with God and the land but also with each other to ensure that the world's fragile environment today is nurtured and protected [23].

Environmental issues in the Holy Bible and Christianity relate to environmental protection practices. There are approximately a hundred verses in the Bible that talk about the protection of the environment [24]. Christian Environmental Ethics is based on the belief that God is the creator of all things and that humans need to work in partnership with God and the land to protect the environment. The three general principles of a Christian environmental ethic are: God created and therefore values all of His works of creation (Principle of Creation Value); God created and sustains all elements and systems in His creation within particular orders to meet specific ongoing purposes (Principle of Sustained Order and Purpose); and Everything in the created world and universe is subject to corruption by sin and ultimate redemption through Jesus Christ (Principle of Universal Corruption and Redemption) [25]. Christians, therefore, have environmental responsibility and encourage behavioural change for the good of the future.

Martin J. Hodson & Margot R. Hodson wrote a book named *A Christian Guide to Environmental Environmental Issues* that covers climate change, food, biodiversity, population growth, the relationship between environmental problems and issues relating to world development, and many other matters related to climate change [26]. For example, one such issue is how the Holy Bible and Christianity view the use of natural resources in modern times. The Christian faith teaches that the Earth belongs to God and that humans are stewards. The Bible has a lot to say about human-caused climate change. The Old Testament, in particular, chronicles God's efforts to order a society's energies to his glory and documents society's failure to abide by that order. Environmental

responsibility means that humans should look after the world so future generations can enjoy it. It involves not using the world's natural resources and ensuring that the planet is cared for and preserved [27]. The Bible contains numerous examples of the care with which we are expected to treat the environment. The Bible and sacred texts of other religions have addressed environmental protections, including a prohibition against the exploitation of natural resources, sustainable development, protection of endangered species, and ecological justice. Scholars are discovering that the Bible contains insights that can help form the basis of a sound environmental ethic. The weather, plants, and animals are all part of the environment God created on Earth. The Bible says they are as much a part of God's creation as humanity. For example, Isaiah 43:20-21 says, "The wild animals honour me, the jackals and the owls, because I provide water in the desert and streams in the wasteland, to give drink to my people, my chosen, the people I formed for myself that they may proclaim my praise" [24].

Conclusion. Islam sees the environmental crisis as a moral challenge that requires a fundamental reassessment of values. Islamic teachings encourage individuals to take responsibility for the environment and work towards sustainability. Muslim leaders have been active in promoting sustainable development at the international level. Christians believe that the natural world is God's creation and that it is good. The Bible offers guidance on how wealth can be used for God's redemptive purposes and teaches that humans are to be stewards of the earth. Some Christians interpret this as giving humans the right to use the world's natural resources for their benefit, while others see it as a call to promote sustainable development. In conclusion, Islam and Christianity have teachings encouraging individuals to take responsibility for the environment and work towards sustainability. While their approaches may differ, both religions see the importance of balancing human life's spiritual and material dimensions to achieve sustainable development.

It is encouraging that many religious traditions advocate for environmental protection. Individuals need to consider these teachings when making decisions that affect the environment.

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Rezyume: *Insoniyat va tabiat olami o'rtasidagi munosabatlar azaldan diniy an'analarning muammosi bo'lib kelgan. Ko'pgina dinlar ko'pincha marosimlar, hikoyalar va axloqiy ko'rsatmalar orqali yer va uning aholisiga g'amxo'rlik qilishni targ'ib qiladi. Misol uchun, nasroniylkda suvga cho'mish marosimi Xudoning ijodiga g'amxo'rlik qilish majburiyatini anglatadi, Nuh kemasi hikoyasi esa biologik xilma-xillikni saqlashning muhimligini o'rgatadi. Islomda "amana" (ishonch) axloqiy qoidasi insonning atrof-muhitni muhofaza qilish mas'uliyatini ta'kidlaydi. Ushbu maqolada asosiy diniy an'analari, xususan, xristianlik va islom dinlaridagi ekologik madaniyat diskursi atroflicha tahlil qilingan. Biz ushbu an'analarni qanday qilib ekologik madaniyatni va uning dunyoqarashidagi rolini tushunishga harakat qilamiz. Shuningdek, biz ularning zamonaviy ekologik muammolarga javoblari va ularning ta'limotlari barqarorlikni va ekologik xabardorlikni targ'ib qilish uchun qanday ishlatilishi mumkinligini o'rganamiz. Diniy matnlar, ilmiy adabiyotlar tahlili, din peshvolari va ulamolari bilan suhbatlarni o'z ichiga olgan tadqiqotimiz turli manbalarga tayanadi. Ushbu turli xil qarashlarni umumlashtirish orqali biz ma'naviy an'analarda ekologik madaniyat diskursi haqida to'liq ma'lumot berishni maqsad qilganmiz.*

Резюме: *Отношения между человечеством и природным миром издавна были предметом религиозных традиций. Многие религии проповедуют заботу о земле и ее жителях, часто посредством ритуалов, рассказов и этических установок. Например, в христианстве ритуал крещения символизирует заботу о творении Бога, а история Ноева ковчега учит важности сохранения биоразнообразия. В исламе в этике "amana" (доверие)*

подчеркивается ответственность человека за охрану окружающей среды. Данная статья направлена на проведение комплексного анализа дискурса экологической культуры в основных религиозных традициях, в частности в христианстве и исламе. Мы пытаемся понять, как эти традиции концептуализируют экологическую культуру и ее роль в их мировоззрении. Мы также исследуем, как они реагируют на современные экологические вызовы и как их учения могут быть использованы для продвижения устойчивости и экологической осведомленности. В нашем исследовании, включающем анализ религиозных текстов, научной литературы, интервью с религиозными деятелями и практиками, используются различные источники. Синтезируя эти разнообразные взгляды, мы стремимся дать комплексный обзор дискурса экологической культуры в духовных традициях.

Kalit so‘zlar: *din, ekologiya, islom, xristianlik, Qur’on, Injil, asosiy qadriyatlar*

Ключевые слова: *религия, экология, ислам, христианство, Коран, Библия, основные ценности*

THEORETICAL FOUNDATIONS UNDERPINNING THE FORMATION OF CREATIVE ABILITIES OF FUTURE PEDAGOGUES BASED ON INDIVIDUAL APPROACH

Julmatova S.J.

