



ACTUAL PROBLEMS OF MODERN SCIENCE, EDUCATION AND TRAINING

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MODERN PROBLEMS OF TECHNICAL SCIENCES

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DEVELOPMENT OF CLEANING TECHNOLOGY OF TUNGSTEN CARBIDE POWDER OBTAINED BY ELECTROLYSIS IN ARGON ENVIRONMENT

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Annotatsiya. Ushbu maqolada volfram karbid-kobalt asosli qattiq qotishma chiqindilaridan elektroliz usulida kobaltning eritmaga o'tishi natijasida olingan shlamlarni toza volfram karbid kukunlari holatigacha tozalash xususida bajarilgan tadqiqotlar natijalari keltirilgan. Olib borilgan ilmiy va amaliy izlanishlar shuni ko'rsatadiki dastlabki shlam tarkibida Al, Fe, Ni, Mo, Hf, V, Hg va boshqa zararli qo'shimcha metallar hamda ko'p miqdorda SiO₂ mavjud. Ushbu metallar va metall oksidlari mavjud bo'lgan kukunlarni tozalamasdan qattiq qotishmalar ishlab chiqarishda qo'llash olingan detallarning fizik-mexanik xossalari yomonlashtiradi. Tadqiqotlarda shlamlarni tozalash maqsadida ikki bosqichli texnologiyadan foydalanildi va 99.9 foiz tozalikda volfram karbid kukunlari olindi.

Kalit so'zlar: elektroliz, qattiq qotishma, toza volfram karbid, kremniy tutgan texnogen va sanoat chiqindilari, filtrlash, yuvish, tozalash, Energy Dispersive X-ray Fluorescence, carbon miqdori, elektr pech, argon muhit.

Аннотация. В статье представлены результаты исследований по очистке шламов, полученных при переводе в раствор кобальта с электролизом от отходов твердых сплавов карбида вольфрама и кобальта до состояния чистых порошков карбида вольфрама. Проведенные научно-практические исследования показывают, что исходная шлам содержит Al, Fe, Ni, Mo, Hf, V, Hg и другие вредные примеси металлов, а также большое количество SiO₂. Использование порошков, содержащих эти металлы и оксиды металлов, при производстве твердых сплавов без очистки ухудшает физико-механические свойства получаемых деталей. В исследованиях использована двухстадийная технология очистки шламов и получены порошки карбида вольфрама чистотой 99,9%.

Ключевые слова: электролиз, твердый сплав, чистый карбид вольфрама, кремний содержащие техногенные и промышленные отходы, фильтрация, промывка, очистка, Energy Dispersive X-ray Fluorescence, содержание углерода, электропечь, среда аргона.

Abstract. The article presents the results of studies on the purification of sludge obtained by converting waste tungsten carbide and cobalt hard alloys into a cobalt solution with electrolysis to the state of pure tungsten carbide powders. Conducted scientific and practical studies show that the original sludge contains Al, Fe, Ni, Mo, Hf, V, Hg and other harmful metal impurities,

as well as a large amount of SiO_2 . The use of powders containing these metals and metal oxides in the production of hard alloys without purification worsens the physical and mechanical properties of the resulting parts. The research used a two-stage sludge purification technology and obtained tungsten carbide powders with a purity of 99.9%.

Keywords: *electrolysis, hard alloy, pure tungsten carbide, silicon containing technogenic and industrial waste, filtration, washing, cleaning, Energy Dispersive X-ray Fluorescence, carbon content, electric furnace, argon environment.*

Introduction

As a result of the increased demand for commercial products containing tungsten, the rise in prices on the world market has required the processing of solid alloy waste several times. Over the past 20 years, the most rapid developments have been carried out by the leaders in this field the Russian Federation and the People's Republic of China and are rapidly expanding. Currently, research in the field of obtaining commercial products containing tungsten, which is significantly different from that of the leaders, is being conducted in Japan, the USA, Canada, Korea, and European countries.

In the course of research on the processing of solid alloy waste, tungsten carbide was collected at the Research and Production Association for the Production of Rare Metals and Hard Alloys of AMMK JSC and damaged by abrasive wear in the CEMCO and CEMCO rotary crushers of the Central Mining Administration JSC "NMMK". In the "Heap leaching of gold workshop" fingers made of a hard alloy based on cobalt (94% WC + 6% Co) were used both as cathode and anode. The composition of the resulting sludge was studied, and it was found to contain additional impurities. In order to purify the sediments from impurities, the literature was studied, and scientific and practical experiments were carried out in this direction.

Literature Review

Today, there are various methods for processing silicon-containing technogenic and industrial waste into hard alloys. Pyrometallurgical methods, such as smelting in shaft, reflective, rotary tube, and electric furnaces, are characterized by high productivity and the relative cheapness of the reagents used. However, their disadvantages include low product quality and the need for cleaning and disinfection processes. Additionally, there is less extraction of gases and valuable components [1]. In most cases, the resulting products require additional processing (usually hydrometallurgical).

Currently, a lot of scientific and research work is being carried out in this direction. For example, a device for the industrial production of silicon dioxide during the industrial processing of silicon-containing waste has been patented [2]. To implement the method, the flow of components forming the hydrolysis flame is supplied to the reaction zone through a multichannel coaxial mixing device. Hydrogen gas is introduced with dispersed liquid and gaseous waste from the production of trichlorosilane, containing mainly chlorosilanes and chlorosilane mixtures. The gaseous waste is used to disperse the liquid waste and create a ring-shaped flying flame. Fire hydrolysis of dispersed waste produces flue gases containing silicon dioxide [3]. A device for processing silicon waste by flame hydrolysis includes a cylindrical-conical body, a lid located in the cylindrical part of the body, a multi-channel jet mixing device installed in the middle of the lid, and a flame cooling device. At the edge of the cover surface in relation to the mixing device, there is a pipe for removing flue gases, installed in the upper part of the cone of the conical part of the housing [4-10]. The invention provides the creation of a universal technology that makes it possible to effectively process liquid and gaseous silicon waste but does not allow the processing of solid household waste in this way.

Research Methodology

The closest technical solution to the problem under study is a method for producing high-purity silicon dioxide, which involves the interaction of raw materials containing initial quartz with fluoride, ammonium hydro difluoride, or a mixture of them to form silicon fluoride and fluorides of harmful additional elements. The resulting ammonium silicon fluoride is purified from metal impurities by sublimation distillation. An aqueous solution of ammonium silicofluoride is purified from non-metallic impurities by extraction. Synthetic silicon dioxide is then precipitated from the ammonia solution of silicon fluoride using ammonia water, ensuring the production of high-purity silica.

However, due to the process being carried out in an open furnace, a large amount of dioxide evaporates, leading to a decrease in process productivity and an increase in energy consumption for heating raw materials [11-20].

Analysis and Results

The worn fingers were reduced to sludge using the process of electrolysis. After completing the entire electrolysis process, the sludge was filtered, washed, and dried in a vacuum drying oven at a temperature of 50-80 °C and brought to a powder state. The chemical composition of the dried powders was determined using an Energy Dispersive X-ray Fluorescence (EDXRF) instrument (see Table 1). The results showed that the powders were not pure enough for use in the production of hard alloys. It was found that they contained a small amount of acidic residues, non-metal cobalt that had gone into solution, a small amount of tungsten oxides, and a small amount of tungstic acid. To completely eliminate the cobalt, the powders were mixed and filtered three times for 45 minutes in a solution used as an electrolyte in a ratio of 1:3. After three washes and filtration, the powder contained no cobalt metal.

Table 1. Chemical composition of tungsten carbide powder obtained from finger waste.

Detectable elements, %								
<i>M</i>	W	Al	Fe	Ni	Cu	Zn	Mo	Ag
%	87.1	0.287	0.123	0.150	0.0444	0.0532	0.534	0.0113
<i>M</i>	Sn	Te	Hf	V	Hg	Si	P	S
%	0.0475	0.0191	0.219	0.194	0.150	6.75	0.298	3.97

Table 1 shows that the sludge formed after the electrolysis process contains a significant amount of silicon (more than 10%), which negatively affects the physical and mechanical properties and performance characteristics of carbide-cobalt hard alloys. This necessitates the purification of the resulting tungsten carbide powder from silicon.

In this regard, a method was developed based on heat treatment by washing tungsten carbide powder obtained by electrolysis with fluoride compounds in a vacuum at a temperature of 200 °C to 500 °C for 2-6 hours (depending on the temperature). The device consists of a vacuum pump (0.1 - 0.5 Pa), a special filter filled with a fibrous ion exchanger, and a closed oven in a horizontal position, round in shape and with a lid on top.

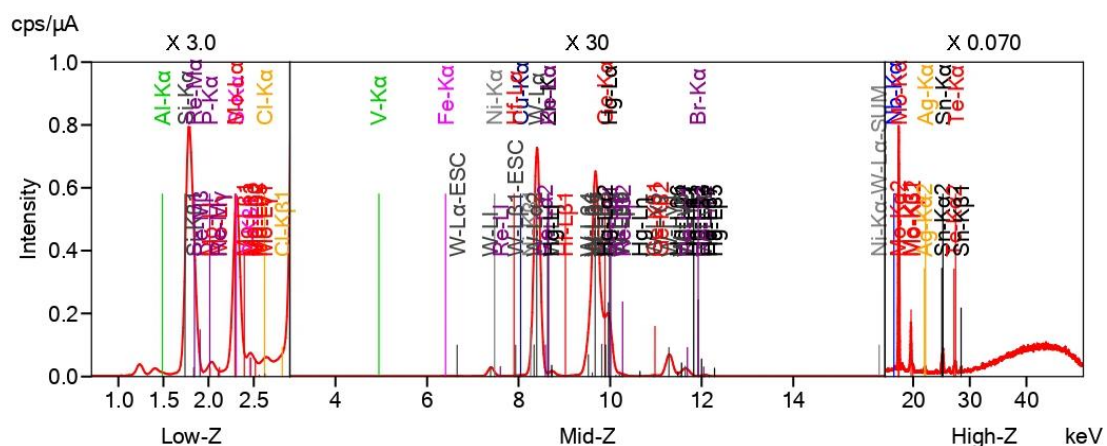
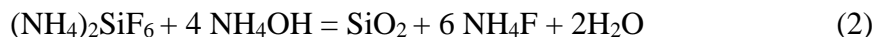


Figure 1. Chemical composition of tungsten carbide powder obtained from finger waste.

The development of this purification scheme was based on the following theoretical principles: tungsten carbide powder formed during electrolysis contains up to 10-11% silicon oxide and a small amount of associated metals in the form of various chemical compounds. Removing silicon oxide from samples leads to a sharp increase in the tungsten carbide content in the samples. In this regard, the treatment of tungsten carbide powder with ammonium fluoride (NH₄F) occurs according to the following reaction:



Ammonium hexafluoro silicate, formed as a result of a chemical reaction, has favorable physicochemical properties from a technological point of view. Under normal conditions, it is a solid substance, but at temperatures above 320 °C, it sublimates and transitions into the gas phase. The advantage of using ammonium fluoride as a desilication reagent is its reversibility. The solubility of ammonium hexafluoro silicate reaches 370 g/l at 70 °C. When interacting with ammonia, it hydrolyzes according to the following reaction and precipitates in the form of silicon dioxide:



The ability to extract ammonium fluoride allows for the organization of a continuous cycle of silica purification and the removal of the quartz component in finely dispersed form from samples. After separating the silicon oxide by filtration, the ammonium fluoride solution remains, and after evaporation, it can be used to desiliconize a new batch of tungsten carbide powder. Additionally, other harmful elements contained in the tungsten carbide powder are further purified using the following method.

The process of obtaining pure tungsten carbide powders from powders with metal impurities is carried out in vacuum electric furnaces at a temperature of 1000 °C in an argon atmosphere (an excessive increase in temperature inside the furnace can lead to decarburization of tungsten carbide). Since argon is an inert gas, it does not react chemically with any of the components of the powder, and harmful additives in the powder (acid residues, oxidized tungsten, tungstic acid) are removed under the influence of temperature. The chemical composition of purified tungsten carbide powders is presented in Table 2.

The powders coming out of the kiln lose their granularity due to the high temperature, and a grinding process is carried out to reduce them to a granular powder state.

Table 2. Chemical composition of refined tungsten carbide powders.

Detectable elements, %									
M	W	Al	Fe	Ni	Cu	Zn	Mo	Ag	Sn
%	93.624	0.0187	0.0119	0.015	0.0312	0.0325	0.0534	0.0113	0.0147
M	Co	Te	Hf	V	Hg	Si	P	S	
%	–	0.0111	0.0192	0.0194	0.0150	0.0121	0.0002	0.0003	

As a result of the analyses carried out to determine the chemical composition of the powders, it was shown that the amount of harmful additional metals in WC powders is small (Mort <0.05). The amount of carbon contained in tungsten carbide powders that have undergone electrolysis, filtration, and purification has been determined; the results are presented in Table 3.

Table 3. The amount of carbon contained in tungsten carbide powders that have undergone the stages of electrolysis, filtration and purification.

Tungsten Carbide Powder					
Sample serial number	№1	№2	№3	№4	№5
C gen.	6.14%	6.08%	6.12%	6.06%	6.07%
C free.	0.04%	0.02%	0.04%	0.03%	0.10%

The purity level of tungsten carbide powders obtained from Tables 2 and 3 and the amount of carbon they contain indicate that they can be used in the production of hard alloys.

Conclusions

1. Al, Fe, Ni, Mo, Hf, V, Hg, and other impurities are present in the sediments obtained from the abrasive wear of fingers. Due to the fact that these metals negatively affect the strength of hard alloys, it is impossible to directly use this slurry.
2. When purifying from impurities in an argon atmosphere at a temperature of 1000 °C, all harmful impurities were blown away.
3. In addition to harmful metals, the amount of SiO₂ in the resulting sludge was about 20-22 %. Removal of SiO₂ was carried out using (NH₄)F, and a reduction to 0.02 % was achieved.

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SYNTHESIS AND ANALYSIS OF MIXED LIGAND COORDINATION COMPOUND BASED ON NiCl₂, CEFOTAXIME AND ACETAMIDE

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Annotatsiya. Nikel (II) xlorid, sefotaksim va asetamid asosida aralash ligandli kompleks birikmasi sintez qilindi. Sintez qilingan birikmalarning tarkibi element analizi usulida aniqlandi. Sintez qilingan birikmalarning fazoviy tuzilishi va energiya parametrlarini aniqlash uchun kvant-kimyoviy hisoblash amalga oshirildi. Kompleks birikma tarkibida metall va ligandlarning o'zaro bog'lanish mol nisbatlari aniqlandi.

Kalit so'zlar: koordinatsion birikma, sefotaksim, asetamid, skanerlovchi elektron mikroskop va energiya dispersion tahlil (SEM-EDT), kvant-kimyoviy hisoblash.

Аннотация. Синтезировано соединение со смешанным лигандом на основе хлорида никеля(II), цефотаксима и ацетамида. Состав синтезированных соединений определен методом элементного анализа. Проведены квантово-химические расчеты с целью определения пространственной структуры и энергетических параметров синтезированных соединений. Определены мольные соотношения металла и лигандов в составе комплексного соединения.

Ключевые слова: координационное соединение, цефотаксим, ацетамид, сканирующая электронная микроскопия и энергодисперсионный анализ (СЭМ-ЭДА), квантово-химический расчет.

Abstract. Based on nickel (II) chloride, cefotaxime and acetamide, a complex compound with a mixed ligand was synthesized. The composition of the synthesized compounds was determined by the method of elemental analysis. Quantum chemical calculations were performed to determine the spatial structure and energy parameters of the synthesized compounds. In the composition of the complex compound, the molar ratios of metal and ligand interconnections were determined.

Keywords: coordination compound, cefotaxime, acetamide, scanning electron microscopy and energy dispersive analysis (SEM-EDA), quantum chemical calculation.

Introduction

The role of complex compounds in the life of living organisms is huge. The organism represents a system consisting of many coordination compound-forming substances and biologically active ligands, and there is a certain ratio between them. Violation of the balance of the ligand component with the metal leads to the development of pathological conditions. Therefore, studying the interaction processes of some biometals with organic ligands is the key to the search for new drugs.

Biocatalysis plays a key role in metabolic processes. It involves organic enzymes containing Ni biocomplexes. Such enzymes are unique catalysts with unmatched efficiency and high selectivity.

Literature Review

Cefotaxime is an antibiotic of the third generation cephalosporin group and has a wide spectrum of action. It belongs to the class of amphoteric antibiotics [1] and contains aminothiazole and carboxyl groups. In acidic media, it exists as a cation or zwitter ion, and in neutral and alkaline media as an anion. In medicine, sodium salt is used in the form of NaC_{xm} [2].

Cephalosporin molecules contain electron-donating functional groups that allow the formation of complex compounds upon interaction with metal cations [3]. Many drugs have altered toxicological and pharmacological properties when in the form of metal complexes [4]. The most commonly used metal in this regard is copper(II), which has proven beneficial in diseases such as tuberculosis [5], peptic ulcer [6], rheumatoid arthritis [7] and cancer [8]. [Zn(C_{xm})₂] \cdot 3H₂O in [9] Zinc complex of cefotaxime with composition was obtained and studied. But in this work, the authors did not come to any conclusions about the structure of the coordination field of the complex. [10] provides information on the synthesis of a complex compound with the composition [Zn(C_{xm})Cl₂(H₂O)₂].

These results are important for the study of binding methods in the solid state and the biological activity of the obtained complex compounds.

Research Methodology

It is known that quantum chemistry is currently considered a high-level method with good experimental data and deep approaches in solving biochemical, material science and other fundamental and practical problems with the results of many calculations. Quantum chemical methods allow not only to calculate the properties of individual molecular systems, but also to determine the general laws characteristic of selected classes of molecules, to substantiate the laws existing in chemistry, and to study the influence and dependence of these relations on the general laws. allows you to determine the basis for installation. Based on the methods of quantum-chemical calculations, it is possible to predict competing donor centers of multifunctional ligands for coordination.

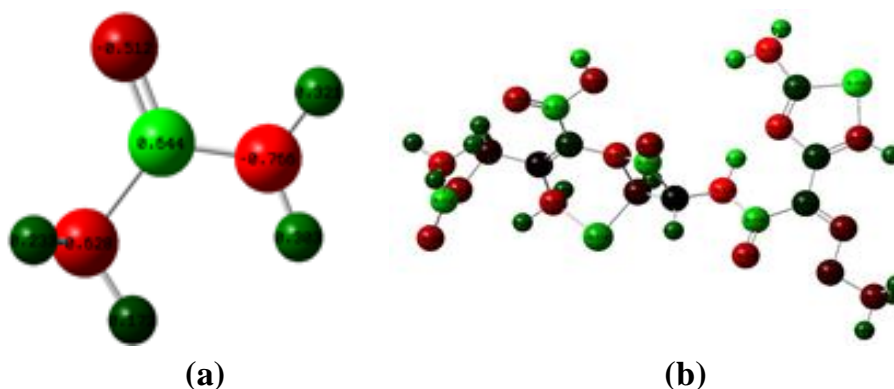


Figure 1. Optimized electronic structure of ligands and distribution of Mulliken charges: (a) acetamide, (b) cefotaxime.

As a result of the high ability of ligands containing carbonyl groups to form coordination compounds, various complex compounds were synthesized and their composition and properties were studied. If O and N-containing ligands, including amides, are included in compounds with such properties, it is of theoretical and practical importance to study whether they form a complex compound together. Because the reactivity of ethanolamines is high, it exhibits both amine and alcohol properties. As a result of their different denaturation properties, complex compounds with mixed ligands can be synthesized.

Cefotaxime and acetamide Various physico-chemical properties were analyzed quantum-chemically using Gaussian 09 software package. Calculations were performed using the B3LYP

method within the DFT theory. HyperChem, GausView programs were used to create and visualize model systems [11-13].

The system was optimized at the initial stage of theoretical research. At the next stage, basic calculations were carried out. Figure 1 shows the optimized electronic structure of the ligands and the Mulliken charge distribution. Also, high occupied molecular orbital (HOMO) and low unoccupied molecular orbital (LUMO) electronic orbitals of the ligand molecule were studied as part of quantum chemical calculations. The results of the calculations are presented in Figure 2.