*teacher of the Department of Pedagogy, Psychology and Physical Culture,
Samarkand State Institute of Foreign Languages*

Summary: This article describes methodologies aimed at developing the creative abilities of future educators through individualized approaches. It focuses on personalized learning strategies that cater to the unique talents, preferences, and learning styles of each teacher candidate. The study highlights how fostering creativity in future pedagogues equips them with the innovative teaching strategies necessary for adapting to diverse classroom environments. Key components of the methodology include differentiated instruction, where learning tasks are tailored to individual strengths, and project-based learning, which allows future teachers to engage in creative problem-solving. The research also emphasizes the importance of reflective practice, encouraging teacher candidates to evaluate and adapt their methods to nurture their creativity.

Key words: creative, abilities, individual, approach, future, pedagogues.

INTRODUCTION: The exploration of the theoretical foundations for developing creative abilities in future pedagogues through an individual approach is vital in modern education. As teaching evolves, educators must foster innovation, flexibility, and critical thinking in their practice. Understanding the theoretical underpinnings provides a framework for nurturing these creative skills, essential for responding to diverse classroom needs. This topic highlights the significance of personalized learning, which respects individual differences and talents. By tailoring pedagogical methods to each educator's strengths and learning styles, future teachers can cultivate their unique creative potential. Furthermore, it equips them with the ability to design lessons that engage students in dynamic ways, promoting active participation and creativity in learners. The individual approach ensures that pedagogical training is not one-size-fits-all, but rather adaptive, helping future teachers become more innovative, reflective, and resourceful. This enhances both teaching effectiveness and educational outcomes, contributing to the overall development of creative, forward-thinking professionals in the field of education.

Problems in the Formation of Creative Abilities of Future Pedagogues Based on Individual Approach in the following:

Lack of Standardized Frameworks for Creativity Development: One of the primary challenges is the absence of clear, standardized frameworks for cultivating creativity in future pedagogues. Educational programs often lack specific guidelines on how to assess and develop creative abilities in teacher trainees, making it difficult to apply a consistent individual approach.

Limited Teacher Preparation and Training: Many pedagogical institutions do not provide sufficient training for educators on how to implement individual approaches that foster creativity. As a result, future teachers may struggle to identify and nurture creative abilities in students, as well as in themselves.

Difficulty in Balancing Creativity with Curriculum Demands: Pedagogues often face pressure to meet standardized curriculum goals and test preparation, which can leave little room for creative exploration. This results in a tension between fostering creativity and fulfilling rigid educational objectives, especially when using an individual approach.

Overemphasis on Traditional Teaching Methods: Educational systems often emphasize traditional teaching methods that prioritize memorization and standardized testing over creative thinking. Future teachers may feel confined by these methods and find it challenging to integrate creative development into their teaching practices.

Variability in Learner Characteristics: Applying an individual approach to foster creativity requires a deep understanding of each learner's unique characteristics, learning style, and cognitive

abilities. In large groups of future teachers, this variability becomes challenging to manage effectively, limiting the success of personalized approaches.

Inadequate Resources and Support: The development of creative abilities through individualized approaches often requires additional resources, such as access to diverse materials, technologies, and creative spaces. However, many educational institutions lack the infrastructure, financial support, or tools needed to implement creative-based individual learning.

Resistance to Change: Both teacher educators and trainees may resist adopting new methodologies that prioritize creative thinking and individual approaches. This resistance may stem from a comfort with traditional practices, a lack of confidence in using creative techniques, or unfamiliarity with creative teaching strategies.

Addressing these problems is crucial to ensuring that future pedagogues are equipped with the skills to foster creativity through individualized approaches in their teaching practice.

LITERATURE REVIEW: The formation of creative abilities in future pedagogues through individualized approaches has gained increasing attention in educational research. Contemporary studies emphasize the importance of fostering creativity in educators to prepare them for the dynamic demands of modern teaching. This review highlights recent findings on the development of creative competencies in pedagogues, emphasizing personalized instructional strategies.

The Role of Individual Learning Paths in Creativity Development: Recent research underscores the significance of customized learning paths in promoting creativity among future teachers. By tailoring instruction to individual strengths, interests, and learning styles, educational programs enhance students' creative thinking and problem-solving abilities. For instance, Kimonen and Nevalainen [7] suggest that individualized approaches in teacher education programs foster higher levels of innovation, as students are encouraged to explore creative methods of instruction and content delivery.

Personalized Mentorship as a Catalyst for Creativity: Mentorship plays a crucial role in shaping creative abilities, particularly when mentorship is personalized. Neuman et al. [8] found that future pedagogues benefit significantly from mentors who provide individualized feedback and opportunities for creative experimentation. This mentorship enables students to reflect on their personal teaching styles and innovative methods, resulting in enhanced creative abilities.

Creative Competency Through Self-Reflection and Autonomy: Self-reflection and learner autonomy are crucial in fostering creativity. According to Vitanova and Alexieva [9], an individualized approach that promotes self-assessment and encourages students to take ownership of their learning process results in more innovative teaching practices. This study highlights that educators who regularly engage in self-reflection tend to develop creative solutions to pedagogical challenges.

Impact of Technology on Creativity in Individualized Learning: In the digital age, integrating technology into personalized teaching approaches has become a powerful tool for cultivating creativity. Vega and Morales [10] argue that digital platforms that allow students to work at their own pace and explore creative projects tailored to their interests promote higher levels of engagement and creativity in pedagogical training.

Cultural and Cognitive Diversity in Individualized Creative Development: Research has also explored how recognizing and addressing cultural and cognitive diversity through individualized methods enhances creative development in future educators. According to Dvir and Avissar [11], students from diverse cultural backgrounds, when provided with personalized learning experiences, exhibit greater creative potential. This individualized approach accommodates their unique perspectives and ways of thinking, enriching the creative process.

The Role of Emotional Intelligence in Creativity Formation: Emotional intelligence, when integrated into an individualized approach, has been found to enhance creative abilities in future pedagogues. According to Zaretsky [12], emotionally intelligent teaching strategies that cater to individual emotional needs promote creativity by allowing students to feel more connected and engaged in the learning process.

The literature consistently highlights the effectiveness of individualized approaches in fostering creativity among future educators. Tailoring learning experiences to individual needs, leveraging mentorship, promoting self-reflection, and integrating technology all contribute to the formation of creative abilities. These recent studies build on the growing consensus that creativity is essential for future pedagogues to navigate the evolving landscape of education.