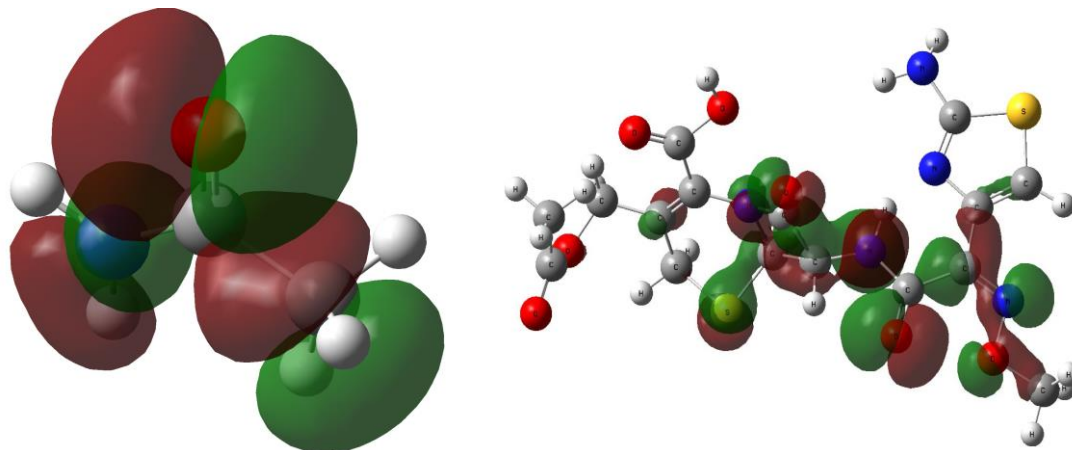


Figure 2. The position of the high occupied molecular and low unoccupied molecular orbitals of the acetamide and cefotaxime molecule.

Calculations show that the energy difference between the HOMO and the LUMO is 2.232 eV in acetamide and 3.199 eV in cefotaxime.

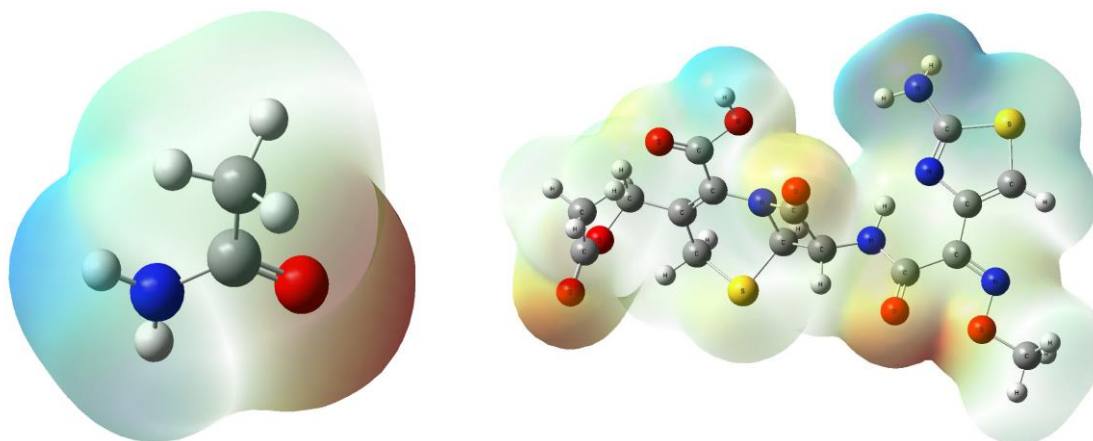


Figure 3. Geometric structure and MEP distribution of molecules of acetamide (a) and cefotaxime (b).

The MEP (molecular electrostatic potential) plots in red and blue are the negative and positive electrostatic potentials, respectively. In the color scheme of the MEP graph, the red area indicates atoms with an unshared electron pair or a negative electrostatic potential; the intensity of the color is proportional to the absolute value of the potential energy. Positive electrostatic potentials are shown in the blue/yellow areas and characterize the polar hydrogen in the E–N bonds. Green areas cover parts of the molecule with electrostatic potentials close to zero (C – C, C – N).

Energetic, geometric and electronic properties of the ligand molecule were calculated. The angle and bond length values of the ligands were determined. Quantum-chemical research includes several successive stages, such as model creation, its optimization, spectroscopic and thermodifferential calculations, processing and visualization of results.

Quantum chemical calculations were carried out in order to calculate the possible coordination centers, coordination possibilities, energetic, geometric and electronic parameters of the ligand

molecule. The minimum formation energy of the ligands was determined from the results of the calculations shown. Low formation energy of ligand molecules (Table 1) indicates stability of ligands.

Table 1. Ligand formation energies

Methods	E _{cefotaxime} (Hartrees)	E _{acetamide} (Hartrees)
Gaussian/ DFT/B3LYP/3-21G	-123,411	-189,658

According to the amount of charges on ligand donor atoms, the highest negative effective charge in the molecule is determined on the oxygen atom of the carbonyl group and on the nitrogen atom of the amino group.

Based on the values of electron densities and effective charges in donor and reaction active atoms of ligand molecules, it was found that the results correspond to the information in the literature.

It follows that potential tetra, penta and hexadentate ligands can be connected through the oxygen atom of the carbonyl group and the nitrogen atom of the amino group in the formation of a complex. In this case, because these two high negativity centers are located on both sides of the molecule, either they can form a polynuclear complex and form a bridge between two metal ions, or the atoms on only one side (C=O or H₂N-C) can be coordinated in a bidentate state.

Based on the obtained quantum chemical results, it was determined that the optimal conditions for the synthesis of a complex compound with a mixed ligand in the ratio of 1:1:1 were used, and the following method was used: NiCl₂ (0.001 mol), cefotaxime (0.001 mol) and acetamide (0.001 mol) in aqueous, acetonitrile and aqueous solutions were mixed using a magnetic stirrer at a speed of 800 revolutions per minute at a temperature of 400 °C for 1,5 hours. As a result, a dark green solution was obtained [11]. This solution was left at room temperature for 12 days until crystals formed.

Analysis and Results

In order to compare the obtained mixed ligand coordination compound with the theoretically calculated amounts of the elements, elemental analysis was carried out using the scanning electron microscope-energy dispersive analysis (SEM-EDT) method of the complex compounds obtained as a result of the reaction (Fig. 4) and it was found that their amounts are compatible with each other.

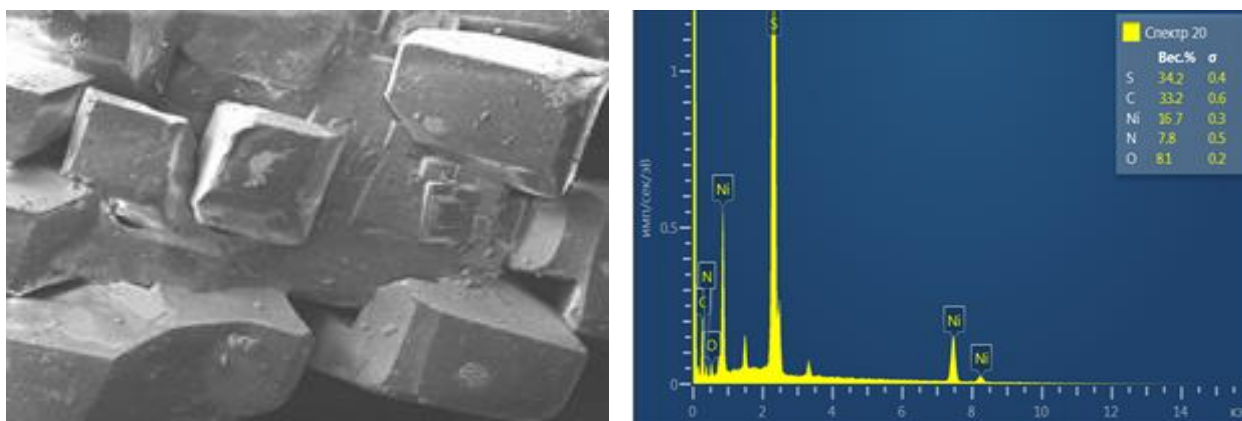


Figure 4. SEM image of the [NiC₁₈H₂₁N₆O₈S₂Cl] and its energy dispersion analysis results.

According to the results of SEM-EDA, a large number of peaks characteristic for the metal ion were recorded, together with the formation of a complex with the metal ion and the change of the microstructure of the ligand. The degree of crystallinity of the new complex was also determined. Quantum chemical analysis of the lowest energy conforming structure When compared with the data obtained by SEM-EDA analysis, it was found that 6 coordination numbers correspond to cobalt in this coordination compound (Figure 5).

In order to prove the individuality of the crystal lattice of the synthesized coordination compound, X-ray phase analysis of the initial and synthesized coordination compounds was carried out and diffractograms were compared. It was found that the interplanar distances and intensities of the synthesized compounds do not match.

The interplanar distance and intensity values were calculated from the diffractograms and the obtained results are presented in Table 2.

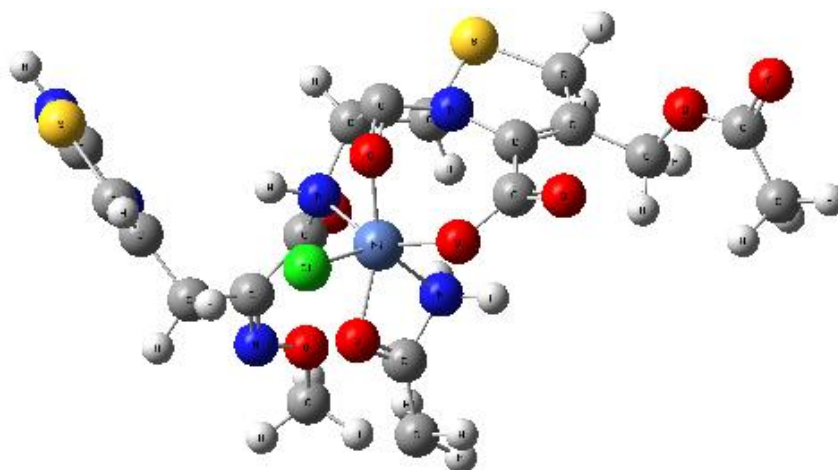


Figure 5. Spatial structure of the compound $[\text{NiC}_{18}\text{H}_{21}\text{N}_6\text{O}_8\text{S}_2\text{Cl}]$.

Table 2. Interplanar distances and intensities of the synthesized complex compound.

Angle, [2 θ -degree]	Height, [cts]	Distance between planes, [Å]	Intensity, [%]	Three widths
20.2537	56.54	4.38098	1.62	0.2573
24.6986	166.46	3.60171	4.76	0.1545
25.1909	152.27	3.53241	4.35	0.1538
25.7622	37.14	3.45537	1.06	0.2932
26.4407	34.99	3.36821	1.00	0.3794
28.9218	38.78	3.08466	1.11	0.3588
33.3257	42.39	2.68641	1.21	0.3657
35.0834	42.85	2.55574	1.22	0.5416
37.6272	57.63	2.38859	1.65	0.2734
39.2612	112.42	2.29287	3.21	0.1261
40.5349	50.26	2.22371	1.44	0.1525
59.9970	3499.67	1.54067	100.00	0.0060

As can be seen from the interplanar distance and intensity values, the obtained compounds do not repeat the initial compounds, and based on the obtained data, it was determined that the synthesized complex has a specific individual crystal lattice that is not found in the crystallographic database.

Conclusions

A mixed ligand complex of nickel (II) chloride with cefotaxime and acetamide was synthesized. SEM-EDA and quantum-chemical calculations were performed in order to prove that the newly synthesized compound formed a coordination bond. Based on the obtained results, the carboxyl group anion in the nickel cefotaxime ligand contained in $[\text{NiC}_{18}\text{H}_{21}\text{N}_6\text{O}_8\text{S}_2\text{Cl}]$ is ionic bonding through the oxygen and chloride anion, the nitrogen atoms in the carbonyl and amide bond of the four-membered heterocyclic ring, and the nitrogen of the amino group and the oxygen of the carbonyl group in the acetamide ligand. It was determined that it was united by coordination bonds with its atoms and formed a coordination number of 6.

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PRODUCTION OF ORGANOMINERAL FERTILIZERS BASED ON GULIOB PHOSPHORITE AND COTTON GIN WASTE

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Annotatsiya. Maqolada guliob fosforiti va paxta tozalash zavodi chiqindisi asosida organomineral o'g'itlar olish tajribasi bayon etildi. Ekologik havfsiz bo'lgan kompostlash usuli orqali paxta tozalash zavodi chiqindisi va past navli Guliob fosforiti asosida organik mineral o'g'it olish mumkinligi asoslandi.

Kalit so'zlar: *guliob fosforiti, paxta tozalash zavodi chiqindisi, kompostlash, organomineral o'g'itlar.*

Аннотация. В статье описан опыт получения органоминеральные удобрения на основе Гулиобского фосфора и отхода хлопкоочистительного завода. Доказано, что с методом экологическо-безопасного компостирования на основе отхода хлопкоочистительного завода и низко качественного Гулиобского фосфора можно получить органоминеральные удобрения.

Ключевые слова: *гулиобский фосфорит, отходы хлопчатобумажного производства, компостирование, органоминеральные удобрения.*

Abstract. The article describes the experience of obtaining organo-mineral fertilizers on the basis of Guliob phosphorus and cotton plant waste. It is proved that organo-mineral fertilizers can be obtained by ecologically safe composting method on the basis of cotton plant waste and low-quality Guliob phosphorus.

Keywords: *guliob phosphorite, cotton mill waste, composting, organomineral fertilizers.*

Introduction

Year after year, the world's population is growing at a rapid pace, and as a result, the arable land is shrinking, making the global food problem worse. In this regard, rational use of mineral and organic fertilizers, which increase soil fertility and play a key role in obtaining high and quality crops, is one of the most effective solutions to solving the food problem. Therefore, it is very important to get complex organomineral fertilizers containing various nutrients necessary for plant development. The reason for this is that, in addition to the macro and micronutrients necessary for plants, complex fertilizers contain humus substances that improve the structure and fertility of the soil [1-4].

Measures taken in the agricultural sector of the republic include the rational and effective use of natural and secondary resources, the introduction of advanced chemical and agrochemical technologies to increase and maintain soil fertility and restore its ecological condition, improve the regime of organic (humus) nutrition of soils, grow agricultural crops from soil. including timely return to the soil of nutrients taken out with the crop through fertilization, obtaining the planned harvest, etc. Development and implementation of technologies for obtaining high-quality organomineral fertilizers, which ensure the increase, maintenance and improvement of soil fertility, is one of the main directions of many countries. If this process is carried out in sequence, agricultural production

will develop and the ecological situation of that country will continue to improve. Soil fertility is the main condition for obtaining high and quality crops from agricultural crops [5, 6]. Organic matter plays an important role in improving and maintaining soil fertility. Soil fertility is determined by the amount of humus. In addition to humus, nitrogen, phosphorus, and potassium mineral fertilizers are also required for obtaining a good harvest from agricultural crops. Today, only 29% of the need for phosphorus fertilizers is met in our republic. This is a very low indicator. Therefore, the need for phosphorus fertilizers is extremely high [7-9]. Therefore, the role of nutrient phosphorus element (P_2O_5) in the assimilable form is extremely important in improving soil fertility and obtaining high yields from agricultural crops. In nature, there are no natural sources of replenishment of phosphorus reserves, therefore, the only way to increase the amount of P_2O_5 in the soil is the rational use of phosphorus fertilizers [10, 11].

Research Methodology

First, cotton gin waste was thoroughly dried using a drying oven at a temperature of 100-1050C and for 4 hours. Then, its chemical composition was determined by the following methods. Moisture content according to GOST 26712-85, ash content according to GOST 26714-85 and organic matter according to GOST 27980-80, total and absorbed forms of P_2O_5 according to GOST 20851.2-75, total and absorbed forms of SO_3 according to GOST 26715-85 determined in accordance with Humic acids (HA) are isolated by treating the samples with 0.1 N alkali solution and then neutralizing the solution with mineral acid [12]. After the soluble substances contained in the organic sample are separated under their influence, organic substances remain in the solid phase.

The organic matter formed as a residue is washed with distilled water and dried to constant weight using a drying oven. The content of dried finished organic matter is determined. The difference between the amount of alkali-soluble organic matter and the amount of HA gives us the amount of fulvic acid. All forms of phosphorus (P_2O_5) are determined in accordance with GOST 20851.2-75 at a temperature of 1000-1050 °C by precipitation of phosphate ions in the form of magnesium ammonium phosphate using a gravimetric method. Plant-absorbable forms of P_2O_5 were determined in 2% citric acid and 0.2 M Trilon B solutions. The amount of CHaO in the sample was determined by a complexometric method: the plant-absorbable form of CHaO was determined by titration with the presence of indicator fluorexone using 0.05 N solutions of Trilon B and 2% citric acid.

For experiments, Guliob phosphorite (GPH) $P_2O_{5\text{common}}$ - 10.3%; SaO_{common} - 29.9%; MgO - 1.65%; SO_3 - 1.67% and cotton gin waste (CGW) moisture - 16.36%; ash - 17.43%; organic substances - 66.21%; HA - 5.51%; fulvic acid - 7.63%; water-soluble organic substances - 5.04%; raw materials with 15.60% content of water-insoluble organic matter were used.

CGW: Guliob Phosphorite (GPh) = 80 : 20 for making composts based on cotton gin waste and GPH; 70:30; 60 : 40; Changed to 50 : 50 and 40 : 60 weight ratios. Prepared composts in selected weight ratios were placed in 1-liter polyethylene containers and water was added on top of the compost at 50-55% of total weight. The samples of the prepared composts were thoroughly mixed with a glass rod, and in order to be close to natural conditions, the surface of all the samples was covered with fine soil and placed in a thermostat adjusted to a temperature of 25 °C. These samples were stored in a thermostat for 90 days, and their chemical composition was determined every 15 days (15, 30, 45, 60, 75, 90) using certain methods [12-14].

The obtained results are presented in tables and figures.

Analysis and Results

It can be seen from Table 1 that with the increase in the mass fraction of GPH compared to cotton gin waste, the amount of $P_2O_{5\text{common}}$ in compost samples increased, while the amount of $P_2O_{5\text{mastered}}$ in tr.B and citric acid decreased slightly. For example, after 15 and 90 days of ripening, the amounts of $P_2O_{5\text{common}}$ increase from 1.58 to 1.77% and from 3.40 to 3.64% at the weight ratios of COTTON GIN WASTE:GPH = 80:20 and 40:60.

$P_2O_{5\text{mastered}}$ according to tr.B in the same weight ratio. amounts increased from 0.456 to 1.523 and from 0.978 to 1.854, respectively, lim. and according to kis-ta, it was found to be in the range from 0.346 to 1.441 and from 0.757 to 1.757.

Table 1. Dependence of the amount of phosphorus element in $P_2O_{5common}$ and $P_2O_{5mastered}$ forms in composts prepared on the basis of CGW and GPh, depending on the weight ratio of the starting materials and the ripening time.

CGW:GPh weight ratio	Total $P_2O_{5common}$ during ripening. change of the amount of the form according to tr.B, day						
	1	15	30	45	60	75	90
80:20	1,57	1,58	1,61	1,65	1,69	1,73	1,77
70:30	2,02	2,04	2,07	2,11	2,16	2,20	2,25
60:40	2,47	2,49	2,52	2,56	2,61	2,66	2,71
50:50	2,92	2,95	2,98	3,02	3,07	3,12	3,18
40:60	3,38	3,40	3,43	3,47	3,52	3,58	3,64
CGW:GPh weight ratio	$P_2O_{5mastered}$ own according to tr.B during ripening. change in the amount of form, day						
	1	15	30	45	60	75	90
80:20	0,282	0,456	0,684	0,970	1,236	1,430	1,523
70:30	0,419	0,594	0,834	1,144	1,425	1,636	1,723
60:40	0,566	0,719	0,947	1,267	1,567	1,792	1,862
50:50	0,704	0,815	1,028	1,325	1,613	1,819	1,889
40:60	0,901	0,978	1,151	1,391	1,624	1,796	1,854
CGW:GPh weight ratio	$P_2O_{5mastered}$ on citric acid during ripening. Changes in the amount of (%) form, day						
	1	15	30	45	60	75	90
80:20	0,213	0,386	0,612	0,896	1,158	1,350	1,441
70:30	0,317	0,493	0,736	1,050	1,332	1,544	1,630
60:40	0,428	0,586	0,821	1,151	1,460	1,691	1,762
50:50	0,532	0,642	0,870	1,190	1,498	1,718	1,788
40:60	0,681	0,757	0,956	1,234	1,501	1,696	1,757

These pointers are better seen in Figure 1.

The main factor affecting the increase of $P_2O_{5mastered}$ in CGW-phosphorite composts is the storage period of the ripening period, that is, with the increase of the ripening period, an increase in the amount of $P_2O_{5mastered}$ in the compost samples was also observed.

$P_2O_{5common}$ in the contents of all compost samples prepared on the basis of cotton gin waste and Guliob phosphorite with increasing amount of Guliob phosphorite and maturation period. and $P_2O_{5mastered}$ amounts were also found to increase.