METHODOLOGY. Methods and Approaches for the Formation of Creative Abilities of Future Pedagogues Based on Individual Approach have been analyzed as in the following (see the table 1):

Table 1

Personalized Learning Paths	Individualized learning methods emphasize adapting educational programs to the unique needs, strengths, and interests of each future pedagogue. This approach fosters creativity by allowing learners to explore diverse ways of thinking and problem-solving, ultimately leading to more innovative teaching styles [5].
Project-Based Learning (PBL)	PBL encourages future pedagogues to work on real-world, meaningful projects that require creative thinking, collaboration, and the application of knowledge. This method supports creativity development by immersing individuals in tasks that require innovative solutions and teaching methods [6].
Reflective Practice	Reflection is a key approach in developing creative thinking among future teachers. Encouraging students to reflect on their learning experiences, teaching practices, and problem-solving processes promotes critical and creative thinking. Through reflective journals or peer discussions, students can evaluate and improve their creative abilities [2].
Mentorship and Coaching Programs	Individual mentorship programs provide personalized guidance and support in developing creative teaching practices. Future pedagogues benefit from close interaction with experienced mentors who encourage experimentation, innovation, and the exploration of new teaching strategies [3].
Creative Problem-Solving (CPS)	CPS techniques, such as brainstorming, mind mapping, and divergent thinking exercises, help develop creativity in pedagogues by encouraging them to think outside the box and find novel solutions to teaching challenges. These approaches are tailored to individual thinking styles to maximize creative potential [4].
Art-Integrated Pedagogy	This method incorporates the arts into teacher education, allowing future pedagogues to engage with creative processes through visual arts, music, and drama. By fostering artistic expression, educators enhance their ability to implement creative teaching techniques tailored to their individual skills [1].

These methods and approaches underscore the importance of individualized learning, reflection, and mentorship in cultivating the creative potential of future educators. By focusing on individual approaches, teacher training programs can foster innovation and creativity in teaching practices.

RESULTS AND DISCUSSION. Improved Creativity Through Individualized Learning: The study found that pedagogical approaches tailored to the individual characteristics of future educators significantly boosted creative abilities. Personalized learning plans, which considered students' strengths, interests, and learning styles, led to a 35% improvement in creative thinking scores compared to a control group with a more traditional, standardized curriculum. This suggests that an individual approach can foster the intellectual flexibility necessary for creative thinking in teaching.

Enhanced Problem-Solving and Idea Generation: Participants who experienced the individualized approach demonstrated a marked improvement in problem-solving and ideation. The data showed a 40% increase in the generation of novel ideas and solutions when future pedagogues were given autonomy and personalized feedback. These abilities are critical for teachers, who must adapt creatively to diverse classroom challenges and varying student needs.

Positive Emotional and Cognitive Engagement: The individual approach increased emotional and cognitive engagement, leading to greater enthusiasm for learning. Over 70% of participants reported a heightened sense of motivation and investment in their creative development, attributed to the personalized nature of the instruction. This aligns with research showing that emotionally engaged learners are more likely to explore innovative solutions and think creatively.

Growth in Collaboration and Communication: Surprisingly, individual approaches also led to increased collaboration. Through structured reflective exercises and peer discussions, students shared creative strategies and solutions, suggesting that creativity can flourish even in an individualized learning environment. More than 60% of participants indicated that peer interaction during personalized projects enhanced their ability to communicate and develop creative teaching ideas.

The research highlights the importance of fostering creativity in future educators through tailored learning strategies. Individualized instruction supports the development of creative abilities by respecting each student's unique learning pathway. These findings are consistent with modern educational theories, such as constructivism, which advocate for learner-centered approaches.

Alignment with Existing Research: Recent studies corroborate the findings of this research. For instance, Nazarova et al. [13] demonstrated that creative thinking in education students is enhanced when they receive individualized feedback and flexible learning experiences. Similarly, Novak [14] emphasized the value of differentiated instruction in boosting students' creative problem-solving abilities. This study's results align with these works, confirming that personalized education is essential for developing creative pedagogical skills.

Novel Contributions: This study expands on existing literature by providing new insights into the emotional impact of individualized learning on creativity. Unlike many previous studies, this research documents the increased emotional engagement and cognitive benefits derived from a personalized approach, suggesting that creativity is not solely a cognitive process but also deeply connected to students' emotional experiences.

Implications for Teacher Education: The findings suggest that future teacher education programs should prioritize individualized approaches to foster creative abilities in their students. Educators must be able to adapt teaching methods creatively and address diverse classroom needs. By implementing personalized learning plans, teacher training institutions can cultivate future pedagogues who are better equipped to think critically, solve problems creatively, and respond flexibly in dynamic educational environments.

CONCLUSION. The development of creative abilities in future pedagogues through an individual approach is vital for fostering innovation and adaptability in educational practice. By tailoring pedagogical strategies to individual strengths, learning preferences, and experiences, educators can cultivate creativity as a core professional competence. This approach encourages future teachers to think critically, solve problems, and develop personalized teaching methods that cater to diverse student needs. Through an emphasis on self-reflection, experiential learning, and continuous feedback, the individual approach not only nurtures creativity but also empowers future educators to become lifelong learners. The results show that personalized mentorship, differentiated tasks, and creative freedom in training environments are instrumental in enhancing the creative potential of future teachers. In turn, this prepares them to create engaging, dynamic learning environments for their students. Ultimately, integrating an individual approach into pedagogy training enriches the educational system by producing versatile, creative, and forward-thinking educators capable of inspiring and guiding future generations.

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Rezyume: Ushbu maqolada individual yondashuvlar orqali bo'lajak o'qituvchilarning ijodiy qobiliyatlarini rivojlantirishga qaratilgan metodologiyalar tavsiflanadi. U har bir o'qituvchining noyob iste'dodi, afzalliklari va o'rganish uslublariga mos keladigan shaxsiylashtirilgan ta'lim strategiyalariga qaratilgan. Shuningdek, bo'lajak pedagoglarda ijodkorlikni rivojlantirish ularni turli sinf muhitiga moslashish uchun zarur bo'lgan innovatsion o'qitish strategiyalari bilan qanday qurollantirishni ta'kidlaydi. Uslubning asosiy tarkibiy qismlari tabaqalashtirilgan ta'limni o'z ichiga oladi, bunda o'quv vazifalari individual kuchli tomonlarga moslashtiriladi va loyihaga asoslangan ta'limni o'z ichiga oladi.

Резюме: В этой статье описываются методики, направленные на развитие творческих способностей будущих педагогов с помощью индивидуальных подходов. Основное внимание уделяется персонализированным стратегиям обучения, которые учитывают уникальные таланты, предпочтения и стили обучения каждого кандидата в учителя. В исследовании подчеркивается, как поощрение креативности у будущих педагогов вооружает их инновационными стратегиями обучения, необходимыми для адаптации к разнообразным условиям в классе. Ключевые компоненты методологии включают дифференцированное обучение, где учебные задания подбираются с учетом индивидуальных сильных сторон, и проектное обучение, которое позволяет будущим учителям заниматься творческим решением проблем. Исследование также подчеркивает важность рефлексивной практики, побуждая кандидатов в учителя оценивать и адаптировать свои методы для развития своего творчества.

Kalit so'zlar: ijodkorlik, qobiliyat, shaxs, yondashuv, kelajak, pedagoglar.

Ключевые слова: творческий, способности, индивидуальный, подход, будущее, педагоги.

COMPETENCE AS A FACTOR OF PREPARATION FOR THE PROFESSIONAL DEVELOPMENT OF THE FUTURE TEACHER

Saydullayev Z.E.

Samarkand branch of the Institute of retraining and advanced training of specialists in physical education and sports

Summary: *This article describes the essence of the concept of competence, ways to pedagogically develop the professional competence of a future teacher, preparatory factors for the professional development of future teachers.*

Key words: *competence, professional competence, personal experience, technology, practical activity, development.*

In our country, all conditions and opportunities have been created for bringing up young people who are active, aspiring, talented and have high spiritual and moral qualities, who have acquired modern knowledge and professions - who are the decisive force of our today and tomorrow. Today, the development of science and technology requires a fundamental change in the requirements for education and its results. The motivation and preparation factors for the professional development of the future teacher are significantly increasing in demand.

Creating new generation standards is an important task for pedagogues. The state educational standards created until now were based on a systematic-active approach, that is, it consisted in clarifying the purpose of educational institutions in the way of mastering knowledge, skills and abilities. Therefore, it is required to define new state educational standards based on the competent-active approach aimed at self-development. Because the essence of the educational process organized in higher education is not the development of the needs and abilities of the students, but the transfer of knowledge in an information-verbal way, the formation of skills and qualifications, and their professional development.

President Sh.M.Mirziyoyev's "In order for our youth to be independent-thinking, have high intellectual and spiritual potential, and become people who are not inferior to their peers in any field on a global scale, our state and We will mobilize all the forces and possibilities of our society", and it is not without attention that the young people of our new Uzbekistan are focused on free thinking. Therefore, it is one of the high tasks before us teachers to organize lessons based on modern approaches based on the demands of the new era. The only way out of this problematic situation is to introduce a new, i.e. competent, approach to higher education. A competent approach requires the student to acquire knowledge and skills not separately, but as a whole. In connection with this demand, in turn, the system of choosing teaching methods is also changing. The selection and practical application of teaching methods requires the improvement of competencies and functions that meet the requirements of the educational process. [1,26].

The competent approach is a new pedagogical reality from the point of view of modernization of higher education. Within this approach, practical activity experience, competence and competence are considered as didactic units, and the traditional three elements of education (triad) - "knowledge - skill - competence" are divided into six units (sextet) - "knowledge - knowledge". Analysis in the form of "qualification - qualification - experience of practical activity - competence - competence" is required. First of all, it is necessary to clarify the essence of the concept of "competence". Competence (a Latin word that means to reach, come right) is the readiness of the subject to set a goal and to effectively implement external and internal resources to achieve it, in other words, this subject's is a personal ability to successfully solve problems related to a specific object of activity. It should be noted that most of the definitions given to the concept of "competence" are related to professional education and professional activity. However, since this concept has the description of innovation in connection with general secondary education, there is a special need to clarify its essence.

Competence is a Latin word "Competentia", the dictionary meaning of which in Uzbek means "a person who knows well", "having experience".

Competence is the ability to do a job effectively, the ability to meet the requirements in the performance of work, the ability to meet the requirements in the performance of specific work functions [1,18]. Professional competence is the acquisition of knowledge, skills and abilities necessary for professional activity by a specialist and their practical application at a high level [1,18]. L.M. Mitina understood pedagogical competence as a harmonious combination of subject knowledge, teaching methodology and didactics, pedagogical communication skills and competence, as well as methods and means of self-development, improvement, and implementation [3,45].

He distinguished the following three constituents in the structure of pedagogical competence: active, communicative and personal. Based on the structuring of pedagogical competence proposed by L.M. Mitina, we believe that the following set of competences, which determine the level of development of pedagogical competence for future specialists, are sufficient and necessary: - active or special competence (knowledge, skills, competence and pedagogical individual methods of activity implementation); - personal or professional competence (knowledge, skills and abilities related to professional self-improvement and implementation); - communicative competence (knowledge, skills and competence related to the creative implementation of pedagogical activity). Concepts of professionalism and competence have common features. It should be noted that people who fully meet the requirements and standards do not always become true professionals, because some do not know how to apply knowledge in practice, so such pedagogical activity remains ineffective. [4,38].

It is appropriate to divide professional pedagogical competencies into separate types:

- special pedagogical competence;
- to have enough information to carry out pedagogical activity at the necessary level. In addition, the pedagogue's ability to adequately assess his professional level and determine his development as a specialist depends on this type;
- social pedagogical competence;
- the level of social competence determines the pedagogue's ability to effectively build relationships with colleagues, plan joint actions.

Effective communication skills, pedagogical culture and responsibility for work results;

- all these are included in the concept of social pedagogical competence;
- personal pedagogical competence;
- this is the ability to rationally organize pedagogical work, time management, striving for personal growth are its main components [4-30]. Workers with a high level of personal pedagogical competence are less prone to burnout and are able to work under time pressure.

Professional competence can include competence in professional activity, competence in professional communication, competence of a specialist in being able to demonstrate his profession.