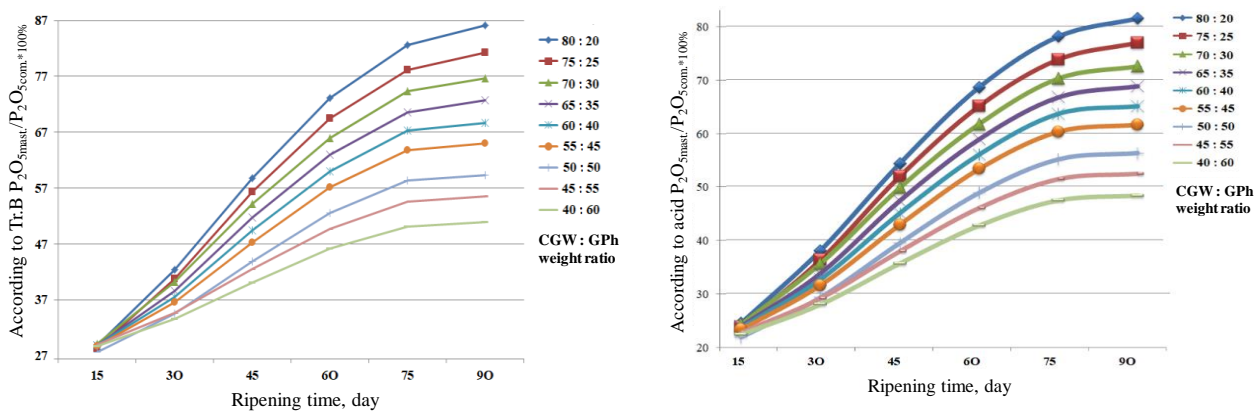


Figure 1. tr.B and lim in organomineral fertilizer samples. of $P_2O_{5mastered}$ per acid. dependence of quantity change on the ratio of initial substances and ripening time.

It is worth noting that, on the contrary, the amount of CGW decreased in the studied CGW : GPh ratio, and the degree of humification of organic substances in the organomineral fertilizer (OMF) increased with the increase in the amount of GPh and the ripening time (Table 2). Therefore, this

means that GPh natural ore promotes faster decomposition of CGW and also serves to increase the degree of humification of its total organic matter. The level of organic and OMF quality is determined by the content of humic and fulvic acids and water-soluble organic substances.

Table 2. Dependence of the change in the degree of humification of total organic matter in composts prepared on the basis of CGW and GPh, the weight ratio of the initial substances and the maturation time

CGW:GPh weight ratio	Time of ripening, day						
	1	15	30	45	60	75	90
100:0,0	27,46	29,58	32,52	36,91	42,31	47,81	52,81
80:20	27,57	31,90	37,53	46,03	54,06	60,59	64,41
70:30	27,74	33,11	40,24	49,80	59,33	66,37	70,21
60:40	28,01	34,35	43,31	53,54	63,86	70,91	74,52
50:50	28,27	36,00	46,84	57,75	69,56	76,52	79,62
40:60	28,43	36,97	48,89	60,74	73,41	80,78	84,05

As can be seen from Table 3, it was observed that the amount of HA in the OMF samples increased with the increase in the content of CGW in the composts prepared on the basis of CGW and GPh.

Table 3. Changes in HA content of composts prepared on the basis of CGW and GPh depending on the weight ratio of the starting materials and ripening time.

CGW:GPh weight ratio	Time of ripening, day						
	1	15	30	45	60	75	90
100:0	2,76	2,87	3,03	3,24	3,50	3,79	4,08
80:20	2,20	2,51	2,89	3,42	3,86	4,21	4,41
70:30	1,93	2,29	2,72	3,27	3,77	4,13	4,32
60:40	1,65	2,04	2,53	3,07	3,59	3,93	4,10
50:50	1,38	1,79	2,30	2,80	3,32	3,62	3,75
40:60	1,10	1,48	1,94	2,40	2,87	3,14	3,26

In particular, the change in the amount of HA (%) in the composts prepared on the basis of CGW and GPh is more evident in Figure 2. Thus, all studied proportions of CGW : GPh obtained after a 3-month maturing period in CGW-phosphorite compost contain organic matter - 12.57-24.90%; HA - 3.26-4.41%; fulvic acid - 4.30-5.74%; water-soluble organic matter - 3.0-3.95%; Total P₂O₅ – 1.77-3.64%; tr. According to B, P₂O₅mastered - 1.52-1.85%; P₂O₅ on lemon cyst - 1.44-1.75%; It was found that CaO_{common} - 4.13-10.06% and CaO_{mastered} - 3.99-8.36% according to lemon cyst.

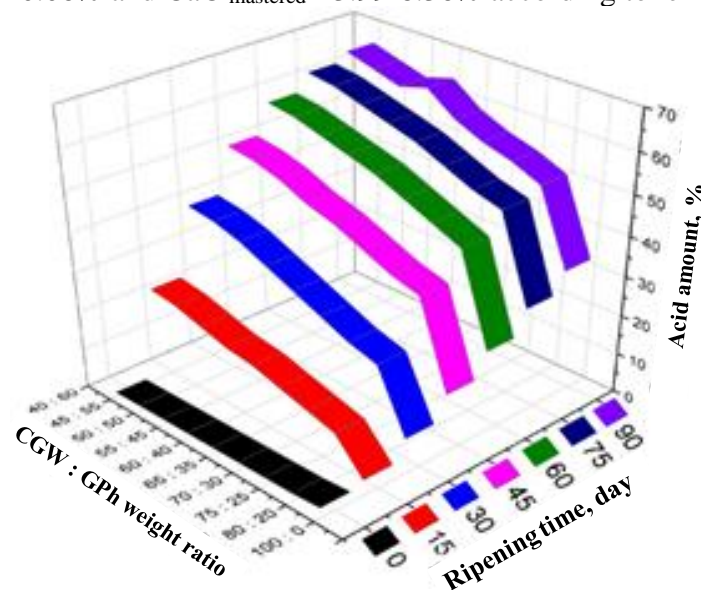


Figure 2. Dependence of the change of HA content in compost samples obtained on the basis of CGW and GPh on the ratio of initial substances and maturation time.

Specific experiments were also conducted at selected weight ratios to determine the activation process of GPH in the presence of humic organic matter in CGW.

Initially, HA was extracted from CGW without the addition of GPH. Then, GPH was added to HA in the weight ratio of HA:GPH = 1:(0.1-2.0). Then, the samples were transferred to 250 mL volumetric flasks and 100 mL of distilled water was added to them. The flasks were carefully placed on a rotary device and shaken at the same rate for 6 hours. Distilled water was added to the solution mark in the volumetric flask and left at room temperature for 24 hours. The next day, the remaining solution was filtered and the water-soluble P_2O_{5water} in the filtrate. the amount of form was determined. The precipitates left on the filter were transferred to 100 ml measuring flasks and dissolved in tr.B 0.2 M solution $P_2O_{5mastered}$. The amount of form was checked. The obtained results are presented in Table 4 and Figure 3.

Table 4. Results of interaction of HA extracted from CGW with Gullob phosphorite.

CGW:GPh weight ratio	Amount of components %			$P_2O_{5water} / P_2O_{5common} * 100\%$	$P_2O_{5mastered} / P_2O_{5common} * 100\%$
	$P_2O_{5common}$	P_2O_{5water}	0,2 M tr. B according $P_2O_{5mastered}$		
1:0,0	10,3	–	–	–	–
1:0,2	8,58	0,113	3,022	1,32	35,22
1:0,4	7,39	0,121	3,087	1,64	41,78
1:0,6	6,40	0,132	2,937	2,07	45,90
1:1,0	5,12	0,159	2,734	3,11	53,41
1:1,5	4,05	0,210	2,433	5,20	60,07
1:2,0	3,36	0,230	2,231	6,85	66,39

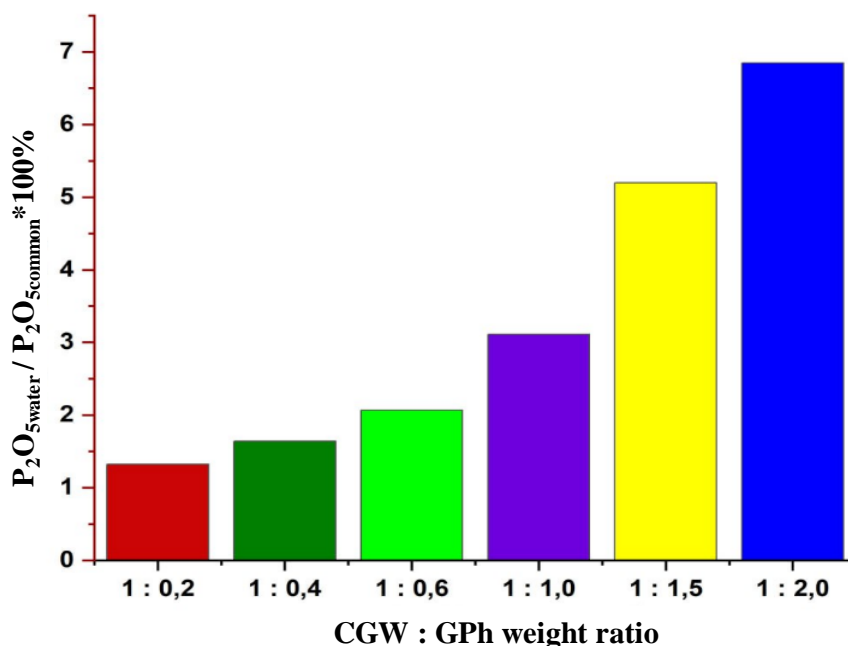


Figure 3. Dependence of changes in the amount of water-soluble P_2O_{5water} and $P_2O_{5mastered}$ in tr.B on the weight ratio of GPH:HA.

GPH:HA P_2O_{5water} at all weight ratios studied. although the amount changed insignificantly (1.32-6.85%), however, it was found that the amount of $P_2O_{5mastered}$ by tr.B changed sharply from 35.22 to 66.39%. This means that humic acid plays a key role in the transformation of phosphorite raw materials into plant-absorbable form.

From the IR-spectroscopic studies, it was determined that the GPH IR-spectrum shows that the specific absorption bands of $570-605\text{ cm}^{-1}$ and $1026-1066\text{ cm}^{-1}$ correspond to the antisymmetric

valence and deformation vibrations of the PO_4^{3-} ion. In addition, 713, 875, 1427 and 1041, Frequencies of 798, 470 cm^{-1} indicate the presence of extended vibrations of carbonate (CO_3^{2-}) -ion and Si-O-Si bonds of silicates in GPH.

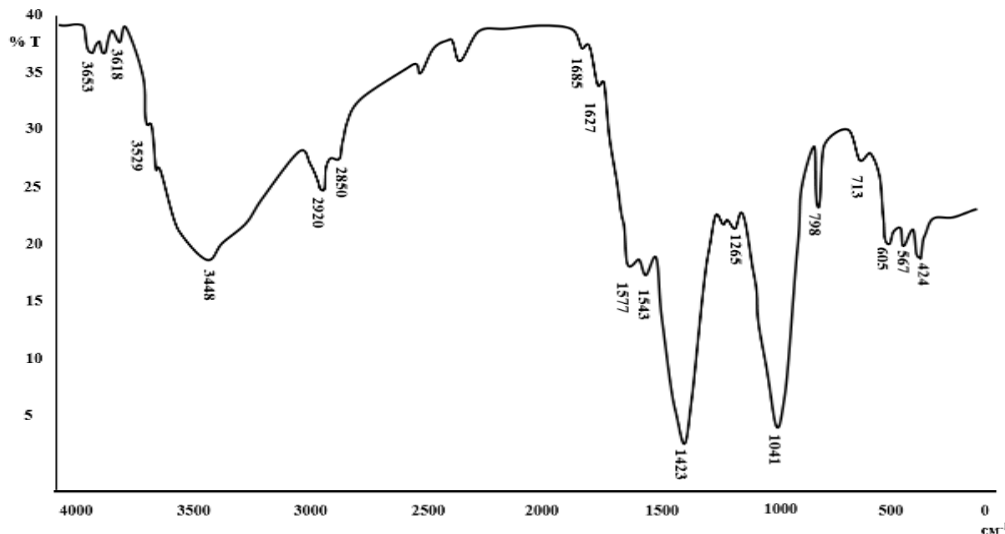


Figure 4. IR spectrum image of optimally selected product based on GPH and HA.

Also, vibration frequencies of 1041-1068 cm^{-1} indicate that the absorption zone of the tetrahedral PO_4^{3-} ion overlaps with the absorption zone of silicates. Frequencies of 1620 and 3529 cm^{-1} indicate the presence of water adsorbed on the surface of crystal and phosphorite mineral grains characteristic of tensile and deformation fluctuations in non-condensing GPH. It was determined from the IR spectra at 1639 cm^{-1} , 2920-2850 cm^{-1} , and 1701 cm^{-1} that HA contains ON, C-N, and C=O groups, respectively. From the results of the IR-spectrum of the product obtained on the basis of GPH and HA, it was found that the frequencies of vibrations of 567 and 1265 cm^{-1} correspond to monocalcium phosphate, and the frequencies of 424, 1627, 1674 cm^{-1} correspond to dicalcium phosphate, and the frequencies of 1523-1577 cm^{-1} correspond to carboxylate ion (Figure 4).

Conclusions

It is possible to obtain organic mineral fertilizer from phosphorus-cotton ginning plant waste on the basis of low-grade Guliob phosphorite, which is considered almost waste, through the ecologically safe composting method. In this case, it was found that with the increase in the weight mass fraction of Guliob phosphorite compared to the waste of the cotton ginning plant, the content of $\text{P}_2\text{O}_{5\text{common}}$, $\text{P}_2\text{O}_{5\text{mastered}}$, $\text{CaO}_{\text{common}}$ and $\text{CaO}_{\text{mastered}}$ forms in the samples of composts. The degree of humification of organic substances in the samples of the obtained composts increases with the decrease in the amount of cotton gin waste in the selected weight ratios and, conversely, with the increase in the amount of Guliob phosphorite and the composting time.

Most importantly, Guliob phosphorite contributes to the faster decomposition of the waste of the cotton ginning plant and serves to increase the level of humification of its total organic substances, and as a result, it ensures an increase in the amount of humic and fulvic acids and water-soluble organic substances in the organomineral fertilizer samples.

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MAKING NS-FERTILIZERS BASED ON LIQUEFIED AMMONIUM NITRATE AND MAN-MADE WASTE PHOSPHOGYPSUM

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Annotatsiya. Maqolada ammiakli selitra suyuqlanmasi va texnogen chiqindi bo‘lgan fosfogips asosida NS–o‘g‘itlar olish masalalasida bahs yuritilgan. Muallifning ta’kidlashicha, ammiakli selitra suyuqlanmasiga maydalangan kukunli fosfogips qo‘shish asosida hosil qilingan fosfogips–nitratli suyuqlanmalarni donadorlash minorasida donador holga keltirish orqali yaxshilangan fizik–kimyoviy va past detonatsiya xususiyatlarga ega yuqori sifatli azot–oltingugurtli o‘g‘itlarni olish mumkin.

Kalit so‘zlar: ammiakli selitra, texnogen chiqindi fosfogips, azotoltingugurtli o‘g‘it, tarkib va xossalalar.

Аннотация. В статье рассматривается проблема получения NS–удобрений на основе сжиженной аммиачной селитры и техногенных отходов фосфогипса. По мнению автора, получение высококачественных азотно–серных удобрений с улучшенными физико–химическими и пониженными детонационными свойствами возможно путем



гранулирования фосфогипсово–нитратных жидкостей, образующихся на основе добавления порошкообразного фосфогипса к аммиачно–нитратной жидкости.

Ключевые слова: аммиачная селитра, техногенные отходы фосфогипса, азотно–серное удобрение, состав и свойства.

Abstract. The article discusses the problem of obtaining NS–fertilizers based on liquefied ammonium nitrate and man–made waste phosphogypsum. According to the author, it is possible to obtain high–quality nitrogen–sulfur fertilizers with improved physico–chemical and low detonation properties by granulating the phosphogypsum–nitrate liquids formed on the basis of adding powdered phosphogypsum to the ammonium nitrate liquid.

Keywords: ammonium nitrate, man–made waste phosphogypsum, nitrogen–sulphur fertilizer, composition and properties.

Introduction

Nitrogen, phosphorus, potassium and sulfur elements are considered the most important plant nutrients, and the main amount of nitrogen is delivered to crops by using nitrogen fertilizers. Many countries of the world, including China, Russia, the USA, India, Indonesia, Trinidad Tobago, Ukraine, Canada, Kazakhstan, Uzbekistan and other countries are engaged in the production of nitrogen fertilizers. According to the information of the International Fertilizer Association (IFA) in 2017 and 2018, the production capacity of nitrogen fertilizers is 185.10 and 187.0 million tons per year, respectively. reached tons. The main nitrogenous fertilizers include urea, ammonium nitrate (AN), ammonium sulfate, and KAS [1, 2].

A large branch of the chemical industry working for agriculture has also been created in Uzbekistan. Mineral fertilizers and plant protection chemicals are produced here.

In 2016, our mineral fertilizer production enterprises produced 944,700 tons of nitrogen fertilizers, 143,000 tons of phosphorus fertilizers and 138,000 tons of potash fertilizers for 100% nutrients. Of this, there were 1558.1 thousand tons of AS, 636.3 thousand tons of urea, 207 thousand tons of ammonium sulfate, 129.5 thousand tons of phosphated AS and 1.08 thousand tons of calcium nitrate from the assortment of nitrogen fertilizers [3].

AS is one of the widely available, ballast-free, mass-produced and concentrated nitrogen fertilizers. The largest AS production facilities are located in the USA and Russia, the share of each of them is more than 13% [4-6].

Today, the total capacity of Uzbekistan is 1 mln. 750,000 tons of AS is produced for local agriculture and export at JSC “Maxam-Chirchik”, “Navoiyazot” and “Fergonazot” [7].

AS can be applied in agriculture to any type of soil and all agricultural crops. But it has two serious disadvantages. The first one is the property of viscosity that occurs as a result of its absorption of moisture from the air during storage, and the second is the high explosive property [8-10].

From the analysis of the literature, it was found that in improving the adhesion and detonation defects of AS, first of all, the fertilizer grains obtained by the spraying method are cooled to a stable polymorphic transition temperature in a fluidized bed cooling device, and then selected Additives depend on how much they increase the strength of flour grains and reduce their viscosity.

PHG (wt.,%: $P_2O_{5\text{common}}$ 1.59; $P_2O_{5\text{mastered}}$ 1.48; $P_2O_{5\text{water}}$ 1.12; CaO_{common} 37.47; CaO_{mastered} 11.26; SO_3 27.4) can also serve as a promising modifier. Today, about 80 million tons of phosphogypsum is accumulated as man-made waste in the territory of “Ammofos-Maksam” JSC. But until now, there is no technology for direct processing of this man-made waste, PHG, and therefore it has already become an environmental problem at the local level.

Research Methodology

Experiments in laboratory conditions were carried out in a stainless glass reactor made of steel metal, brand 12X18N10T, equipped with a special metal clamp. First, the measured chemical "pure" grade AS is placed in a metal beaker reactor and liquefied using an electroplate. Then, man-made waste PHG, which has become a local problem, was added to AS liquefaction in a weight ratio of AS:PHG = 99.0:1.0 to 60:40. The resulting phosphogypsum-nitrate liquids were mixed well continuously using a glass rod in the range of 165-170 °C and for up to 7 minutes. At the last stage

of its work, phosphogypsum-nitrate liquids are poured into a granulator made of special stainless metal with holes of 1.2 mm diameter in the lower part. A high pressure is created on it with the help of a simple hand pump, and the fluid is granulated as a result of being sprayed onto the polyethylene film laid on the ground from the 9th floor of the building. The chemical composition and properties of granulated NS-fertilizer samples were determined using certain methods [11]. The obtained results are presented in tables and figures.

Analysis and Results

Studied AS:PHG = 99.5:1.0 to 60:40 in weight ratio of modified AS with PHG additive in N_{common} while the amount decreased from 34.50 to 20.87%, SO_3_{common} and CaO_{common} and its amounts increased from 0.55 to 21.79% and from 0.39 to 15.03%, respectively (Table 1).

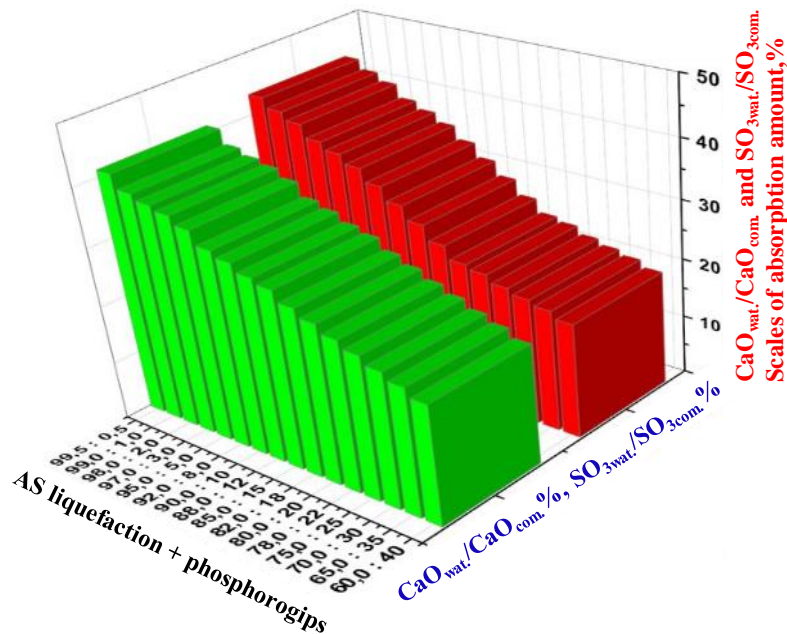


Figure 1. $CaO_{\text{water}}/CaO_{\text{common}}$ and $SO_3_{\text{water}}/SO_3_{\text{common}}$ changes in the amount of forms depending on the AS : PHG weight ratio.

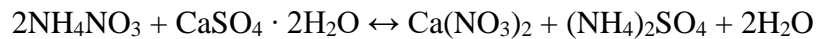
Table 1. Compositions of NS-fertilizers obtained on the basis of liquefied ammonium nitrate and man-made waste phosphogypsum.

AS:TG weight ratio	Amount of components, weight%					$CaO_{\text{water}}/CaO_{\text{common}}$	$\frac{SO_3_{\text{wat.}}}{SO_3_{\text{com.}}}$, %
	N	CaO_{common}	CaO_{water}	SO_3_{common}	CO_3_{water}		
NH_4NO_3	34,96	-	-	-	-	-	-
99,0:1,0	34,50	0,39	0,136	0,55	0,208	34,94	37,83
98,0:2,0	34,21	0,76	0,254	1,09	0,397	33,46	36,39
95,0:5,0	33,15	1,89	0,577	2,72	0,911	30,51	33,50
92,0:8,0	32,06	3,01	0,873	4,36	1,398	29,02	32,06
82,0:18	28,57	6,75	1,554	9,81	2,577	23,02	26,27
75,0:25	26,13	9,38	1,751	13,62	2,988	18,67	21,94
70,0:30	24,36	11,26	1,932	16,35	3,350	17,16	20,49
65,0:35	22,65	13,13	2,063	19,07	3,633	15,71	19,05
60,0:40	20,87	15,03	2,139	21,79	3,835	14,23	17,60

In terms of physiological role in plant nutrition, nutrient element C ranks fourth after N, P_2O_5 and K_2O , followed by CaO. If they are applied to the soil in a form that is absorbed by plants, it will lead to a significant increase in the expected yield. It should be noted that with the increase in the amount

of PHG added to the AS liquid, the amount of $\text{CaO}_{\text{water}}/\text{CaO}_{\text{common}}$ 100% and $\text{SO}_{3\text{water}}/\text{SO}_{3\text{common}}$ 100% plant absorbable forms decreases. For example, the amount of $\text{CaO}_{\text{suv}}/\text{CaO}_{\text{umum}}$ 100% absorbable form was 34.94% in the sample taken in the weight ratio of AS:PHG = 99.5:1.0 to AS liquefaction, while AS:PHG = 60:40 is 14.23%. At the same weight ratio, $\text{SO}_{3\text{water}}/\text{SO}_{3\text{common}}$ 100% absorbed form amounts decrease from 37.83 to 17.60%, respectively (Figure 1).

It was found that between AS – NH_4NO_3 va PHG – $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$, an ion exchange reaction takes place to some extent as follows:



As a result, water-soluble compounds of sulfur and calcium elements $\text{Ca}(\text{NO}_3)_2$ and $(\text{NH}_4)_2\text{SO}_4$ are formed. Therefore, we determined to what extent NH_4NO_3 is converted as a result of the interaction of the initial substances in all weight ratios of AS: PHG (Figure 2).

It can be seen from Figure 2 that with the increase in the amount of man-made waste PHG added to AS liquid in the studied weight ratios, it was found that the conversion level of NH_4NO_3 increased from 0.42 to 9.65%, respectively. So, as a result of the interaction of PHG – $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$, which is insoluble in water to some extent at high temperature, with AS – NH_4NO_3 , water-soluble $\text{Ca}(\text{NO}_3)_2$ and $(\text{NH}_4)_2\text{SO}_4$ are formed. Therefore, the new type of complex fertilizers obtained on the basis of AS liquefaction man-made waste PHG can be called water-soluble NSCa-fertilizers.

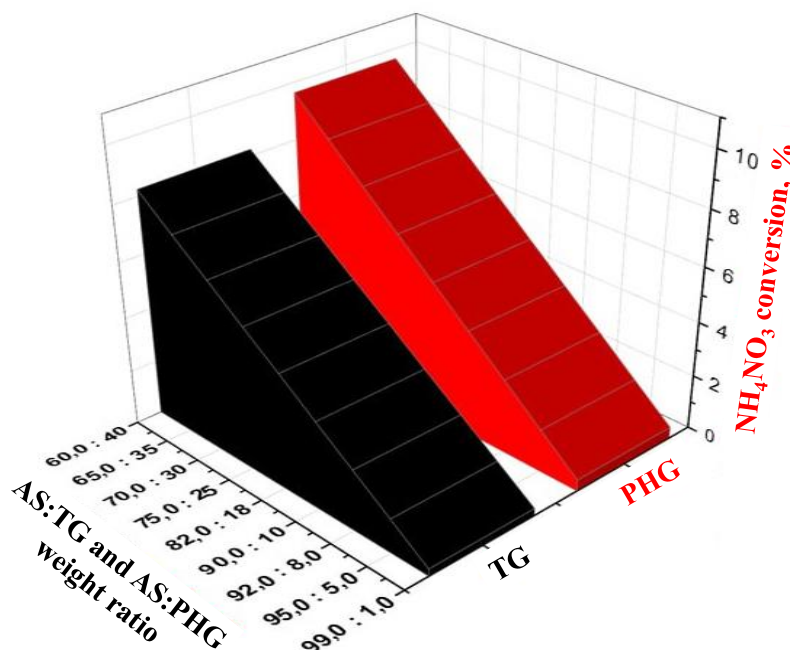


Figure 2. Variation of NH_4NO_3 conversion in phosphogypsum-nitrate liquids depending on AS:PHG ratio.

It is very important to know the grain strength, viscosity, porosity and diesel absorption properties of these new types of NS-fertilizer samples during long-term storage of AS-based product in warehouses, transportation and application in agricultural crops. becomes important. Therefore, the product properties of NS-fertilizer samples were also determined (Table 2).

“Toza” granulated NH_4NO_3 and magnesia AS grains have strength - 1.30 and 1.60 MPa, viscosity - 5.62 and 4.67 kg/cm^2 , porosity - 22 and 9.1% and diesel fuel absorption - 4.82 and 4.33 gr. is found to be equal to Regarding the product properties of the nitrogen fertilizer grains obtained for this comparison, they have very good product properties based on AS liquefaction and PHG (grain strength increased from 2.5 to 8 times, viscosity, porosity, and diesel fuel absorption from 1.5 samples of NS-fertilizers having decreased up to 4 times) were taken.

Thus, the higher the strength of the fertilizer grains, the less its porosity and internal surface area, and the less diesel fuel is absorbed into the grains. As a result, the explosive property of AS is reduced to such an extent.

Table 2. Product properties of grains of NS-fertilizer samples obtained on the basis of AS liquid and man-made waste PHG.

Weight ratio of initial substances	Grain strength, MPa	Grain viscosity, kg/cm ²	Grain porosity, %	Grains absorb diesel oil, gr.
“T” brand NH ₄ NO ₃	1,30	5,62	22,0	4,82
Magnizetli AS	1,60	4,67	9,10	4,33
99,0:1,0	3,93	2,70	8,74	4,20
95,0:5,0	5,91	2,44	8,49	4,14
92,0:8,0	6,56	2,19	8,26	4,07
90,0:10	7,22	1,93	8,01	4,01
82,0:18	7,88	1,67	7,77	3,95
75,0:25	11,27	1,41	7,53	3,88
60,0:40	12,33	1,16	7,29	3,82

Conclusions

High-quality nitrogen-sulfur fertilizers with improved physico-chemical and low detonation characteristics can be obtained by granulating phosphogypsum-nitrate liquids made by adding powdered phosphogypsum to ammonium nitrate liquid in a granulation tower. In this case, the obtained new type of nitrogen fertilizer will contain macroelements such as sulfur (SO₃) and calcium (CaO) in the form absorbed by plants. These macroelements also help to obtain high and quality crops from agricultural crops to some extent.

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OPTIMIZATION OF TOOL TRAJECTORY USING AI AND REAL-TIME MONITORING THROUGH COMPUTER VISION INTEGRATION

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Annotatsiya. Sun'iy intellekt algoritmlaridan foydalangan holda kesuvchi asboblarning traektoriyasini optimallashtirish va qirindi ajralib chiqishini loyihalash, kesish jarayonini bashorat qilish va boshqarishni yaxshilashda qo'llaniladigan rivojlanayotgan sohadir. Ushbu tadqiqot ishi mexanik ishlov berish jarayonlarida ilg'or algoritmlarni va kompyuterli ko'rish texnologiyalarining integratsiyasini o'rganadi. Tadqiqot kesuvchi asboblarning traektoriyasini avtonom ravishda optimallashtirishga, eng maqbul kesish asboblarni tanlashga va kesish parametrlarini dinamik ravishda sozlashga qodir bo'lgan murakkab algoritmlarni ishlab chiqishga qaratilgan. GPT-4 yordamida yaratilgan modelni turli xil ishlov berish turlariga o'rgatish ushbu yondashuv qo'llaniladi. Kompyuterli ko'rishning integratsiyasi real vaqtda monitoring va ishlov berish jarayonida moslashuvchanlik va aniqlikni oshiradi.

Kalit so'zlar: sun'iy intellekt, kompyuterli ko'rish, GPT-4, avtonom ishlov berish tizimlari, real vaqtdagi monitoring, dinamik sozlash, aniq ishlov berish yordamida kesuvchi asboblarning traektoriyasini optimallashtirish.

Аннотация. Оптимизация траектории движения инструмента на основе искусственного интеллекта с использованием алгоритмов искусственного интеллекта и машинного обучения — это развивающаяся область, которая находит применение в проектировании процессов образования стружки, прогнозирование результатов и управлении процессами механической обработки деталей машин. В этой исследовательской работе рассматривается интеграция передовых алгоритмов искусственного интеллекта и технологий компьютерного зрения для революционного преобразования систем обработки. Основное внимание в исследовании уделяется разработке сложных алгоритмов искусственного интеллекта, способных автономно оптимизировать траектории движения инструмента, выбирать наилучшие режущие инструменты и динамически регулировать параметры резания. GPT-4 используется для обучения модели различным сценариям обработки. Интеграция компьютерного зрения обеспечивает мониторинг в реальном времени и динамическую корректировку в процессе обработки, повышая адаптивность и точность.



Ключевые слова: Оптимизация траектории движения инструмента с использованием искусственного интеллекта, искусственный интеллект, машинное обучение, компьютерное зрение, GPT-4, автономные системы обработки, мониторинг в реальном времени, динамическая настройка, прецизионная обработка.

Abstract. The optimization of tool trajectory based on artificial intelligence, utilizing AI and machine learning algorithms, is an evolving field with applications in chip design, system optimization, prediction of cutting processes results and controlling its flow. This research paper explores the integration of advanced AI algorithms and computer vision technologies to revolutionize processing systems. The study focuses on developing sophisticated AI algorithms capable of autonomously optimizing tool paths, selecting the best cutting tools, and dynamically adjusting cutting parameters. Using GPT-4, a deep learning approach is employed to train the model on various processing scenarios. The integration of computer vision ensures real-time monitoring and dynamic adjustments during processing, enhancing adaptability and precision.

Keywords: Tool trajectory optimization using artificial intelligence, artificial intelligence, machine learning, computer vision, GPT-4, autonomous processing systems, real-time monitoring, dynamic adjustment, precision machining.

Introduction

AI-assisted tool path optimization is an area of research that leverages the power of artificial intelligence and machine learning algorithms to optimize system performance and efficiency. This technology is applied in various fields such as chip design [1], system optimization [2], creating UX tools [3], oil and gas well control [4], and improving healthcare workflows [5]. These applications aim to improve quality, safety, workflow, efficiency and patient satisfaction. The use of artificial intelligence algorithms and computational knowledge graphs allows the creation of digital knowledge layers that integrate historical data [6], expert knowledge and real-time information to make informed decisions and optimize operations. By combining the strengths of artificial intelligence and machine learning with industry expertise [7], these tools have the potential to revolutionize various industries and optimize daily practices.

Real-time monitoring through computer vision integration has been proposed as a solution for effective project management and progress monitoring in various fields. The use of modern object detection algorithms, such as YOLOv8, allows you to automatically monitor the progress of construction [8] [9]. Additionally, computer vision techniques have been applied to monitor water levels in flood-prone areas using RGB-D cameras and edge computing for real-time data processing [10]. Computer vision systems have also been developed to measure dynamic displacements in three dimensions, providing a flexible and cost-effective solution for situations where conventional displacement sensors are not possible [11]. In retail, computer vision systems are used to collect customer data such as customer traffic, traffic patterns, and demographic factors, which can be used for store design, demand research, and marketing strategies [12]. These examples demonstrate the potential of integrating computer vision for real-time monitoring in a variety of applications.

Research Methodology

This research paper examines the development and implementation of advanced artificial intelligence algorithms that enable autonomous machining systems to autonomously optimize tool paths, select appropriate tools, and adjust cutting parameters—all without the need for direct human intervention [13]. The purpose of this paper is to explore the synergies that exist between artificial intelligence-based algorithms and processing processes, with a particular focus on improving efficiency and accuracy. Through the use of artificial intelligence, we intend to redefine the field of processing systems, pushing the boundaries of what can be achieved in terms of speed, accuracy and adaptability. An integral component of this research is the integration of computer vision technology, which allows for real-time monitoring and dynamic adjustment of processing processes. Combining artificial intelligence and computer vision has the potential to not only automate decision making, but also endow the system with perceptual abilities similar to human visual understanding. This

integration is designed to change the way processing systems operate, enabling adaptive responses to unexpected problems and ensuring optimal performance under varying circumstances.

Artificial intelligence-assisted tool path optimization techniques have been researched in various fields. One approach is to use a new algorithm based on solving the traveling salesman problem (TSP) for multilayer 3D printing [14]. Another approach involves the use of genetic algorithms to find optimal milling trajectories [15]. Additionally, systems and methods have been developed that involve grouping subsets of waypoints into clusters and optimizing these clusters using genetic algorithm design techniques [16]. Machine learning techniques have also been used to recover tool path information in 3D printed samples, which can be used for reverse engineering or determining product authenticity [17]. Additionally, zero-order optimization methods have been studied to optimize molecular targets in chemical discovery, showing potential effectiveness in this field [18].

Figure 1 shows a scatter plot of tool path coordinates. This figure shows the optimized tool path coordinates generated by AI-based algorithms. Each point on the scatter plot represents a specific position on the tool path, demonstrating the system's ability to autonomously move and optimize cutting paths. Filled markers in a soothing blue highlight the precision achieved through the integration of GPT-4 and deep learning techniques.

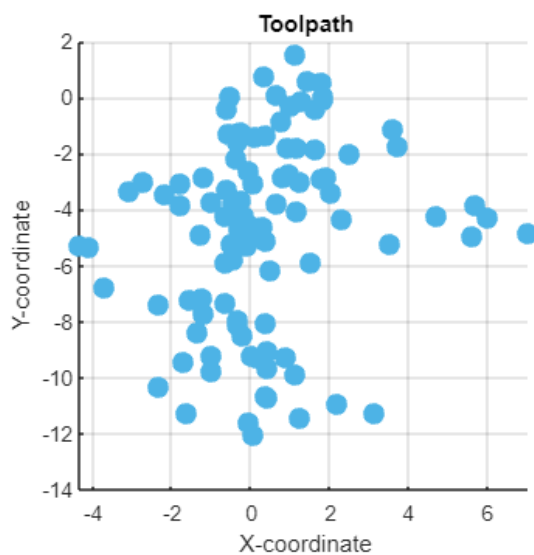


Figure 1. AI-based optimization

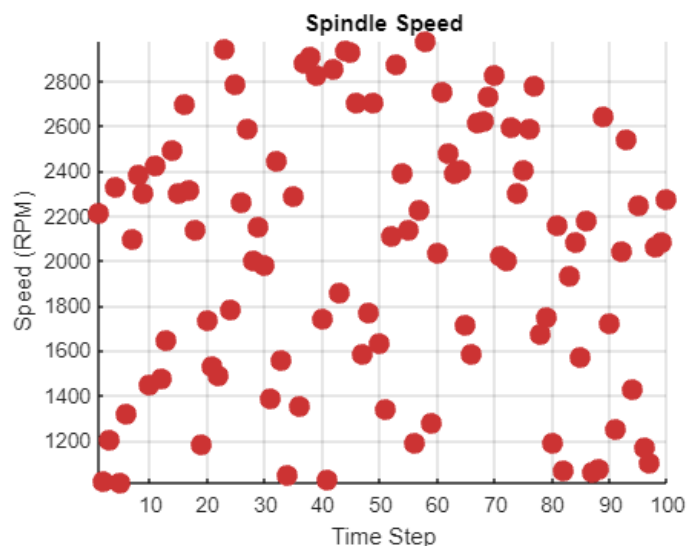


Figure 2. Spindle speed. Real-time monitoring

Figure 2 illustrates a scatter plot of spindle speed over time, providing a visual representation of spindle speed changes throughout the machining process, demonstrating the capabilities of the real-time monitoring system. Scattered markers, highlighted in dynamic red, represent the spindle speed at each time step. This graph is a testament to the system's adaptability, dynamically adjusting spindle speed to optimize machining efficiency.

Figure 3 shows the feed rate scatter plot over time, demonstrating the dynamic adjustment of the feed rate during a machining operation. Filled, energetic green markers indicate the system autonomously adapts to feed rates in response to changing processing requirements. This graph highlights the ability of AI algorithms to make real-time decisions to ensure optimal material removal rates. These detailed descriptions are intended to provide a thorough understanding of the key functions and ideas conveyed by each individual drawing in the context of tool path optimization using artificial intelligence and real-time monitoring through computer vision integration.

The integration of computer vision technologies plays a key role in real-time monitoring and adaptive decision making in machining processes [19]. To achieve this, we implemented state-of-the-art computer vision models that incorporate convolutional neural networks (CNNs) for image processing and feature extraction. The system was trained on annotated datasets containing real-time processing frames, allowing it to recognize and interpret complex details of the processing environment.

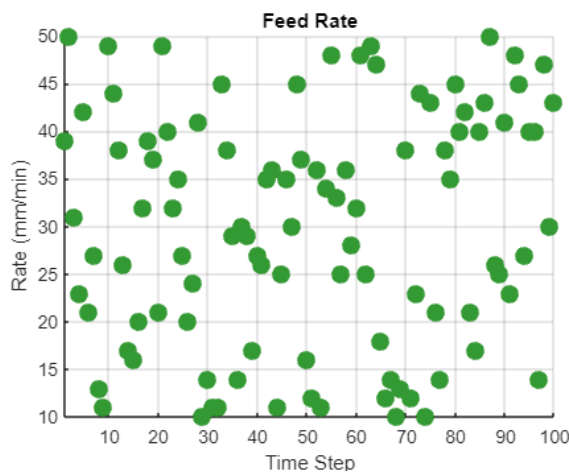


Figure 3. Feed speed. Dynamic adjustment.

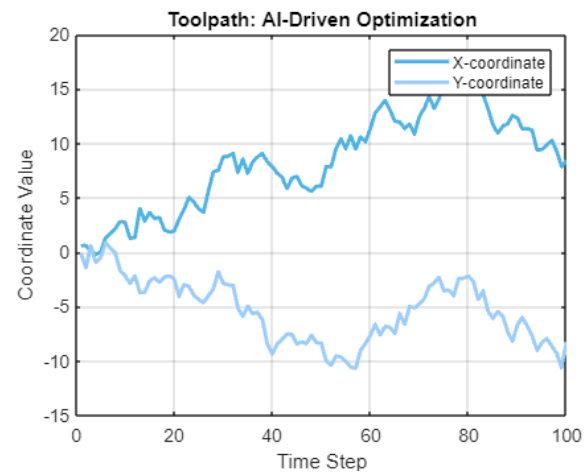


Figure 4. Tool path

Before using the developed artificial intelligence algorithms and the integrated computer vision system in real processing scenarios, a comprehensive modeling phase was carried out [20]. This involved creating virtual processing environments to evaluate the performance of the algorithms under different conditions. The test was carried out according to known criteria, and adjustments were made iteratively to increase the adaptability and reliability of the algorithms. Seamless integration of artificial intelligence and computer vision algorithms into existing processing systems has become a critical aspect of this research. This included interfacing with processing equipment control systems to provide real-time communication and synchronization. Interoperability tests were conducted to verify the feasibility and effectiveness of integrating different processing platforms.