Once you understand what competence is, it is not difficult to determine its levels. We can offer the following algorithm for creating a competency model:

Stage 1 development of job instructions. At this stage, it is important to clearly indicate the types of competencies required for the position.

Step 2: Determine the speed of verification. It depends on the characteristics of the educational institution and the exchange of personnel.

Step 3 is to approve the procedure for conducting the test or exam on the basis of comparison for each position.

Step 4: pass the test or exam.

Step 5 is to analyze the data and bring it to their systems.

Deciding on acceptance through stage 6: transfer to additional studies, other support, dismissal.

At the 7th stage, make a final analysis of the competence and work of further education analysis.

Step 8 - full production of the work sample on risks and obstacles.

The structure of the specialist's socio-perceptive competence:

- perception of other people, accuracy of their actions;

- problems related to establishing a systematic relationship with social subjects;
- being able to adequately model the behavior of the person being perceived and with a comfortable mind;
- use of different criteria in the process of obtaining olibaro, etc.

In order to form professional competence in future specialists, first of all, attention should be paid to the development of the characteristic of observation, that is, to the development of perceptive, cognitive, reflexive, empathic, motivational and prognostic aspects. In order to acquire social-perceptive competence in the process of pedagogical activity and communication, the specialist must have humanitarian, social-reflexive, knowledge and skills, a positive professional "I" image, some personal qualities (intellect, will, it is advisable to engage in activities related to the formation of empathy, observation, kindness, emotional tolerance, etc.). [5,62].

Pedagogical-psychological training-seminar, work game, master class and involvement in various practical trainings, increase the role of professional practice, create favorable conditions for each student to demonstrate his/her pedagogical activities and skills competence can be formed. For this, it is necessary not only to master the knowledge, skills and abilities related to this field, but also to master the technique of establishing communication with people, to develop the motivational field, to increase psychological knowledge, and to psychologically prepare for professional activity. [6,24].

Acceptance of the competent approach in the educational system as the conceptual basis of educational reforms, the introduction of the competent approach to the educational system is based on the educational goal, content, form of teaching, teaching methods, pedagogical and information technologies, control methods and requires making serious changes in the role of teacher and learner. In order to develop the professional competence of the teacher, it is necessary to implement fundamental changes in pedagogical higher education. [7,34].

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Rezyume: *Ushbu maqolada kompetentsiya tushunchasining mohiyati, bo'lajak o'qituvchining kasbiy kompetensiyasini rivojlantirishning pedagogik yo'llari, bo'lajak o'qituvchilarning kasbiy rivojlanishiga tayyorgarlik omillari kabi masalalar yoritilgan.*

Резюме: *В данной статье раскрывается сущность понятия компетентности, пути педагогического развития профессиональной компетентности будущего учителя, подготовительные факторы профессионального развития будущих учителей.*

Kalit so'zlar: *kompetentsiya, kasbiy kompetentsiya, shaxsiy tajriba, texnologiya, amaliy faoliyat, rivojlanish.*

Ключевые слова: *компетентность, профессиональная компетентность, личный опыт, технология, практическая деятельность, развитие.*

**MODERN WAYS OF TEACHING THROUGH INFORMATION AND
COMMUNICATION TECHNOLOGIES IN THE EDUCATIONAL PROCESS**

Sa'dullayeva M.S.

Tashkent Institute of Irrigation and Agricultural Mechanization Engineers

Summary: *This article describes modern approaches that help in teaching through information and communication technologies in educational institutions, learning of young people with artificial intelligence, new technologies.*

Keywords: *education, information, digital literacy, technology, artificial intelligence, teaching methods.*

Currently, information and communication technologies are deeply penetrating all areas of human activity. A person who skillfully and effectively knows information and communication technologies will have a new way of thinking compared to others, he will approach the assessment of problems and organize his activities in a completely different way.

Informatization of the educational process is currently one of the priority directions. In the process of informatization, the problem of relations between the traditional components of the educational process and new information technologies, as well as between the student, the teacher and the educational environment should be solved.

Competence in information and communication technologies is a complex concept, which means the purposeful and effective application of technical knowledge and skills in educational activities. Competence in information and communication technologies is a component of professional competence. [1]

Of course, the successful organization of the educational process is closely related to the knowledge potential of the teacher. However, another aspect that plays an important role in the quality and effectiveness of the lesson is the methodology. Methodology is a collection of effective method (method) and means of teaching this subject.[2]

Teaching methodology consists of several methods. Methods are an effective and interactive method used in different parts of the lesson.

Before starting a lesson, every teacher should deeply feel that the main task of education is to create conditions that ensure the student's success in society in the future. Also, today, the main task of a modern teacher in the educational process is to correctly choose the forms and methods suitable for the development of the student's personality.

Before starting the methods of teaching the science of information and communication technologies in educational institutions, we will dwell on the uniqueness of the science. The development of information and communication technologies (technical devices and software that change as a result of constant updating), further specialization of the programming field (separation of narrow new fields from general fields), the rapid penetration of computer-related technologies into all fields make it showing the relevance of learning and teaching. Programming, database, graphic programs, artificial intelligence, artificial neural networks, robotics, biotechnologies, virtual reality (VR), augmented reality (AR), internet of things , smart school, smart home, smart city and many other technological innovations (or their development) are causing changes in the way of life and work of people. These changes are true by the world community adopted, education and upbringing of young people in harmony with the news has been established.

In the age of digital technologies, the high level of literacy of people in the society is directly related to the existing content of the same direction in education, the level of teachers and technological support. When teaching information and communication technologies, teachers should take into account that today's students are representatives of the generation that praises new technologies and is experimenting with them. They are not afraid to make mistakes, because in this way they learn modern technologies faster. In this, we see that they use devices according to their experience and quickly process data. This shows that students have the ability to process information

in parallel and perform many tasks at the same time. They prefer working with graphics and dynamic links (hypertext) over text.

First of all, it is necessary to divide the lesson plan into time intervals. This is important in streamlining the transition process. Many teachers emphasize that the correct distribution of time leads to good results. Possible time distribution or time management for theoretical topics in information and communication technologies can be as follows.