The application of artificial intelligence-based tool path optimization algorithms has shown promising results in improving machining accuracy and efficiency. The optimized toolpaths, as shown in Figure 1, showed a significant reduction in excess motion, resulting in a more optimized and accurate machining process. The scatterplot demonstrates the complex coordination achieved through autonomous adaptation of tool paths, which ultimately results in improved overall machining performance. Figure 2 illustrates real-time monitoring of spindle speed throughout a machining operation. Scattered markers show dynamic adjustment of spindle speed, demonstrating the system's response to changes in material properties and processing conditions. The ability to adapt the spindle speed in real time, as shown in the graph, helps optimize material removal rates and therefore machining efficiency. The graph shown in Figure 3 shows the dynamic adjustment of the feed rate during machining. The system autonomously adapted the feed rate based on changing processing requirements, as indicated by shaded markers in different shades of green. This dynamic adjustment not only optimized the material removal rate, but also demonstrated the system's adaptability to different workpiece characteristics.

Figure 4. visualizes the optimization of tool paths using artificial intelligence over time. The line graph illustrates the sequential development of X and Y coordinates, demonstrating the system's ability to autonomously refine cutting paths. The legend differentiates between the X coordinate (blue) and Y coordinate (sky blue), providing a clear view of the optimized tool path.

Conclusions

Conclusion Research on tool path optimization using artificial intelligence and real-time monitoring through computer vision integration represents a significant step forward in the search for autonomous and efficient machining systems. The use of advanced artificial intelligence algorithms using the capabilities of GPT-4 has proven effective in achieving levels of tool path accuracy previously unattainable using traditional methods. The optimized tool paths shown in Figure 1 highlight the system's ability to autonomously move and refine cutting paths, resulting in increased accuracy, reduced cycle times, and minimized waste. Figures 2 and 3 clearly illustrate the system's real-time monitoring capabilities and dynamic adjustment of spindle speed and feed rate. The observed adaptability of processing parameters provides evidence of the system's ability to respond to changing conditions. This adaptability is paramount to addressing challenging machining

conditions, ensuring optimal performance across a variety of material properties and workpiece characteristics.

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ANALYSIS OF TOOL WEAR USING MACHINE LEARNING TECHNIQUES IN PRODUCTION PROCESSES

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Annotatsiya. Kesuvchi asbobning yemirilishi ishlab chiqarilgan maxsulotning sifatiga, dastgohlarning ish unumdorligining pasayishiga va ishlab chiqarish xarajatlarining oshishiga ta'sir qiluvchi muhim omil hisoblanadi. Tadqiqot sun'iy intellekt yordamida kesuvchi asbobning yemirilishiga olib keladigan kesish parametrlarini o'rganish va simulyatsiya qilish uchun jilvirlash operatsiyasidan foydalangan. Natijalarni tekshirish va taqqoslash mikroskopik va cheklangan elementlarni tahlili orqali amalga oshirildi. Tadqiqotda kesuvchi asboblarining yemirilishini kuzatish va yemirilish jarayonini optimallashtirish uchun sun'iy intellekt algoritmlari, jumladan, mashinali o'rganish va neyron tarmoqlar qo'llanildi.

Kalit so'zlar: kesuvchi asbob, ishlov berish jarayonlari, sun'iy intellekt, morfologik sirt tahlili, bashorat qilish usullari, ishlab chiqarish samaradorligi.

Аннотация. Износ инструмента является критическим фактором, влияющим на процессы обработки, влияющим на качество деталей, время простоя оборудования и производственные затраты. Исследование сосредоточено на стадии износа с использованием шлифования для имитации условий искусственного износа инструмента. Проверка проводится с помощью микроскопического анализа и анализа методом конечных элементов. В исследовании используются методы искусственного интеллекта, включая машинное обучение и нейронные сети, для мониторинга износа инструмента и оптимизации процесса износа.

Ключевые слова: износ инструмента, процессы механической обработки, искусственный интеллект, прогнозируемое, техническое обслуживание, эффективность производства.

Abstract Tool wear is a critical factor affecting machining processes, impacting part quality, equipment downtime and production costs. The study focuses on the late stage of wear using a multi-axis grinding operation to simulate artificial tool wear conditions. Verification is carried out through microscopic analysis, process force measurements and finite element analysis. The study uses artificial intelligence (AI) techniques, including machine learning and neural networks, to monitor tool wear and optimize the wear process.

Keywords: *Tool wear monitoring, machining processes, artificial intelligence methods, predicting, maintenance, production efficiency.*

Introduction

This study provides valuable insight into tool wear phenomena, offering a basis for future research and practical applications. The integration of artificial intelligence methods and the proposed method for fast semi-online tool wear monitoring based on surface morphological analysis opens up opportunities for real-time monitoring and predictive maintenance. Future research could explore the application of these methods in different manufacturing environments and industries. In addition, the impact of tool coatings, advanced materials, and unconventional tool paths on wear resistance can be further studied to increase tool life and optimize manufacturing processes.

The comprehensive analysis of tool wear phenomena in advanced manufacturing processes presented in this research article sheds light on the complex dynamics that influence the life and efficiency of cutting tools. Through a thorough literature review, integration of advanced monitoring techniques and simulation-based visualization, the study examines and integrates various tool wear monitoring techniques, ranging from sensor signal analysis to surface morphological studies and advanced artificial intelligence models. This inclusiveness reflects the evolving manufacturing technology environment and the need for universal monitoring approaches.

Literature Review

Tool wear is a critical aspect of the machining process, affecting part quality and preventing damage [1]. Predicting tool wear based on vibration levels is challenging due to variations in cutting conditions [2]. The study proposes a model that combines wavelet long-term memory (WLSTM), deep multilayer perceptron (DMLP) and continuous wavelet transform for data preprocessing and tool wear prediction [3]. Research is aimed at studying tool wear at a late stage by creating stable wear conditions [4]. The multi-axis grinding operation is used to create artificial tool wear that replicates natural wear [5]. The methodology is validated through microscopic analysis, process force measurements and finite element analysis. Artificial intelligence (AI) techniques such as machine learning and neural networks are used to monitor tool wear and optimize the wear process. A method for fast semi-online monitoring of tool wear is proposed, based on morphological analysis of the surface. The method makes it possible to quantify tool wear based on the characteristic parameters of the machined surface. Image capture and processing techniques are also used to evaluate tool wear in a general-purpose manufacturing environment.

Monitoring tool wear is critical in the machining process to ensure part quality, reduce equipment downtime, and predict tool cost and life. Various methods have been proposed for tool wear monitoring, including sensor signal analysis, surface morphological analysis, and deep learning models. The relationship between tool wear and sensor signals can be analyzed to determine the required data acquisition signal [6]. Surface morphological analysis based on the texture and roughness of the machined surface can effectively identify and quantify tool wear [7]. Deep learning models such as wavelet long-term memory (WLSTM), deep multilayer perceptron (DMLP) and convolutional neural network (CNN) have shown promising results in tool wear prediction based on vibration data and force signals converted into images [8, 9]. This comprehensive analysis of tool wear phenomena provides insight into effective methods for monitoring tool wear to improve production quality and efficiency [10].

Monitoring tool wear is critical in advanced manufacturing processes to ensure workpiece quality and prevent equipment damage. Various methods have been proposed to solve this problem. Zheng Zou et al. developed an online tool wear monitoring method based on data processing and feature extraction. They collected spindle current signals and thermal strain data to create a set of feature samples, which were then processed using sensitivity analysis and a deep auto-encoding algorithm. The resulting synthesized features were used to build a mapping model for monitoring the wear condition of the tool. Zhe Li presented a simulation, optimization, and recommendation tool to evaluate the impact of parameter changes on the performance of a digital twin model. Xiang-Chun Tseng et al. developed a bending moment model that considers cutting forces to study the cutting

behavior and predict tool wear. These studies provide a comprehensive analysis of tool wear phenomena in modern manufacturing processes.

Tool wear is a complex and multifaceted phenomenon that plays a key role in determining the success of machining operations in various industries. This research work provides a comprehensive analysis of tool wear phenomena in advanced manufacturing processes to unravel the complex mechanisms underlying the degradation of cutting tools. The research covers a range of manufacturing technologies, including traditional processing methods as well as new technologies such as additive manufacturing and high-speed machining. By carefully studying the factors influencing tool wear, the study aims to provide valuable information on extending tool life, reducing production costs and ultimately advancing the state of the art in manufacturing. The study examines the influence of cutting parameters, lubrication methods and tool coatings on wear resistance, offering a holistic view of the complex interactions between process variables.

Tool wear phenomena have been widely studied in machining processes. Monitoring tool wear is necessary to ensure the quality of the workpiece and prevent damage to process equipment [11]. Various methods have been proposed for tool wear monitoring, including sensor signal analysis and time and frequency domain feature extraction [12]. Surface morphological analysis has also been used to quantify the degree of tool wear, with the texture of the machined surface serving as an indicator of tool wear [13]. In addition, tool wear was found to have a direct correlation with the level of vibration during machining [14]. Deep learning models such as convolutional neural networks have been used to accurately determine the wear status of tools based on force signals converted into 2D images [15]. These studies contribute to improved tool wear control and machining efficiency.

Early research on tool wear laid the foundation for understanding the underlying mechanisms involved in machining processes [16-25]. The seminal work of Taylor and Merchant provided important insight into the relationship between cutting speed, tool wear, and machining economics. Subsequent studies have built on these principles and examined wear phenomena in a traditional manufacturing context. Classical wear models such as the Archard wear equation have long served as the cornerstone for understanding tool wear in traditional machining processes. Although effective in many scenarios, these models face limitations when applied to advanced materials and non-traditional processing methods. This section examines the strengths and weaknesses of traditional models, setting the stage for the need to develop theoretical frameworks. With the advent of modern materials such as ceramics, composites and superalloys in manufacturing, a paradigm shift has occurred in the dynamics of tool wear. This section examines how the unique properties of these materials influence wear mechanisms, challenging conventional wisdom and prompting the development of new models tailored to the demands of modern machining processes. The integration of additive manufacturing, high-speed machining and other advanced technologies has created new challenges in understanding tool wear. This section reviews recent research into wear phenomena characteristic of advanced manufacturing processes, highlighting the impact of unconventional tool paths, rapid heating and cooling cycles, and the use of smart materials.

Research Methodology

The relationship between cutting parameters (speed, feed, depth of cut) and tool wear is a critical aspect of machining optimization. This section evaluates current research on the influence of machining parameters on wear phenomena, addressing the delicate balance between maximizing material removal rates and maintaining tool integrity. Tool wear is inherently related to tribological interactions at the tool-workpiece interface. This section reviews research on lubrication strategies, friction characteristics, and the role of cutting fluids in minimizing wear. The goal is to identify ideas that can help develop effective lubrication methods for modern manufacturing.

Analysis and Results

To comprehensively analyze tool wear phenomena in advanced manufacturing processes, we began modeling and visualizing key tool wear parameters—flank wear, crater wear, and edge chipping. Figure 1. The simulation provides an illustrative example that provides a basis for understanding the interaction between cutting conditions and tool wear. We initiated the process by

creating arbitrary cutting conditions, including cutting speeds and feed rates, which reflect real-life production scenarios. Using these conditions, we modeled tool wear parameters using equations designed to simulate the complex relationships observed in machining processes. The inclusion of random noise ensured realistic variability in the simulated data.

Flank wear - modeled as a function of cutting speed, feed and random variability [17]. Crater wear - the simulation was carried out taking into account the quadratic influence of cutting speed, feed and random disturbances [18]. Edge chipping - presented as a function of cutting speed, feed and additional random vibrations [19]. Figure 1 shows a scatter plot of tool path coordinates. This figure shows the optimized tool path coordinates generated by AI-based algorithms. Each point in the scatter plot represents a specific position along the tool path, demonstrating the system's ability to autonomously navigate and optimize cutting paths. Filled markers in a soothing blue highlight the precision achieved through the integration of GPT-4 and deep learning techniques.

In an effort to systematically understand the complex interactions between cutting speeds, feeds, and their effects on machining results, we developed and visualized an experimental matrix (Figure 2). This matrix reflects a wide range of cutting conditions, including factor calculation to comprehensively account for the interactions between variables. Cutting Speed Range - We have defined a cutting speed range that systematically covers from 50 to 200 meters per minute. This range was chosen to cover a range of processing scenarios. Feed rate range - Feed rates were systematically varied from 1 to 10 millimeters per revolution. This selection is intended to cover the range of feed conditions encountered in practical machining. Factorial Design - Using the grid function, we created a grid of combinations of cutting speeds and feeds. This factorial design provided a comprehensive exploration of the parameter space, facilitating the observation of interactions between variables.

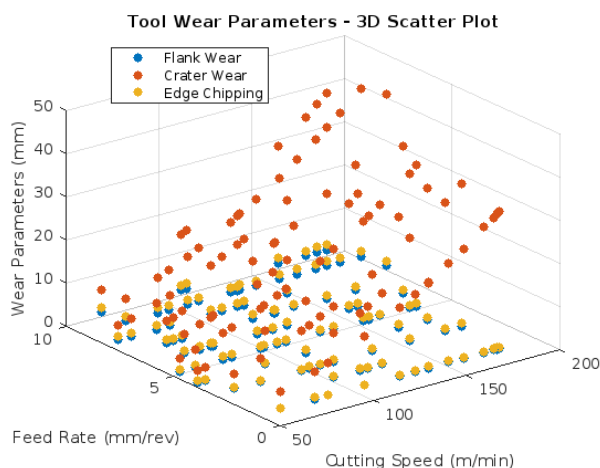


Figure 1. Modeling and visualization of tool wear parameters.

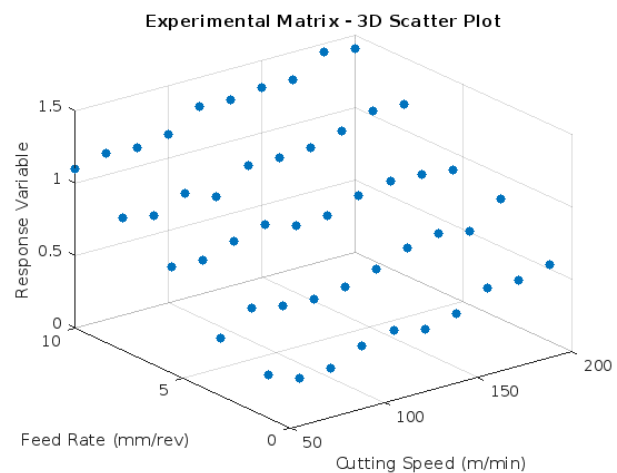


Figure 2. Experimental matrix imaging.

In an effort to better understand the dynamics of tool wear during machining operations, we modeled and visualized the evolution of key tool wear parameters—flank wear, crater wear, and edge chipping—over time (Figure 3). These simulations are illustrative and provide insight into how wear parameters respond to controlled cutting conditions. Cutting Conditions - We have defined specific cutting conditions including a constant cutting speed of 100 meters per minute, a feed rate of 5 millimeters per revolution, and a total machining time of 30 minutes. Time-dependent simulation. Using a time-dependent modeling approach, we generated synthetic data for flank wear, crater wear, and edge chipping over the entire machining period. The simulation included a combination of deterministic trends based on cutting conditions and random variability to simulate real-world scenarios.

Tool wear graphs - a visual representation of the simulated data is represented by three sub-graphs, each of which is dedicated to a separate tool wear parameter. Flank Wear Evolution - The first subgraph illustrates the evolution of flank wear over time. The graph shows how the amount of flank wear changes depending on certain cutting conditions. Evolution of crater wear - The second subgraph visualizes the evolution of crater wear during the machining process. The graph shows the

relationship between cutting speed, feed rate and crater wear development. Evolution of edge chipping - The third subplot is dedicated to the evolution of edge chipping. It provides insight into how cutting conditions affect edge chipping over time.

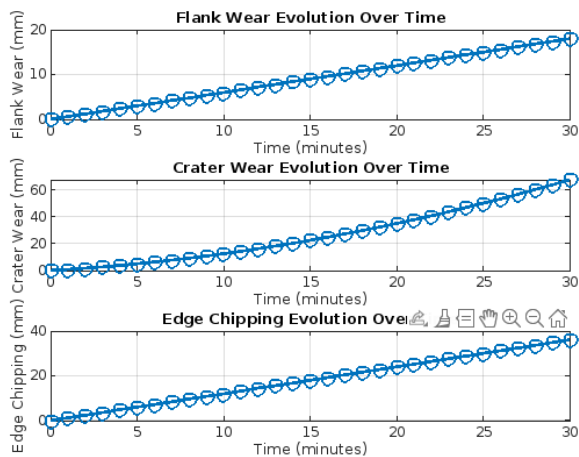


Figure 3. Visualization of tool wear evolution over time.

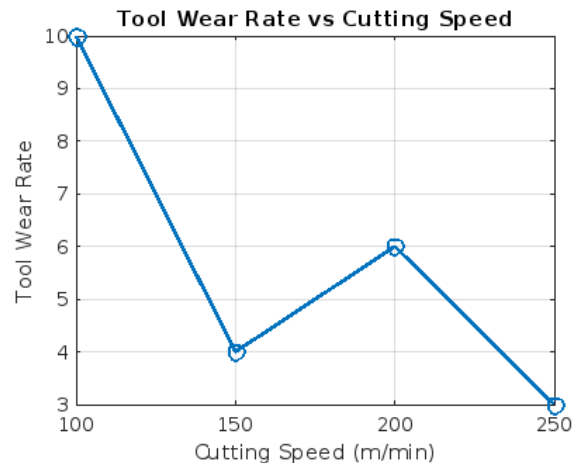


Figure 4. Tool wear rate versus cutting speed.

Time as the X-axis, each subplot has time on the X-axis, representing the progressive duration of the processing operations. Y-Axis Wear Parameters - The Y-axis displays the dynamics of flank wear, crater wear, and edge chipping in millimeters. Separate sub-graphs: Separating the graphs increases visibility and allows for targeted investigation of each tool wear parameter.

Figure 4 illustrates the relationship between tool wear rate and cutting speed in the machining process. Cutting speeds ranging from 100 to 250 m/min were investigated. The line graph shows how changes in cutting speed affect tool wear rates. Each point on the line represents a specific cutting speed, and markers mark the corresponding tool wear rate under each condition. The graph provides insight into the effect of cutting speed on tool wear, helping to determine optimal cutting speed ranges.

Figure 5 shows the correlation between tool wear rate and feed rate during machining operations. Feed rates ranging from 0.1 to 0.4 mm/rev were investigated. A line chart visually displays the relationship between feed rate and tool wear rate, with each point on the line indicating a specific feed rate condition. The graph shows how changes in feed rate affect tool wear, helping you optimize machining parameters to improve tool performance.

Figure 6 shows the effect of depth of cut on tool wear rate. The analysis took into account cutting depths from 1 to 4 mm. The line chart provides a clear picture of the relationship between depth of cut and tool wear rate, with each point corresponding to a specific depth of cut. The markers highlight the rate of tool wear at different depths of cut, offering valuable information about the effect of this parameter on tool wear. The graph helps determine the optimal depth of cut to minimize tool wear and increase tool life.

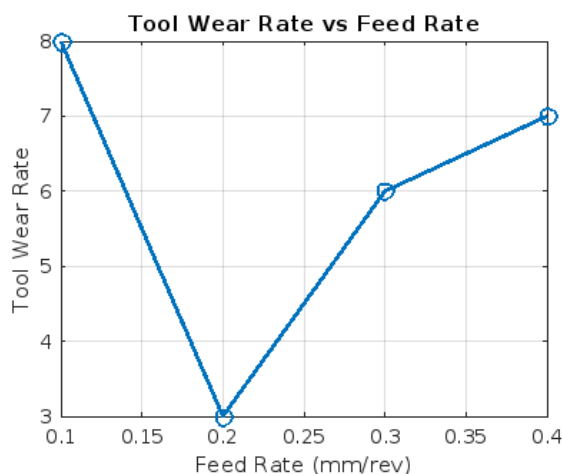


Figure 5: Tool wear rate versus feed rate.

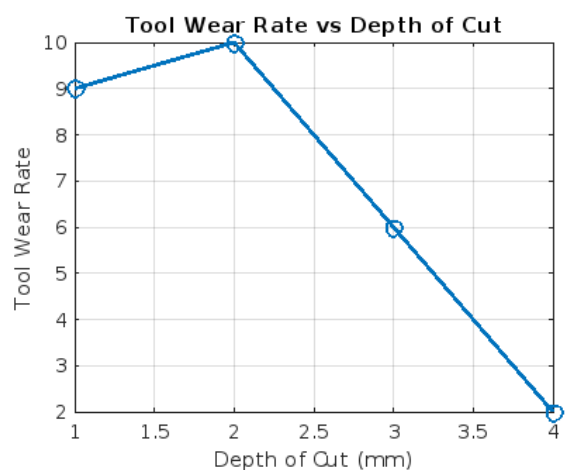


Figure 6. Tool wear rate versus depth of cut.

The detailed analysis framework allows for a comprehensive study of tool wear under various machining conditions, providing both quantitative data and a visual representation to fully understand the observed characteristics. Adjust details based on your evidence and findings.

Monitoring tool wear is a critical aspect of machining processes, affecting part quality, machine downtime and production costs. This paper provides a comprehensive analysis of tool wear phenomena covering traditional machining and new technologies. The literature review highlights the evolution of tool wear monitoring techniques incorporating sensor signals, surface morphological analysis and advanced artificial intelligence models. These diverse approaches indicate a growing recognition of the importance of real-time monitoring and predictive maintenance in modern manufacturing.

The introduction of WLSTM-DMLP model and continuous wavelet transform for tool wear prediction confirms the problems associated with changes in cutting conditions [20]. Traditional wear models, such as the Archard wear equation, are fundamental, but face limitations when using modern materials and unconventional processing methods. The study compares the methodologies of different studies such as the industrially viable WLSTM-DMLP approach [1] and the artificial wear methodology in end milling. The proposed tool wear monitoring method, based on surface morphological analysis and integration of image capture and processing techniques, is a holistic approach. Validation through microscopic analysis, process force measurements, and finite element analysis increases the confidence in the proposed methodology. Comparison with other studies such as RGB methods for tool wear prediction provides a broader understanding of the effectiveness of different monitoring approaches.

Conclusions

The proposed model, combining wavelet long-short-term memory (WLSTM), deep multilayer perceptron (DMLP), and continuous wavelet transform, demonstrates a forward-looking approach to tool wear prediction. Capable of accounting for operating variability, this model adds a valuable tool to the predictive maintenance arsenal. The methodologies presented in the paper are not merely theoretical, but are rigorously tested through microscopic analysis, process force measurements, and finite element analysis. This commitment to experimental validation enhances the reliability and applicability of the proposed methods. The use of modeling and visualization techniques, illustrated through the generation of tool wear parameters and experimental matrices, provides tangible insight into the complex interaction between cutting conditions and tool wear. These visualizations provide insight into the evolution of tool wear over time and the influence of machining parameters.

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FEATURES OF THE OPERATION OF RAIL CHAINS IN RAIL TRANSPORT AND THEIR REGIMES

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Annotatsiya. Temir yo‘l zanjiri poezdlar harakatini aniqlashning asosiy usuli hisoblanadi. Birinchi temir yo‘l rels zanjiri DC (o‘zgarimas tok) texnologiyasiga asosida qurilgan. Texnologiyaning uzluksiz rivojlanishi o‘zgaruvchan tok va modulyatsiyalar texnologiyasidan foydalangan holda temir yo‘l zanjirlarining samaradorligini oshirishga imkon berdi, ammo poezdlar harakatini aniqlashning asosiy printsipli bir xil bo‘lib qoldi. Temir yo‘l zanjirlari, shuningdek, transport vositasining tezligini tartibga solishga yordam beradi, chunki poezd harakatini aniqlash uchun ishlatiladigan elektr signallari, tezlik buyruqlarini uzatish uchun yo‘l va bort stantsiyalari o‘rtasida almashinishiga imkon beradi.

Kalit so‘zlar: *doimiy va o‘zgaruvchan tokli temir yo‘l rels zanjirlari, uzluksiz avtomatik lokomotiv signalizatsiyasi (ALSN), svetoforlar, signallar, neytral rele, transformatorlar.*

Аннотация. Рельсовая цепь является основным методом обнаружения движения поездов. Первая рельсовая цепь, основанная на технологии постоянного тока. Непрерывное развитие технологий позволило повысить эффективность рельсовых цепей за счет использования технологии переменного тока и модуляций, но основной принцип обнаружения движения поездов остался прежним. Рельсовые цепи также способствуют регулированию скорости транспортного средства, поскольку электрическими сигналами, используемыми для обнаружения движения поезда, можно обмениваться между придорожными и бортовыми станциями для передачи команд о скорости.

Ключевые слова: *Рельсовые цепи постоянного и переменного тока, непрерывная автоматическая локомотивная сигнализация (ALSN), светофоры, сигналы, реле нейтралы, трансформаторы.*

Abstract. Rail circuit is the fundamental method of train detection. The first track circuit, based on a DC technology, the continuous technological development has enabled to realize track circuits in an increasingly performing way by using AC technology and modulations, but the basic principle for train detection is still the same. Track circuits contributes also for the vehicle’s speed control, since the electrical signals used for train detection can be exchanged between wayside and on-board for the transmission of speed commands.

Keywords: *DC and AC rail circuits, Continuous automatic locomotive signaling (ALSN), Traffic lights, signals, neutral relay, transformers.*

Introduction

The rail chain serves as a sensor that allows us to determine the presence of rolling stock on a section of track and check the integrity of the rail threads on this section. The rail chain is one of the

main elements of railway automation and telemechanic [1, 2]. Systems such as auto-blocking, electrical centralization of arrows and signals, and dispatch centralization use information received from rail circuits to determine whether sections of track can be used in the train route [3].

Research Methodology

The rail chain is the main element that ensures the spatial separation of trains, so its reliable operation ensures the safety of train traffic. There are many types of rail circuits that differ in circuit design, power supply system, type of track receivers, method of passing traction current and other elements [4]. All types of rail circuits use rails to transmit signals. A rail circuit is an electrical circuit of a special type in which rails are used to transfer energy [5]. In the simplest rail circuit, a battery is used as a power source, the receiver is a neutral relay (Figure 1). To regulate the current consumed by the rail circuit and protect against short circuit of the power supply, the wheel pair uses a resistor R_o . To exclude the influence of adjacent rail chains on each other, they are separated by insulating joints.

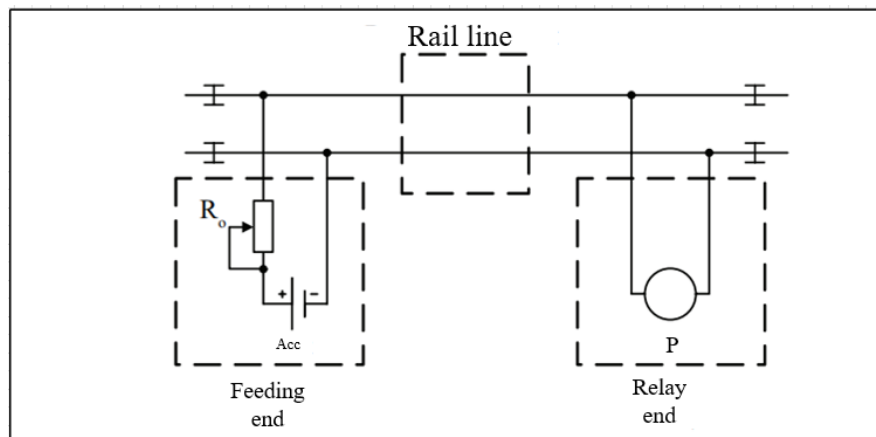


Figure 1. Block diagram of the simplest rail chain.

Analysis and Results

- auto-blocking, in which the automatic change of signal readings occurs when the train is moving;
- automatic locomotive signaling of a continuous type, in which rail chains are used to transmit from the track to the locomotive the signal readings of the auto-blocking traffic lights;
- dispatching control over the movement of trains, in which the condition of the block sections of the crossings and the receiving and sending tracks of the stations is monitored [5, 6];
- electrical centralization, which excludes the transfer of arrows under the train and the reception of trains on occupied tracks;
- light monitoring of the condition of the tracks and switch sections on the remote control board of the station attendant [16].

When installing a rail circuit, the upper structure of the track must ensure not only the safe passage of trains at a set speed, but also the reliability of the rail circuit with good current conductivity. This is complicated by the fact that rails laid on sleepers and ballast have relatively low and varying insulation relative to the ground and to each other. For these reasons, there are significant current leaks that complicate the operation of the circuit. The best conductivity of the rail circuit is achieved with low electrical resistance of the rail threads and high insulation resistance [7]. To reduce and stabilize the electrical resistance of rail threads, individual rail links are connected with conductive butt connectors or graphite joint lubrication is used.

Rail chains in areas where electric traction is used are divided into single-threaded and double-threaded.

In single-threaded circuits, reverse traction current is passed through one rail thread, and in double-threaded circuits, through both rail threads.

Auto-blocking rail circuits that are powered by batteries, accumulators or rectifiers are called DC rail circuits, and those powered by transformers are called AC rail circuits.

Circuits powered by intermittent direct or alternating current are also used. Such rail circuits are called pulse circuits [8]. In pulsed RC, in the absence of rolling stock on the block section, the armature of the track relay constantly vibrates.

There are pulse code RC, which allow not only to check the occupancy of the path, but also at the same time to establish a relationship between the readings of neighboring traffic lights. At the same time, various combinations of current pulses are supplied via the RC.

Work conditions of rail circuits and its regimes.

The current from the source flows along one of the rails, through the relay winding and returns to the source along the other rail. If the rail circuit is free of rolling stock, then the track relay keeps the anchor pulled. This mode of operation of the rail chain is called normal, or adjustment [9, 10]. When the rolling stock enters the rail chain, the wheel pairs bypass the track relay, the main part of the current from the source flows through them. The current in the relay winding decreases, it releases its armature, opening the contacts. In this case, the rail chain operates in shunt mode.

When the rail is broken or removed, the track relay must also release its anchor, when this happens, the rail circuit operates in control mode [11]. The rail line is also used to transmit continuous automatic locomotive signaling (ALSN) signals to the locomotive, which carries information about the readings of traffic lights located in front. For the operation of the ALSN, it is required to maintain the current in the rails at the level of 1.2–2 A, which also affects the operation of the rail circuits, therefore, when performing calculations, the operation of the rail circuits in the ALSN mode is checked. Part of the current flows between the rail threads, shunting the relay winding. As the length of the rail line increases, the insulation resistance between the rails will decrease, and leakage currents will increase. At a certain length of the rail line, the normal mode will cease to be performed – the relay will not attract the anchor [12].

The insulation resistance of a rail line can vary widely depending on humidity and temperature. Therefore, the maximum length of the rail line at which normal operation is performed will also depend on external conditions. In practice, it is required that the rail chain always performs normal operation. To do this, the insulation resistance is maintained above the set threshold in operation. The specific value of the insulation resistance is used. The insulation resistance assigned to one kilometer of a rail line is called the insulation resistivity r_i and is measured in Ohm/km. In operation, they try to ensure that the r_i is higher than 1 ohms/km. At a lower resistance, special measures are carried out aimed at increasing the insulation resistance between the rails (trimming ballast or completely replacing it, replacing rotten sleepers, etc.).

The operation of rail circuits is influenced by the electrical resistance of the rails. The resistance of rails is always understood as the resistance of the rail loop (both rail strands), consisting of the resistance of the rails themselves and the rail butt connectors. The resistance of the rails, attributed to 1 km of track, is called specific [13]. For alternating current, the rail resistance is complex and consists of active and inductive components. For signals with a frequency of up to 1000 Hz, the capacitive resistance has a negligible effect and is not taken into account. Thus, the resistance of the rails largely depends on the frequency of the signal current. For a frequency of 50 Hz, the resistivity of rails with copper welded connectors is assumed to be $z = 0.80ej65$ ohms/km.

The insulation resistance of the rail line and the resistance of the rails are called the primary electrical parameters of the rail line [14]. The conditions for performing the modes are contradictory. An increase in current from the power supply, a decrease in rail resistance and an increase in resistance between the rail threads will favorably affect the performance of the normal mode and the ALSN mode, but shunt and control modes will be performed worse [15]. Rail circuits must operate stably in various conditions; therefore, the calculation of each mode must be carried out for the most unfavorable combinations of primary parameters. The worst conditions for performing the modes of operation of rail circuits are shown in Table 1.

Branched rail chains are called RC, which include switches or blind intersections.

On railways, normally closed RC systems are mainly used, in which the track relay is activated when the track is free of rolling stock. In this case, the power supply and receiver (waypoint relay)

are located at different ends of the RC and all circuit elements are continuously powered by a signal current. Such a circuit makes it possible to control all its constituent elements with a signal current [16].

Table 1. The worst operating conditions of rail chains.

Regimes	Rail resistance	Insulation resistance	Source voltage
Normal	Maximum	Minimum	Minimum
Shunt	Minimum	Maximum	Maximum
Control	Minimum	Critical	Maximum
ALSN regime	Maximum	Minimum	Minimum

The size of the limiting resistance is chosen so that, with a section free of rolling stock and minimal isolation between the opposing rail threads, the current at the end of the RC is equal to the operating current of the relay. With this ratio, the coils of the track relay attract an anchor, which closes the contacts of the traffic light control circuit, providing information about the unoccupied and serviceable condition of the RC. This mode of operation of the RC is called normal or adjustment.

If the rail thread is damaged, the relay current is reduced to such a value that the relay releases the armature. The contact of the green light circuit of the traffic light opens, and the contact of the red-light circuit closes, transmitting information about the damage to the circuit. This mode of operation of the RC is called a control one.

When the block section is occupied by a train, i.e., shunting with a relatively low resistance of the wheel pairs, the current in the coils of the track relay decreases sharply, the relay armature disappears, closing the red light circuit and opening the green circuit[14 - 16].

In this way, information is provided about the occupancy of the block site. This mode of operation of the RC is called a shunt. There is a special case of shunt mode - short circuit mode, when the wheel pairs of the train are at the supply end of the RC, i.e., shunting occurs directly at the limiting resistance.

The replacement circuit of any rail circuit can be represented as a chain of three sequentially connected four-poles. In this case, the first four-pole H replaces the equipment of the supply end, the second - the equipment of the rail line and the third K - the equipment of the relay (Figure 2).

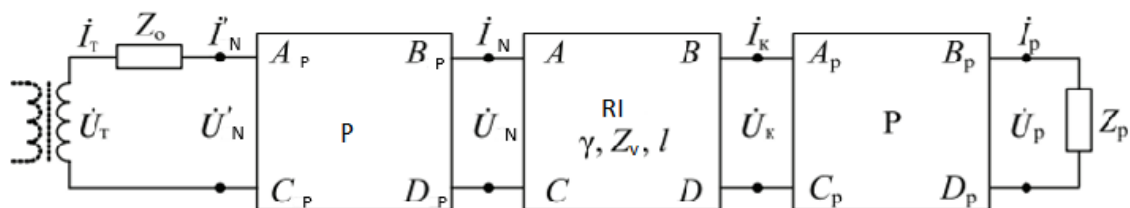


Figure 2. General electrical circuit replacement of the rail circuit.

$$\begin{aligned} \dot{U}_N &= A\dot{U}_K + B\dot{I}_K; \\ \dot{I}_N &= C\dot{U}_K + D\dot{I}_K, \end{aligned}$$

Where, \dot{U}_N, \dot{I}_N - voltage and current at the beginning of the line;

\dot{U}_K, \dot{I}_K - voltage and current at the end of the line;

$A = chyl$;

$B = Z_v \cdot chyl$; Ohm;

$C = chyl/Z_v$; 1/Ohm;

$A = chyl$; – the coefficients of the four-pole rail;

l – line length, km.

The value of Z_v is called the wave resistance of the line and shows how much resistance the line exerts to a passing wave of one direction. Through the primary parameters, Z_v is determined by the following formula:

$$Z_v = \sqrt{z * r_i} \text{ Ohm.}$$

The amount γ – wave propagation coefficient;

$$\gamma = \sqrt{\frac{z}{r_i}} \text{ 1/km.}$$

Since, γ – is a complex quantity, it can be written as;

$$\gamma = \alpha + j\beta.$$

Accept $Z_K = Z_V$, in this case

$$\begin{aligned} \dot{U}_K &= \dot{U}_K \cdot Z_V; \\ \dot{U}_N &= \dot{U}_K \cdot ch\gamma l + \dot{U}_K \cdot sh\gamma l \end{aligned}$$

or

$$\dot{U}_N = \dot{U}_K \cdot \frac{e^{\gamma l} + e^{-\gamma l}}{2} + \dot{U}_K \cdot \frac{e^{\gamma l} - e^{-\gamma l}}{2}.$$

From here

$$\dot{U}_N = \dot{U}_K \cdot e^{\gamma l}.$$

or

$$\dot{U}_K = \dot{U}_N \cdot e^{\gamma l} = \dot{U}_N \cdot e^{-\alpha l} \cdot e^{-j\beta l}$$

Such a substitution scheme is called a general one and serves mainly for engineering calculations, i.e. such when all the elements of the rail chain are known.

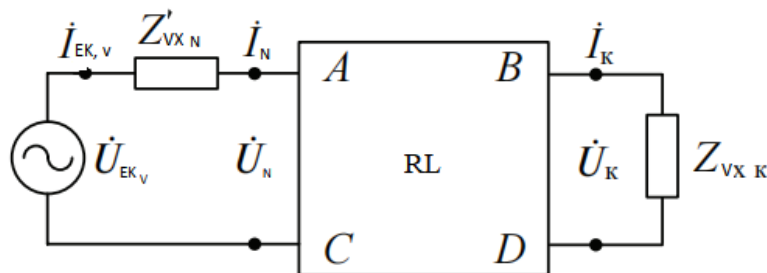


Figure 3. The main electrical circuit of the rail circuit replacement.

The disadvantage of the general scheme is that it does not allow you to directly judge the effect of the rail line on the main modes of operation of the rail circuit, therefore it is advisable to replace the general replacement scheme so that only the rail four-pole remains in it.

Conclusions

To sum up, rail chains are a critical component of railway automation and telemechanic, ensuring safe and efficient train operations. Their primary function is to detect the presence of rolling stock and verify the integrity of the track. Various types of rail circuits, powered by DC, AC, or pulse currents, are employed to maintain the spatial separation of trains and facilitate several essential functions, including auto-blocking, automatic locomotive signaling, and dispatch control. The effective operation of rail circuits depends on maintaining appropriate electrical resistances and insulation levels, which are influenced by external conditions and require regular maintenance. Understanding and optimizing the primary electrical parameters are crucial for ensuring the reliability and safety of rail circuits in various operational modes.

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INVESTIGATING THE IMPACT OF ULTRADESPERSE TITANIUM CARBIDE AND TUNGSTEN CARBIDE NANOPOWDER QUANTITY ON THE DENSITY, HARDNESS, AND FLEXURAL STRENGTH OF TUNGSTEN-COBALT CARBIDE-BASED HARD ALLOY SAMPLES

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Annotatsiya. Ushbu maqolada modifikatorlar miqdorining volfram karbid-kobalt asosli qattiq qotishma namunalarning fizik-mexanik xossalariga ta'sirini aniqlash xususida bajarilgan tadqiqotlar natijalari keltirilgan. Modifikatorlar sifatida ultradispers titan karbid va volfram karbid nanokukunlari tanlangan. Modifikatorlarning miqdori: 1% dan 6% gacha ultradispers TiC kukuni va 1% dan 8% gacha WC nanokukuni oralig'ida qo'shib qumoqlangan qattiq qotishma namunalarning fizik-mexanik xossalariga ta'siriga bo'g'liqligi o'rganilgan. Olib borilgan ilmiy va amaliy izlanishlar shuni ko'rsatadiki modifikatorlar miqdorining ortish bilan namunalarning zichligi, qattiqligi, egilishdagi mustahkamlik chegarasi oshgan.

Kalit so'zlar: qattiq qotishma, qumoqlash, zichlik, qattiqlik, egilishdagi mustahkamlik chegarasi, presslash bosimi, pechdagi muhit, qumoqlash harorati, qoldik g'ovaklik miqdori, oquvchanlik chegarasi, chegaraviy deformatsiya, plastik deformatsiy.

Аннотация. В данной статье представлены результаты исследований по определению влияния количества модификаторов на физико-механические свойства образцов твердого сплава на основе карбида вольфрама-кобальта. В качестве модификаторов были выбраны ультрадисперсные нанопорошки карбида титана и карбида вольфрама. Изучено влияние количества модификаторов: ультрадисперсного порошка TiC от 1 до 6 % и нанопорошка WC от 1 до 8 % на физико-механические свойства образцов закаленного сплава. Проведенные научно-практические исследования показывают, что с увеличением количества модификаторов плотность, твердость и предел прочности на изгиб образцов возрастают.