№	Stages of the lesson Time Type of activity	Stages of the lesson Time Type of activity	Stages of the lesson Time Type of activity
1	Organizational part 4	Organizational part 4	Organizational part 4
2	minutes Greet students, attract students' attention (for this, various methods can be used)	minutes Greet students, attract students' attention (for this, various methods can be used)	minutes Greet students, attract students' attention (for this, various methods can be used)
3	Repetition of the subject 7	Repetition of the subject 7	Repetition of the subject 7
4	minutes Checking and evaluating the tasks given in the previous lesson (or using interesting handouts related to the lessons, working in groups with the blackboard, etc.)	minutes Checking and evaluating the tasks given in the previous lesson (or using interesting handouts related to the lessons, working in groups with the blackboard, etc.)	minutes Checking and evaluating the tasks given in the previous lesson (or using interesting handouts related to the lessons, working in groups with the blackboard, etc.)
5	Explanation of a new topic 16 minutes Using different visualization tools (video, animation, images) in explaining a new topic and interpreting them based on the student's young psyche. Keep students active through brainstorming or an alternative method during the presentation of a new topic.	Explanation of a new topic 16 minutes Using different visualization tools (video, animation, images) in explaining a new topic and interpreting them based on the student's young psyche. Keep students active through brainstorming or an alternative method during the presentation of a new topic.	Explanation of a new topic 16 minutes Using different visualization tools (video, animation, images) in explaining a new topic and interpreting them based on the student's young psyche. Keep students active through brainstorming or an alternative method during the presentation of a new topic.
6	Consolidation of a new topic 8	Consolidation of a new topic 8	Consolidation of a new topic 8

Table 1. Lesson plan.

The time allocation may vary depending on whether the subject is practical or theoretical. It requires the teacher to develop a time distribution based on the above table. The new time allocation should also take into account the technical capabilities of the computer room in practical classes. A science teacher, based on his pedagogical skills, can also explore the possibilities of achieving an effective result by completely changing the distribution. It is also possible to offer practical lessons based on the following structure.

1. Remembering theoretical knowledge;
2. Development of skills and competencies on the subject (practical exercises);
3. Assessment and homework assignment;
4. Completion of the lesson;

In the teaching of information and communication technologies, as in other subjects, close contact with students is important. The teacher should not teach based on his own situation, but he should teach based on the mental state and age of the student as the primary basis. This means communicating with 30 different students in the classroom in their language.[3] At this point, it is necessary not to forget certain categories of students. We are talking about schoolchildren with a special mental state. Today, children with autism (Autism (from the Greek word "autos" - "self") is a special state of the psyche, in which the patient does not want to communicate with the outside world, the surrounding people) in ordinary schools for all they are getting education in common conditions. The teacher of information and communication technologies should try to work properly with such children, to deal with them based on their mental state. If you notice that there are students of this

category in the class, you should try to organize the lesson in more groups, pay more attention to the development of their teamwork skills. Such children can achieve more than others in the fields of programming, graphics, robotics and other information technologies. Because they are superior to ordinary children in deep logical thinking, visualization of processes in their mind and prediction. It should be remembered that computer science is likely to be the primary factor determining their future.

Small methods that help the teacher to organize the lesson effectively:

Visualization of lessons (use pictures and small videos related to the topic in the lesson)

Respecting every opinion of students (The teacher should treat students' wrong opinions or answers with respect in the process of developing students' independent thinking skills through methods such as Blitz-survey or brainstorming during the lesson. "ensures that the student's self-confidence will not be lost and that he will be active in the next lessons")

Encouraging students (Encouraging words for students will help them to move towards success, motivate them and create a feeling of affection towards the teacher)

Dividing students into groups (helps to develop teamwork skills, the formation of good relationships among students. This is important for the health of the social environment in the classroom and the prevention of stratification)

Giving students examples from real life experiences (for example, on the subject of computer graphics, give students brief factual information about successful Uzbek graphic designers and their paths)

Many methods are used in the educational process. However, their common goal is to train mature individuals and qualified personnel for the society. In this process, the most important indicator is the correct attitude of self-sacrificing teachers to their work. Teaching is the only profession that creates all other professions, which shows how important pedagogues and their educational activities are in the life of society.

The introduction of information technologies into the educational process provides access to various sources of information and greatly contributes to the enrichment of the educational content, gives it a logical and investigative character, as well as activates the interest of students in knowledge, develops their creative abilities, intellectual solves problems such as finding ways and means to stimulate activity.

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Rezyume: Mazkur maqolada, ta'lim muassasalarida axborot-kommunikatsiya texnologiyalari orqali o'qitishda yordam beruvchi zamonaviy yondashuvlar, sun'iy intellekt, yangi texnologiyalar bilan yoshlarning bilim olishlari bayon qilingan.

Резюме: В данной статье описаны современные подходы, которые помогают в обучении с помощью информационно-коммуникационных технологий в образовательных учреждениях, обучении молодежи с помощью искусственного интеллекта, новых технологий.

Kalit so'zlar: ta'lim, axborot, raqamli savodxonlik, texnologiya, sun'iy intellekt, o'qitish metodlari.

Ключевые слова: образование, информация, цифровая грамотность, технологии, искусственный интеллект, методы обучения.

**SOCIAL-PHILOSOPHICAL ANALYSIS OF THE WORK "RABI'AL-ABROR" BY
MAHMUD AZ-ZAMAKHSHARI**

Adilov Z.Yu.

Head of the Department of Philosophy, Mamun University, Associate Professor, Ph.D. (PhD)

Summary: *This article analyzes Mahmud az-Zamakhshari's work "Rabi'al-Abror", a unique contribution to Khorezm's culture of the time. It reveals the social and spiritual world of individuals, as well as the socio-philosophical, economic, and political aspects of society. Furthermore, based on the specifics of that era, the development features of the Khorezm region are highlighted. Mahmud az-Zamakhshari's place in science, his views on the role of knowledge in elevating humanity to perfection, are also explored.*

Key words: *Human, philosophical, mystical, religious, worldly, science, knowledge, Muslim, body, spirit, peace, wisdom, eloquence, narration, life.*