Ключевые слова: твердый сплав, отжиг, плотность, твердость, предел прочности на изгиб, давление прессования, печная среда, температура отжига, остаточная пористость, предел текучести, предельная деформация, пластическая деформация.

Abstract. This article presents the results of studies to determine the influence of the amount of modifiers on the physical and mechanical properties of hard alloy samples based on tungsten-cobalt carbide. Ultrafine nanopowders of titanium carbide and tungsten carbide were chosen as modifiers. The influence of the amount of modifiers: ultrafine TiC powder from 1 to 6% and WC nanopowder from 1 to 8% on the physical and mechanical properties of hardened alloy samples was studied. Conducted scientific and practical studies show that with an increase in the number of modifiers, the density, hardness and bending strength of the samples increase.

Keywords: *hard alloy, annealing, density, hardness, flexural strength, compaction pressure, furnace atmosphere, annealing temperature, residual porosity, yield strength, ultimate deformation, plastic deformation*

Introduction

The performance of tungsten carbide and cobalt hard alloys is determined by the structural and mechanical properties of the material. Structural properties of the material: ζ – residual porosity value; ρ_m – density of the material; It is assessed by such indicators as the equal distribution of carbide and binder phases in the volume of the material. The physical and mechanical properties of hard alloys include: ρ_{um} – total density; σ_{egl} – bending strength; HRA – hardness (microhardness NV); σ_{oqu} – yield strength; ϵ_{ch} – ultimate deformation; A_p – is determined by such indicators as comparative work of plastic deformation [1-5].

Literature review

One of the factors influencing the hardness, density, bending strength, annealing temperature, and abrasive wear resistance of hard alloys during the annealing process of hard alloys is the properties of the binder. The binder must be sufficiently strong in bending, viscous and resistant to abrasive wear under operating conditions. At the same time, the binder must absorb and partially dissolve the carbide phase during the annealing process. The above requirements are fully met by metals belonging to the iron group (Co, Ni, Fe) [5-7]. However, when crushing ore, service life can be increased by strengthening the cobalt binder.

Research Methodology

Density. The addition of TiC and WC nanopowders slightly reduces the density of WC-Co alloys due to the lower specific gravity of TiC. Despite this, the density remains within acceptable ranges, indicating minimal porosity and effective sintering. The reduction in density can be attributed to the lower packing efficiency of the nanopowders, which may introduce microvoids or porosity within the matrix. However, the sintering process effectively minimizes these voids, maintaining a high overall density. The density results suggest that the incorporation of nanopowders does not significantly compromise the densification process, allowing for the retention of desirable mechanical properties [8-9].

Hardness. Hardness increases with the addition of TiC and WC nanopowders, peaking at 3% and 5% concentrations. These improvements are due to the fine dispersion of hard particles, which impede dislocation movement and strengthen grain boundaries. Beyond 5%, the hardness gains plateau, suggesting an optimal nanopowder concentration. The increase in hardness is primarily due to the reinforcement effect of the ultradisperse particles, which act as barriers to dislocation motion, thereby enhancing the material's resistance to plastic deformation. The hardness results indicate that the optimal concentration of nanopowders can significantly enhance the wear resistance and durability of the WC-Co alloys [10].

Flexural Strength. Flexural strength also increases with 3% and 5% nanopowder additions, enhancing the material's ability to withstand bending forces. These improvements can be attributed to the reinforcement effect of the ultradisperse particles, which effectively impede crack propagation and enhance the toughness of the material. However, at 7% nanopowder content, the flexural strength decreases slightly, likely due to nanopowder agglomeration causing stress concentration points. Proper dispersion of nanopowders is crucial for maintaining high flexural strength. The flexural strength results highlight the importance of optimizing the nanopowder content and ensuring uniform dispersion to achieve the best mechanical performance [11].

Analysis and Results

In order to determine the effect of the amount of modifiers on the physical and mechanical properties of hard alloys based on tungsten carbide-cobalt, a hard alloy composite based on tungsten carbide-cobalt was prepared, containing different amounts of ultrafine TiC powders and WC nanopowders. The samples required for each type of research were pressed from the prepared concrete. The processes of primary and final grinding of the press blank were carried out. The composition of the samples, final annealing temperature and environment are presented in Table 1.

Table 1. Composition and final annealing temperature of research samples of WC6 hard alloy modified with modifiers.

№	dwc, mkm	WC, %	Co, %	TiC, %	WC, %	Pressing pressure, t/sm ²	Hardness, HRA		Furnace environment
							Temperature, °C		
							1360	1380	
1	2-2,5	93	6	1	-	5	88,50	88,50	Vacuum, 13,3 · 10 ⁻⁶ Pa
2		92		2			89,70	90,20	
3		91		3			89,93	90,30	
4		90		4			89,97	90,40	
5		89		5			90,00	90,45	
6		88		6			90,00	90,45	
7		93	-	1	89,10		89,10		
8		92		2	89,70		89,90		
9		91		3	90,96		91,00		
10		90		4	90,99		91,10		
11		89		5	91,05		91,20		
12		88		6	91,05		91,20		

The density of modified samples of various compositions annealed at temperatures of 1360 °C and 1380 °C was determined, and a graph was constructed based on the determined results. The graph is presented in Figure 1.

According to the results of a study to determine the effect of the amount of modifiers on the density of samples, the density of samples that underwent the final annealing process at temperatures of 1360°C and 1380°C ranged from 14.8 g/cm³ to 13 depending on the amount of TiC powder in the content decreased to 0.88 g/cm³, which is natural, since the density of TiC (4.93 g/cm³) is lower than the density of WC (15.63 g/cm³). The density of samples modified with nanopowder, which underwent final annealing at temperatures of 1360°C and 1380°C, increased from 14.8 g/cm³ to 14.9 g/cm³. This means that the nanopowders are relatively dissolved in the cobalt binder.

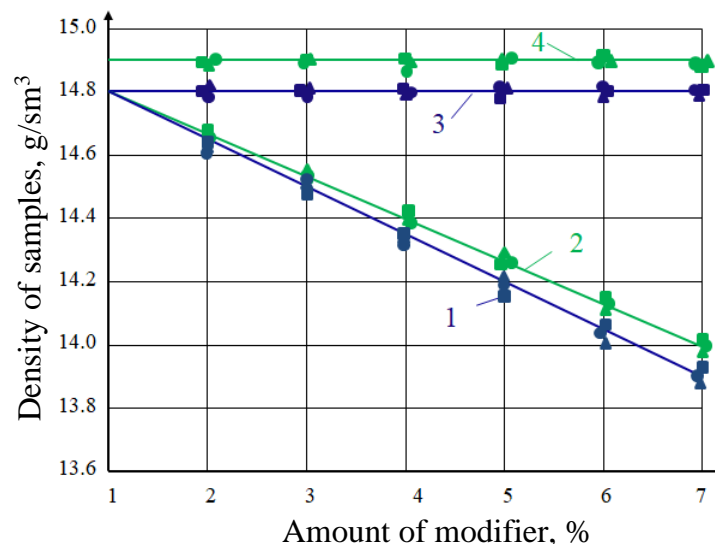


Figure 1. Influence of the amount of ultradispersed TiC: 1- at 1360 °C and 2- at 1380 °C temperatures; WC nanopowder: 3- on the density- at 1360 °C and 4- at 1380 °C temperatures, respectively.

Determination of the influence of the amount of modifiers on the hardness of samples based on tungsten-cobalt carbide. For this purpose, the hardness of each type of sample was determined by the

Rockwell method. Based on the results of the determination, graphs of changes in the hardness of the samples were constructed depending on the number of modifiers. The graphs are presented in Figure 2.

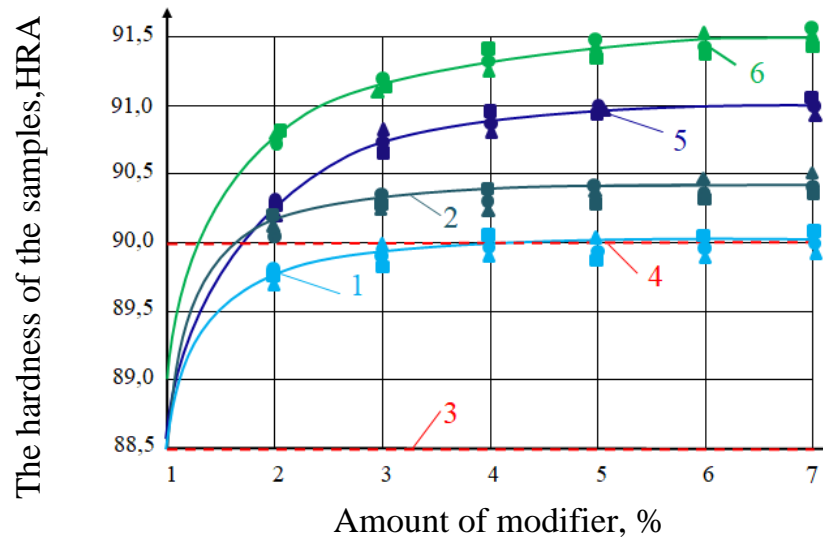


Figure 2. Influence of the amount of ultradispersed TiC: 1- T15C6 (state) and nanopowder WC: 2-WC6 (standard) on alloys at different temperatures: 3- at 1360 °C, 4- at 1380 °C, 5- at 1360 °C, 6- at 1380 °C temperatures, respectively.

According to the results of studies to determine the effect of the amount of ultrafine TiC powder on the hardness of samples, the hardness of finally annealed samples at 1360°C for 20 minutes increased from 88.5 HRA to 90.0 HRA, depending on the amount of ultrafine TiC in it. At a temperature of 1380 °C, the hardness of the samples increased from 88.5 HRA to 90.5 HRA, and this figure is 2 HRA higher than the hardness of standard WC6 hard alloys and 0.5 HRA higher than the hardness of standard T15C6 hard alloys. However, in samples fired at both temperatures, their hardness was not significantly affected by the content of ultrafine TiC powder exceeding 4%. One of the main reasons for this is the saturation of the cobalt binder with ultrafine TiC particles.

According to the results of a study to determine the effect of the amount of WC nanopowder on the hardness of samples, the hardness of the finally annealed samples at a temperature of 1360°C for 20 minutes increased from 88.5 HRA to 91.0 HRA depending on the amount of WC nanopowder in it. At a temperature of 1380 °C, the hardness of the samples increased from 89.0 HRA to 91.5 HRA, and this figure is 3 HRA higher than the hardness of standard WC6 hard alloys and 1 HRA higher than that of WC6 hard alloys modified with ultrafine TiC. Moreover, the standard T15C6 1.5 HRA has a higher hardness than branded carbide alloys. However, in samples fired at both temperatures, their hardness was not significantly affected by the content of WC nanopowder in an amount of 6%. One of the main reasons for this is the saturation of the binder with cobalt modifiers.

To determine the effect of the number of modifiers on the tensile strength during transverse bending of samples of hard alloy based on tungsten carbide-cobalt, prototypes were made. The tensile strength of the samples during transverse bending was determined.

According to the results obtained, the change in the ultimate transverse bending strength of tungsten-cobalt carbide-based hard alloy samples depending on the amount of ultrafine TiC powder and the change depending on the amount of WC nanopowder is graphically presented in Figure 3.

According to the results obtained, the addition of 1 to 6% ultrafine TiC powder to hard alloys based on tungsten-cobalt carbide increases the transverse bending strength of the material from 1550 MPa to 1700 MPa, and the addition from 1 to 8%. WC nanopowder increases the transverse bending strength of the material, which led to an increase in the tensile strength from 1550 MPa to 1800 MPa, which is on average 150-250 MPa higher than the transverse bending strength of standard VK6 hard alloys.

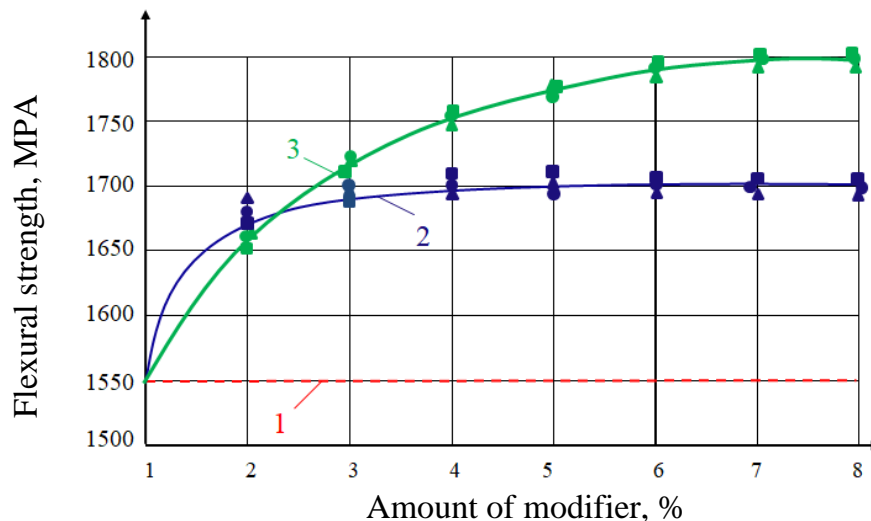


Figure 3. Graph of changes in the transverse bending strength of samples depending on the number of modifiers 1- WC6 (standard); 2- WC+TiC (with ultrafine particles); 3-WC+WC (with nanoparticles)

The results of the study of the influence of the amount of modifier on the hardness of the samples and the tensile strength during transverse bending were fully consistent with the theory of strength of hard alloys.

Conclusions

As a result of the conducted scientific and practical research, the following conclusions can be drawn:

1. The addition of 1% to 6% ultradispersed TiC powder to tungsten carbide-cobalt-based hard alloys increased the transverse bending strength limit of the material from 1550 MPa to 1700 MPa.
2. The addition of 1% to 8% WC nanopowder to tungsten carbide-cobalt-based hard alloys increased the transverse bending strength of the material from 1550 MPa to 1800 MPa, which is an average of the transverse bending strength of standard VK6 hard alloys. 150-250 MPa greater.

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UDC: 339.9,341.7,347.7

HISTORY OF THE DEVELOPMENT OF TRADE RELATIONS WITH SAMARKAND IN THE EARLY MIDDLE AGES

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Annotatsiya. Ushbu maqolada Sug'd savdo manzilgohlarining vujudga kelishiga turtki bo'lgan omillar va tarixiy sharoit, Sug'dning Sharqiy Turkiston va Xitoy bilan aloqalarida sug'diy manzilgohlarning o'rni, Sug'dning Sharqiy Turkiston va Xitoy bilan aloqalarda savdo ustuvorliklari yoritilgan. Shu bilan bir qatorda quyidagi masalar, Sug'd va Xitoy o'rtasidagi aloqalarning tarixiy asoslari, sug'diylarning Xitoy va Sharqiy Turkistonga joylashuvi, Sharqiy Turkistondagi sug'diy manzilgohlaridagi savdo munosabatlarining umumiy tavsifi, Sug'd va Xitoy o'rtasidagi savdo va siyosiy aloqalarda sug'diy manzilgohlarning o'rni masalasi ilmiy asosda yoritilgan.

Kalit so'zlar: koloniya, savdo-tijorat, diplomatiya, strategiya, Buyuk ipak yo'li, etnomadaniyat.

Аннотация. В данной статье выделены факторы и исторические условия, мотивировавшие создание Согдийских торговых поселений, роль Согдийских поселений в отношениях Согде с Восточным Туркестаном и Китаем, торговые приоритеты Согде в отношениях с Восточным Туркестаном и Китаем. Кроме того, рассматриваются следующие вопросы: исторические основы отношений Согде и Китая, расположение согдов в Китае и Восточном Туркестане, общая характеристика торговых связей в согдийских поселениях Восточного Туркестана, торгово-политические отношения между Согд и Китаем, вопрос о на научной основе освещено место согдийских поселений в отношениях.

Ключевые слова: колония, торговля, дипломатия, стратегия, Великий шелковый путь, этнокультура.

Abstract. This article highlights the factors and historical conditions that motivated the creation of Sogdian trading settlements, the role of Sogdian settlements in Sogdian relations with East Turkestan and China, Sogdian trade priorities in relations with East Turkestan and China. In addition, the following issues are considered: the historical foundations of relations between Sogd and China, the location of the Sogds in China and East Turkestan, the general characteristics of trade relations in the Sogd settlements of East Turkestan, trade and political relations between Sogd and China, the question of the location of the Sogd settlements on a scientific basis. in a relationship.

Keywords: colony, commerce, diplomacy, strategy, Great Silk Road, ethnocultural.

Introduction

The peoples of Central Asia are among the peoples whose ancient ancestors contributed their share to the world civilization. This is their one thousand BC As early as the 19th century, large cities such as Samarkand, Bukhara, Marv, Balkh Nakhav, Choch, Akhsik and nd, Kot (Khorazm), Qashghar , Khotan were founded, huge kingdoms such as Scythian (Sak), Hun, Kushan, Kang, Yuyechji and Greater Khorezm, Bactria, Sughd, Krorayna (Eastern Turkestan) and founded oasis states, as well as created several writing systems.

Almost all of these political associations have left their mark on the history of the region. In particular, the "Northern network" passing over both branches of the Great Silk Road - Khorazm - Syrdarya basins - Choch - Fergana - Qashghar, reaching Altai and China, and the "Southern network" connecting to China through the cities of Marv - Balkh - Khotan. these countries had a special place

in their activities. Among them, the Sugdians, who were the founders of the Sughd state, were not only famous in the neighboring countries with their skill in trade and craftsmanship, but through their ability, they caught the attention of the peoples of China, the Far East, Tibet and India in the Middle East and Eastern Europe.

Literature Review

Tomashek V. who was one of the first to study the history of Sughd, based on Chinese and Arab-Persian sources, focused on the information about the activities of the Sughds in the Central Asian region and neighboring regions in the early Middle Ages. While providing general information about Sughd, V. Tomashek also touched on the fact that the Sughds conducted foreign trade relations throughout China and emphasized that they were the main intermediaries in trade with China. N.V. Kyuner, Yu.A. Zuyev and Chinese studies and Turkologists such as L. Chiguyevsky also cited information about the regions of Eastern Turkestan and China of the Sugdian and other ethnic groups. The issue of the settlements of the Sugdians in Eastern Turkestan and trade on the Great Silk Road was also reflected in the researches of E. Rtveladze. According to the scientist, the Sogdian documents found in Dunhuang, Gansu and Eastern Turkestan dating back to the III-VII centuries AD also help to understand the essence of the problem. In particular, in the Sugdian inscriptions (Dunhuan) found at the guard post of the Great Wall of China, which is called "Old Letters" (now kept in the British Museum in London), it is mentioned about the trade routes of the merchant community that went from Samarkand to Turfan and then to China, and about the establishment of separate settlements by the Samarkand Sugd people in these regions.

Etienne de la Vessier, a French scientist who studied the problem in depth, emphasized the trading activities of the Sugdians in his monograph "Sugdian Merchants". B.G. Gafurov, who deeply studied the history of Central Asian nations in his time, also paid attention to the issue of foreign trade activities of the Sugdians. One of the Uzbek Chinese scholars, A. Khojayeov, while studying the history of China, studied the migration processes in the region, the migration of the Sugdians to China, and the influence of the Sugdian culture on the Chinese culture. Archaeologist A. Berdimurodov also conducted scientific research on this problem and clarified the relationship between Sughd and China based on archaeological sources.

Research Methodology

In the study and analysis of the scientific problem posed in this study, scientific methods of approach such as historical comparison, cause, process and result relationship, impartiality, historicity and systematicity of historical knowledge are relied upon.

Analysis and Results

The Sugdian language, which ensured the vibrancy of trade destinations located along the Great Silk Road, served as the language of mutual communication between peoples speaking different languages in dozens of countries, for nearly a thousand years, that is, during the period from the last centuries BC to the 10th century. kept his status.

In the early Middle Ages, the international relations of Central Asia also developed. China began to occupy a leading position in foreign economic- industrial relations during this period. At the end of the 5th century - the beginning of the 6th century, in addition to Central Asia, Turfan (479 AD), Urumchi (490-497 AD), Kashgar (497-507 AD) in Eastern Turkestan, as well as southern Tokharistan and northern parts of India, were part of the Eftali state. In this way, the Ephthalites established their control over the main trade routes of the Great Silk Road from China through the territory of Central Asia to the Sassanid state in Iran and the Byzantine Empire [9]. With the rise of the Hephthalite state, China's desire to establish political and economic relations with this new Central Asian power increased. This is also shown by the 3 embassy missions sent to Central Asia by the Northern Wei Dynasty in China (386-550 AD) in the 20s and 50s of the 5th century. By studying the directions of these embassy missions, it is possible to come to important conclusions about the communication routes connecting China with Central Asia [1].