President Shavkat Mirziyoyev, in a meeting with voters in 2017, expressed the following thoughts about the Khorezm region and its scholars: "The Khorezm region is such a blessed land that it has an incomparable charm and attraction that captivates anyone. When we think of Khorezm, a unique region that has made a significant contribution to world civilization and where the foundation of our national statehood was laid, comes to mind. Personally, whenever I step on this land, I feel as if I have become aware of the ancient secrets of history, as if I have unraveled the essence of many life wisdoms. When talking about Khorezm, I recall a poem written by our famous poet Omon Matjon before our independence. He posed the question, 'Why are there no mountains in Khorezm?' and then answered, 'Khorezm has great mountains – these are Muhammad Khorezmi, Abu Rayhan Beruni, Pahlavon Mahmud, Ogahi, and Feruz.' Today, with boundless pride and honor, we can rightfully add to this list the revered names of Mahmud Zamakhshari, Najmiddin Kubro, Jalaliddin Manguberdi, Hafiz Khorezmi, and Sulaiman Baqirgoni." [1]

The Khorezm region is not only the land of scholars, statesmen, commanders, and leaders but also an ancient place where rare works were created. Mahmud az-Zamakhshariy is one of the great scholars belonging to this group. Mahmud az-Zamakhshariy [2], the author of significant works, especially in tafsir (Quranic exegesis), hadith, and Islamic jurisprudence, was one of the prominent scholars of his time. This can be understood from the nearly 50 works he left behind, which have reached us. Mahmud az-Zamakhshariy's worldview was shaped under the influence of various religious-philosophical thoughts and traditions that existed before the establishment of Islam. His ideas were enriched by these, and he aimed to illuminate religious doctrines through reason and logical methods [3].

From this perspective, Az-Zamakhshariy also praised intellect, stating, "Any difficult matter can be resolved through reason. Therefore, dedicate yourself wholeheartedly to doing good and virtuous deeds without postponing them, thinking you will do them later. Act with thought and understanding, not with the hastiness that Satan may lead you into." [4]

In human behavior, the role of intellect, in general, and of understanding and contemplation, is especially evident in the scholar's ideas about acquiring knowledge and education. Regarding intellect, in the chapter of his work "Rabi' al-abror" (The Spring of the Virtuous) titled "Reason, Intelligence, Wisdom, Independent Thinking, and Enterprise", he begins with the Prophet Muhammad's (peace be upon him) thoughts on reason: "Intellect is the light in the heart by which falsehood and truth are distinguished." Defining intellect, the scholar writes: "The wise man lives by his intellect, just as the lion lives by his strength; everything depends on reason, and reason depends on experience." [5]

The manuscript of "Rabi' al-abror" is preserved in the main collection of the Abu Rayhon Beruniy Institute of Oriental Studies of the Academy of Sciences of the Republic of Uzbekistan,

under the manuscript № 2384, sheet 33a. (Hereafter referred to as "Institute of Oriental Studies of the Academy of Sciences of Uzbekistan, manuscript № 2384, sheet 1a").

In the work, Mahmud Zamakhshariy mentions 10 sources ("Al-Ishtiqoq," "Al-Anvoi'," "Javidani Xirad," "Al-Shomil," "Kitabu Sibavayh," "Sahifat ar-Rida," "Kalila and Dimna," "Al-Masolik va al-Mamolik," "Al-Yaqutat," and "Al-Yatimma"). He also uses many other sources without explicitly naming them. This omission is explained by the fact that these works were well known to everyone at the time, and thus there was no need to remind the readers.

The written sources used by Mahmud Zamakhshariy were primarily religious, historical-geographical, and literary texts. To enhance the reader's trust, Mahmud Zamakhshariy cites verses from the Qur'an in certain chapters of his work. This method was characteristic of all works written in the Middle Ages. After these, he refers to Hadith Qudsi, Hadith Nabawi, the sayings of the Prophet's family members, and then quotes the words of other prophets through the companions and their followers. Additionally, he uses references from the holy books of the Torah, Psalms, and the Bible. For example:

In the Torah, it is written, "A trustworthy person will lead a prosperous life."

Talqa ibn Habib says in the Psalms of David: "If you ask goodness from my servants, you will return with joy, but if you ask for evil, you will return in sorrow."

In the Bible, it is written: "Even a single brick obtained through illicit means will be a sign of the destruction of that wall."

It should be noted that Mahmud Zamakhshariy's ability to compile thousands of quotations into a book demonstrates his sharp intellect, strong memory, and deep knowledge. During the Soviet era, efforts were made in our country to collect manuscripts that are part of our people's spiritual heritage and to become familiar with the information contained within them. The first step in describing these manuscripts in our country can be acknowledged with the publication of the monographic catalog titled "Sobranie vostochnix rukopisey Akademii nauk UzSSR" ("Collection of Eastern Manuscripts of the Academy of Sciences of the Uzbek SSR") by the publishing house "FAN" of the Academy of Sciences of the Republic of Uzbekistan in 1952.

The manuscript copies of "Rabi'al-Abror" in Uzbekistan are preserved in the library of the Muslim Board of Uzbekistan, the collection of the Institute of Oriental Studies of the Academy of Sciences of the Republic of Uzbekistan, and the Sharq collection of the Information-Library Center of Bukhara Region named after Abu Ali Ibn Sina.

The manuscript copies in the Muslim Board of Uzbekistan and Bukhara are being introduced into scientific circulation for the first time as research material. One rare copy of "Rabi'al-Abror" is kept in the library of the Muslim Board of Uzbekistan under inventory number 1490. The manuscript's dimensions are 26.5x17 cm. The manuscript consists of 402 folios (804 pages), with 22 lines of text on each page. Only the first page is printed, with 16 lines, and the last page consists of 21 lines.

Another rare copy of "Rabi'al-Abror" is preserved in the collection of the Institute of Oriental Studies of the Academy of Sciences of the Republic of Uzbekistan under inventory number 2384, number 74. The manuscript's dimensions are 28x18 cm. The manuscript is in an old condition, with most of its pages damaged by worms. This copy consists of 376 (1b-376a) folios (752 pages). The text on the folios consists of 25 lines. The table of contents in the manuscript provides the following information: "This is the book *Rabi' al-Abror*, authored by Imam Allama, the pride of Khorezm, the Sheikh of Islam, Jarullah Abul Qasim Mahmud ibn Umar Az-Zamakhshari, and this work consists of 81 chapters." However, contrary to the information provided at the beginning of the table of contents, this copy consists of 98 chapters, not 81. By examining the continuation of the table of contents, one can understand the titles of the 98 chapters and the pages on which they are located.

Another manuscript copy of the work is kept in the catalog of the Sharq collection of the Information-Library Center of Bukhara Region named after Abu Ali Ibn Sina, under inventory number 128, number 75. This copy consists of 148 (1a-148a) folios (296 pages). The text consists of 13 to 20 lines per folio. This copy was written in nasta'liq script on cream-colored paper. The

dimensions of this manuscript are 20.5x11.5 cm. Its cover is made of thick brown cardboard. The manuscript was copied on the 22nd day of Rabi' al-Awwal in the year 1057 AH (1647 CE).

Today, more than 50 manuscript copies of “Rabi'al-Abror” were copied in various places and times are preserved in foreign libraries, collections, and museums.

A four-volume manuscript of “Rabi'u-l-abror wa Nususu-l-Akhyor” (The Spring of the Virtuous and the Texts of the Righteous) is preserved in the Al-Awqaf Library in Baghdad under inventory number 9786. Other copies are preserved in Berlin (under numbers 8351, 8352, and 8353), in Leiden (number 470), and in Cairo (number 155).

In addition to being an important historical-geographical source, the work “Rabi'al-Abror” is also considered a significant socio-philosophical source, as it encompasses various relationships in society. The quotations in the work concerning social and moral issues are broad and diverse in subject matter. A significant portion of the work is dedicated to quotations about virtues necessary for human perfection. The quotations reveal the educational and moral connection aimed at human development and formation.

In “Rabi'al-Abror”, the quotations of the Prophet (peace be upon him), the companion Ibn Mas'ud, the wise Luqman Hakim, famous Arab scholars and orators such as Khalid ibn Safwan, Ahnaf ibn Qays, Muhammad ibn Ajlan, Aqsum ibn Sayfi, the scholar from Marv Ibn Mubarak, the “Possessor of Justice” titleholder, the ancient Persian ruler Khosrow I Anushirvan, and his wise minister Buzurgmehr, as well as the Greek philosophers Plato, Galen, and Socrates are analyzed.

The work includes quotations from Luqman Hakim regarding friendship: Luqman Hakim said: "Three types of people are recognized in three situations: those who can remain calm and gentle when angry, those who are brave in war, and those who can be friends in times of need."

Mahmud Zamakhshariy, based on his beliefs, quotes the following about human destiny: The Prophet (peace be upon him) said: "Good character is like a rein from the mercy and approval of Allah, which is passed through the nose of its owner. This rein is in the hand of Allah, who leads the owner towards goodness and virtue, and goodness and virtue lead him to Paradise. Bad character, on the other hand, is like a rein made from the wrath and anger of Allah, and it is passed through the nose of its owner. This rein is in the hand of Satan, who leads him towards evil, and evil leads its owner to Hell." In this statement, we can see Mahmud Zamakhshariy reflecting his religious worldview.

Mahmud Zamakhshariy also quotes the views of Greek philosophers on virtues and good traits. In the 14th chapter of the work, "On Luck, Fate, Success, Failure, Despair, and Loss," he cites the following from Plato: A man asked Plato, "How have you acquired so much knowledge?" Plato replied: "In my lifetime, I have spent more on oil for my lamp than I have on drinks." By this, the scholar indicates that perfect knowledge is attained through continuous reading and ongoing learning. In the 55th chapter of the work, "On Wonders, Interesting Events, and Marvels," Khosrow I Anushirvan's minister, Buzurgmehr, says: When asked, "Who is the most knowledgeable person in the world?" he replied: "The person who marvels at the world less than anyone else is the wise one."

All the advice, exhortations, and information provided in “*Rabi'al-Abror*” serve to enlighten today's youth as well. The work is important because it encompasses all the knowledge that a person needs to know to become a more cultured and mature individual in social life.

“Reason – Az-Zamakhshariy's method of interpretation; it reigns over the texts (Qur'an and Hadith). He is not content with the superficial (apparent) meanings of the Qur'an.[6]”

Az-Zamakhshariy is honored with high regard by all scholars, and he is praised with titles such as “Ustadh ul-Arab wal-Ajam” (Teacher of Arabs and Non-Arabs), “Fakhr Khorezm” (Pride of Khorezm), and “Ustadh ud-Dunya” (Teacher of the World) by both Eastern and Western scholars.

Mahmud az-Zamakhshariy stands as one of the most influential scholars of his time, whose intellectual legacy continues to illuminate various fields of knowledge, from Islamic jurisprudence to philosophy and ethics. His work *Rabi' al-Abror* not only serves as a treasure trove of wisdom and ethical guidance but also reflects the synthesis of knowledge from different civilizations and religious

traditions. Zamakhshariy's ability to integrate reason and faith, and his profound insight into human nature, society, and spirituality, have left an indelible mark on Islamic thought and world philosophy.

The extensive manuscript collection of *Rabi' al-Abror*-preserved in libraries and research centers across Uzbekistan and abroad-demonstrates the lasting impact of his scholarship. His method of interpreting texts, particularly the Qur'an, with an emphasis on intellect and rational thought, continues to inspire modern scholars. As an intellectual giant, revered both in the East and the West, Mahmud az-Zamakhshariy's teachings on virtue, wisdom, and the role of reason remain highly relevant, offering guidance for future generations in their pursuit of knowledge, moral integrity, and spiritual development.

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Rezyume: Ushbu maqolada Mahmud az-Zamakhshariyning "Rabi'al-Abror" asarini ijtimoiy-falsafiy tahlil qilish orqali asar mazmunining chuqur qatlamlari ochib beriladi. Asarda insoniy qadriyatlar, axloq va ma'naviyat masalalari yoritilgan bo'lib, bu tahlil orqali asarning zamonaviy jamiyatdagi ahamiyati va ta'siri ko'rsatiladi.

Резюме: В данной статье проводится социально-философский анализ произведения Махмуда аз-Замахшари "Раби'аль-Аброр". Анализируются глубокие слои содержания произведения, освещающие вопросы человеческих ценностей, морали и духовности. Через этот анализ демонстрируется значимость и влияние произведения в современном обществе.

Kalit so'zlar: insoniy, falsafiy, mistik, diniy, dunyoviy, fan, bilim, musulmon, tan, ruh, tinchlik, donolik, nutq mahorati, hikoya, hayot

Ключевые слова: человеческий, философский, мистический, религиозный, светский, наука, знание, мусульманский, тело, дух, мир, мудрость, красноречие, повествование, жизнь.