In the V-VI centuries, a new stage in the development of trade and cultural relations between China and Central Asia began, and the network of roads connecting China with Western countries expanded.

In the V century written source – “Beishi”, 4 networks of roads connecting China with Western countries are mentioned.

In the early Middle Ages, important changes took place in the system of communication routes passing through the territory of Central Asia. The directions of internal and external economic-cultural relations in the region were greatly influenced by the political situation and socio-economic changes that arose during this period. During the period of the Eftali state and the Turkish khanate, some routes of traditional communication routes lost their importance, and depending on the existing socio-political situation, new networks of caravan routes were created. In particular, from the end of the 5th century to the first half of the 6th century, the importance of the Samarkand-Bukhara route, which played a major role in the economic and cultural development of Western Sughd, began to increase among the routes of the Great Silk Road that passed through the territory of present-day Uzbekistan. This branch of the Great Silk Road passed along the left bank of the Zarafshan River, and in this direction Karmana, Dobusiya, Kushaniya (Kattakorgon) and other cities took a prominent place as the main stops. This route turned out to be more convenient and effective for trade caravans than the old route from Samarkand through the Kashkadarya oasis to the cities of Tokharistan through the crossings in the middle reaches of the Amudarya. Samarkand retained its importance as the capital of Sugdiyana during the Turkish khanate. According to Chinese sources, Samarkand was called Sugdi Khan, ruled by a local dynasty related to the Turks, and other properties in Sugdiyana were dependent on it. The inhabitants of Kan, whose law and writing are Turkish, were good at trade, and merchants from other countries came to the city for trade.

Before the Arab caliphate established its rule in Central Asia, the culture of this land was highly developed. Especially in Sughd, high results were achieved in architecture, painting, sculpture, stone and wood carving, calligraphy, music and other arts, as evidenced by the material objects found in the ruins of the cities of Afrosiyab, Panjikent, and Varakhsha. Among them, the city of Panjikent, which has a concentration of various directions of art, stands out. The culture created here has developed in harmony with the culture of the neighboring regions. In this case, relations with China, which has an ancient culture, are especially noticeable. These processes are well preserved in the wall paintings of Afrosiyab and Panjikent, where people's daily lifestyle and religious views are reflected.

Here it should be noted that the Sugdian language played an important role in the establishment of Sugdian settlements in China and East Turkestan and in the development of trade relations in these regions.

Written monuments of the Sugdian language that have survived to us were found mainly in the first decades of the 20th century in the Dunhuang region of the current state of China, Turfan oasis in Chinese Turkestan, and Mugh mountain in the territory of Tajikistan.

In the ancient and early Middle Ages, the Sugdian language was spread in the land of Sugdiyona, located in the oases of the Zarafshan River and the Kashkadarya River, which flow through the territories of today's Uzbekistan and Tajikistan. In addition, as a result of the invasion of Alexander the Great, Sugdian trade colonies were established along the Great Silk Road (mainly in the territory of present-day China), leaving their homeland, and Sugdian language and writing were also used in these areas. There were also Sugdian villages and towns in the Syrdarya basins (Choch, Otror, Sayram), Seven Waters (Issikkol, Talas and Chu river basins), Koshghar and Turfon (Eastern Turkestan).

At this point, it is necessary to dwell a little on the sources of the problem. In particular, information about Central Sughd Samarkand given in Chinese chronicles. It is important in determining the status of this rulership in the early Middle Ages and its place in regional relations. The following is given in the source: - "Kan (Samarkand). The Kan Dynasty is a descendant of the Kangyu Dynasty. They do not lead a sedentary life as they constantly move from one place to another.

Mahmud Koshgari, a great Turkish scholar who lived in the 11th century, spoke about the fact that the people living in the area from Isfijab (Sayram) in the north of Choch to Taroz and Balosogun (Yettisuv) spoke both Sugdian and Turkish, that is, two languages, and that they moved between Samarkand and Bukhara. emphasizes that they have come [6]. Although this information refers to a much later period - the 11th century, the period when the Sugdians fell into a strong Turkic

environment and were involved in the process of Turkification dates back to the early Middle Ages, mainly during the period of the Turkish khanate. The information given by Koshgari probably refers to these periods. For example, some Chinese annals confirm that the Turkification of the Sugdians began in the early Middle Ages. The fact that the Sugdians are sometimes mentioned in the chronicles as a tribe of Turks may be related to similar processes [10].

The fact that a significant part of the pre-Islamic place names in the middle basins of the Syrdarya (Choch, O'tror, Isfijab / Sayram) are Sugdian-based toponyms and their occurrence throughout the oasis indicates that the Sugdians have lived here for a long time. A number of researchers emphasize that the large-scale settlement of the Sugdians in the oasis dates back to the early Middle Ages, that is, to the period of the migration of the Sugdian population to the middle basins of the Syrdarya and Yettisuv [2], while some researchers believe that their spread in the oasis dates back to the end of the first millennium BC - the first centuries AD. they claim that it happened. In our opinion, the second opinion is more reasonable. Because the language of the epigraphic materials (inscriptions on the surface of coins, ceramic plates and silverware) belonging to the first centuries AD is Sugdian [7], it testifies to the presence of representatives of this language in Choch much earlier. Especially in recent years, as a result of archaeological excavations, the Aris River (Shymkent) The fact that the language of the ceramic tablet found in the ruins of Kul-tobe in the basin is Sogdian and that this tablet was installed by the head of the Choch army sheds a lot of light on this issue.

According to experts, Sugdian inscriptions found in various cities of China also show that the Sugdians were widespread along the routes of the Great Silk Road. In the early Middle Ages, Sughd merchants managed to penetrate even into Japan. This opinion is confirmed by the fact that a Sugdian manuscript is preserved in one of the temples of Nara, the ancient capital of Japan , and that the exhibition dedicated to the Great Silk Road in Japan in 1987 was called “The Silk Road Leads to Nara” [5].

During the period of Turkish rule, the route from Shule (Kashkar) to Bakhan (Fergana) and Suduyshona (Ustrushona) to Kan (Samarkand Sugdi) played a key role in economic and interstate diplomatic relations among the roads connecting China with the central regions of Central Asia.

It is known that silk and its products have gained great importance in China's relations with Western countries. Silk, which is grown in large quantities in China, and products made from it, did not occupy a significant place in the country's domestic market. In the conditions of natural economy, silk products were used only for the needs of the Chinese emperor, his family and nobles, and silk was in high demand, mainly in the foreign market. In the early days of the Great Silk Road, Chinese silk was highly valued as a rare and valuable product. This situation was rarely preserved in the early Middle Ages. In particular, in Byzantium, Chinese silk had the same value as gold and other precious stones, and it was considered the main product for paying the mercenary army in addition to the needs of the Constantinople court and the nobility [4]. During the Turkish khanate, the Turks, who gained control of the international trade route and silk trade from China through Sassanid Iran and the Black Sea to Byzantium, and the Sugdian merchants who traded under their patronage, established complete control over the silk trade in Central Asia. Sughd merchants, who benefited greatly from trade with China, primarily from silk trade, were interested in buying Chinese silk and other products directly from manufacturers through their trade factories in Eastern Turkestan and China, taking them along the Great Silk Road, not only to Central Asia, but also to Byzantium. and those who took them to other Western countries [8].

Silk trade played a major role not only in economic, but also in solving military-political tasks of important strategic importance. In particular, it is known that the Turkish khans took a large amount of silk from China as a tribute every year. A large part of the silk obtained from China, surplus to domestic needs, was exported to the foreign market, especially to Byzantium, where the demand for silk was high. This situation continued until the introduction of silk production in the southern regions belonging to Byzantium (Syria) [4].

Thus, the geography of foreign relations of Central Asia in the 5th-8th centuries continuously expanded. In particular, new directions of historical-cultural relations appeared on the basis of Central Asian-Byzantine relations. BC between Central Asia and China. The regular communication that



started in the 2nd century entered the period of development in the early Middle Ages. This international transit communication route, symbolically called the “Great Silk Road”, reaching from China to the shores of the Mediterranean Sea, constitutes a particularly important stage in the history of foreign economic and cultural relations of Central Asia, in the development of the system of communication and trade routes.

Conclusions

Based on the above-mentioned points, the following conclusions can be advanced: The trade activities of the Sugdians across Central Asia prepared the political, socio-economic and ethno-cultural ground of the early Middle Ages and activated the process of creating a single ethno-cultural space in the vast region. In addition, the network of the Great Silk Road to Sughd and China brought the peoples and peoples living in this area closer politically and ethno-culturally on the basis of economic cooperation;

In general, the development of the Sugdian settlements in East Turkestan and China shows the relations between the regions in all areas. Trade, religious and cultural relations have reached the peak of their development. As a result of the achievement of art developed in Sughd in harmony with Chinese culture, an important chain between Iranian and Chinese art was formed. This art has conveyed to us the aspirations of the people who lived in that period, political events in society, religious and worldly views. Also, these artists considered it their duty to pass on the cultural heritage of their ancestors and samples of folk art to the generations.

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PECULIARITIES OF KHOREZM OASIS URBANIZATION IN THE EARLY MIDDLE AGES

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Annotatsiya. Ushbu maqolada Xorazm vohasi me'morchiligining rivojlanish xususiyatlari, turar-joy va istehkomlarning me'morchilik va rejalashtirish tamoyillari hamda inshootlar qurilishida qurilish materiallarining ahamiyati kabi masalalar yoritilgan.

Kalit so'zlar: *Xorazm vohasi, qadimiy manzilgohlar, istehkomlar, ellinistik ta'sir, ustunli ayvonlar, binolarni me'moriy rejalashtirish tamoyillari.*

Аннотация В данной статье освещены такие вопросы, как особенности развития архитектуры в Хорезмском оазисе, принципы архитектуры и планировки жилых и крепостных сооружений, а также значение строительных материалов при возведении сооружений.

Ключевые слова: *Хорезмский оазис, древние поселения, фортификационные сооружения, эллинистическое влияние, колонные крыльца, принципы архитектурного планирования сооружений.*

Abstract. This article covers issues such as the peculiarities of the development of architecture in the Khorezm Oasis, the architecture and planning principles of residential and Fortress structures, and the importance of building materials in the construction of structures.

Keywords: *Khorezm Oasis, ancient settlements, fortification structures, Hellenistic influence, columnar porches, principles of architectural planning of structures.*

Introduction

The historical process that took place in the regions of Central Asia in the early Middle Ages and the life that prevailed in the village-type population centers and cities that formed its content was studied by dividing it into two historical stages. In the first stage, it was observed that as a result of the attack of herding tribes on Central Asia, the activities of the previously flourishing cultural and economic centers came to an end. This situation was especially noticeable in the north of Khorezm, in western Sogd. In fact, nomadic tribes settled down and mixed with the local population. The African state existing in the Khorezm oasis in this historical period carried out construction works in the cities of the ancient period without paying attention to the construction of new cities. "Koshk", "Kasr", "Kurgon" with a strong defense system in the villages near the cities. "Kurgoncha"-shaped residences have risen. (About 100 around Burgutkala such houses were built, and the distance between them was 100-200 m). From the 8th century, cultural life developed in the cities of the Khorezm oasis. During this period, irrigated farming areas were expanded, ancient irrigation canals were restored, and (Kaltaminor, Charmanyap, Govkhor, Dovdon, etc.). The need for handicrafts increased. Trade flourished. This, in turn, led to the creation of neighbourhoods within the cities where people with special professions lived and died. to the market of handicraft products developed by them brought out. Although crafts, trade and other economic activities flourished in medieval cities, large-scale cities were not built in the Khorezm region 50. Hazarasp 18, Voengan 17, Ichankaloea 26, Kattakaloea 8.5 were the majority of small and medium-sized cities.

Literature Review

In the VI-VIII centuries AD, Norinjan, Shorokhan, Teshikkala, Burgutkala, Kumboskankala, Kuyuqkala, Kavatkala, Tukkala, Katkala, Khiva, Khazarasp on the left bank of the Amudarya were located on the right bank of the Amudarya, Katkal'a, Voengan, Almaotishgan, 1, 2, small Kalajik, Dargon, Sadvar, Davkaskan, Zamakhshar, SIIoksanam, Mizdakhkon cities continued cultural life.

In some cities, the population grew, as a result of which the population could not fit inside the city, and at the same time, crafts and trade expanded even more. The role of cities in foreign trade has increased. As a result, the suburbs of some cities were appropriated, people with certain professions settled, and neighborhoods appeared. People who lived in these neighborhoods were connected with the city market. The settlements around SIIaxar were not surrounded by defensive walls. Such an appropriated area around the city was named “Rabad”. As a result, the cities that existed in the Middle Ages consisted of three parts, the “Ark” city parts, the fortified part, the “inner city” and the “surroundings”.

Katkala, located on the right bank of the Amudarya, has a rabad, but there is no rabad in the cities of Khiva, Khazarasp, Dargon, Sadvar, Jigarband, Davkaskan, Gurganch, Mizdakhkon on the left bank of the Amudarya. Even around Mizdakhkon, 12 thousand “Koshk” were built in the XI-XIII centuries of our era. These data prove economic and cultural relations between the city and the countryside. Although crafts, trade and other economic activities flourished in medieval cities, large-scale cities were not built in the Khorezm region 50). Hazarasp 18, Voengan 17, Ichankalao 26, Kattakalao 8.5 were the majority of small and medium-sized cities.

Research Methodology

In the VI-VIII centuries AD, Norinjan, Shorokhan, Teshikkala, Burgutkala, Kumboskankala, Kuyuqkala, Kavatkala, Tukkala, Katkala, Khiva, Khazarasp on the left bank of the Amudarya were located on the right bank of the Amudarya. , Katkal'a, Voengan, Almaotishgan, 1, 2, small Kalajik, Dargon, Sadvar, Davkaskan, Zamakhshar, Shokhsanam, Mizdakhkon cities continued cultural life.

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Analysis and Results. Katkala, located on the right bank of the Amudarya, has a rabad, but there is no rabad in the cities of Khiva, Khazarasp, Dargon, Sadvar, Jigarband, Davkaskan, Gurganch, Mizdakhkon on the left bank of the Amudarya. Even around Mizdakhkon, 12 thousand “Koshk” were built in the XI-XIII centuries of our era. These data prove economic and cultural relations between the city and the countryside.

Khiva was 250 ha in the Middle Ages, it consisted of an arch, the inner part of the city, Dishankala, and according to the old people, Hazarasp also had Rabad. According to the results of archaeological research, the results of the military attack of the settlers are not noticeable. Even in settlements (established in antiquity) the population the continuation of economic activity is observed. This process continued in Fergana and Surkhandarya regions. Movarounnakhir geographically played an important role in the development of the regions known as Turan. The geographical feature is clearly manifested in Khorezm oasis. Here, in the cultural and economic centers where the irrigation facilities continued to operate, the population density takes place, the renovation works are carried out, and the 27 m long square and rectangular walls with majestic walls and pillars near it borders. “Kuchuk” and “Kurgon” with a width of 20 m were built, and such a perfect structure with a height of 8-10 m is not found in the land of Turan, nor in the whole of Central Asia.

The economic and cultural life of Tuproqqala reached a crisis by the 4th-5th centuries AD, but the cultural life continued in its arch-aolo part, and the city walls and turrets were repaired, as a result of which these elements completely lost their defensive capabilities. Only the part of the arch has been repaired. Cultural life revived in the city in the middle of the 6th century AD, and solid houses and buildings were built in the 10th-13th centuries.

Baroktom-1,2 is located in the north-eastern part of the Republic of Karakalpakstan. The size of both fortresses is the same, 20×20 m. The castle - fortifications are two-story, and their upper part is



closed. surrounded by a defensive wall. No constellations were built on the wall. The monument was discovered in 1947 by the Khorezm archaeological-ethnographic expedition. In 1957-1958, M.A. Lapirov-Skoblo, Ye. E. Nezarik carried out archaeological excavations in Baroktom and dated its construction to the end of the 4th century - the 5th century AD.

Yakkaparon - located in the oasis of Burgutkala. 130×190 m known as a rectangle. In the early Middle Ages, it was strengthened by circular towers (12 towers) surrounded by a defensive wall on all four sides. The monument is surrounded by a 20 m wide moat. The fortress gate is fortified with an inner circular defensive wall. The height of the defensive wall and tower is 5-8 m and has a foundation. 5-6 room houses were studied in the center of Kurgan.

Teshikkala - located 2 km south of Burgutkala, its size is 100×100m. The four sides are surrounded by a thatched wall, the height of which is 12-14 m. There is no bastion along the wall, but there is a circular bastion at the corner of the wall, which in turn has shins. A large rectangular dungeon was explored in the southern part of the monument. Its bottom not studied. All sides of the monument are located on an open plain. From the point of view of defense, it must have been surrounded by a wall. 114 part of it is 6 m high, made of straw, and then a wall of raw brick was built. The outer side of the wall is decorated with small indentations, giving it a “waffle” appearance. In 1938-39, the Khorezm archaeological-ethnographic expedition under the leadership of S.Tolstov examined the monument and found that it belongs to the VII-VIII centuries AD.

Naibkala is located on the right bank of the Amudarya, in the lower part of the Amirabad channel. In terms of planning, its four sides are equal, it is surrounded by a defensive wall, in the corner of which there are square-shaped kungurs.

Meshekli is located on the right bank of Amudarya, 25 km north-west of Tuyamoin. It is rectangular and its area is 60x55m. The monument was surrounded by a thatched wall in the early Middle Ages, its height is 6-7m. There is a circular tower on the south-west wall, and a square tower on the north and east walls. The monument served as a caravanserai in the early Middle Ages.

Conclusions

As a result of large-scale archaeological researches in the Khorezm oasis, numerous cities and villages dating back to the early Middle Ages were recorded, and it was found that all of them had an excellent defense system.

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THE HISTORY OF RAISING MOBILE COMMUNICATION COMPANIES TO A NEW LEVEL IN NEW UZBEKISTAN

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Annotatsiya. Mazkur maqolada 2016 yildan keyin uyali aloqa qompaniyalarini xizmat ko'rsatish sifatining oshishi natijasida mijozlarining soni bosqichma bosqich ko'payib borgan. Uyali aloqa kompaniyalari o'rtasida sog'lom raqobatni kuchaytirish maqsadida "Ucell", "Perfectum", "Mobiuz", "Beeline" va boshqa yangi uyali aloqa qompaniyalarini mamlakatimiz aholisiga yangi turdagi hizmatlarni ko'rsatishi natijasida uyali aloqa tizimi yangi bosqichga ko'tarildi. Natijada butun dunyoda bo'lgani kabi yurtimizda ham uyali aloqa keng tarqaldi. Shu bilan birga xizmatlar ko'rsatish sifatining oshishi bilan birga mijozlarning sonini ko'payib borishi hamda rivojlanish tarixi xronologik jixatdan ochib berilgan.

Kalit so'zlar: mobil aloqa, simli internet, covid-19, usell, beeline, mobiuz, uzmobile, internet.

Аннотация. В данной статье рассматривается как в годы независимости, внедрения в нашей стране нового вида услуг компаний мобильной связи и качества услуг связи в первые годы были открыты филиалы и подразделения компании в областных центрах, число клиентов постепенно увеличивалось. В целях усиления конкуренции между компаниями мобильной связи в нашей стране начали свою деятельность новые компании связи, такие как Ucell, Perfectum, Mobile, МТС, "Beeline". В результате как и во всем мире, мобильная связь получила широкое распространение и в нашей стране. При этом наряду с повышением качества оказания услуг увеличивается количество клиентов, а также раскрывается история развития с хронологической точки зрения.

Ключевые слова: мобильная связь, проводной интернет, ковид-19, ucell, beeline, mobiuz, uzmobile, интернет.

Abstract. In this article observed such kind of issue as the introduction in our country of a new type of services of mobile communication companies during the years of independence, and the quality of communication services in the first years, branches and divisions of the company were opened in regional centers, and the number of clients gradually increased. In order to increase healthy competition between mobile communication companies, new communication companies, such as Ucell, Perfectum, Mobile, MTS, Beeline began operating in our country. As a result, as mobile communications have become widespread throughout the world it became popular in our country too. At the same time, along with improving the quality of service provision, the number of clients increases, and the history of development is revealed from a chronological point of view.

Keywords: mobile communications, wired internet, covid-19, ucell, beeline, mobiuz, uzmobile, internet.

Introduction

In the years of independence, the place and role of communication means has increased immeasurably in renewing Uzbekistan. A large number of communication channels, sometimes like invisible and a huge network covered the territory of our republic. New infrastructures related to the industry have been created. In the conditions of the liberalization of the state and society life in our republic, the development of the mobile communication system became an important direction in deepening democratic reforms. The activities of mobile communication companies in our country, their material and technical condition, personnel training, and the process of being covered have not

been systematically studied. Such updates require the research of the development process of the mobile communication system and its place in the socio-cultural life of the population within a separate topic.

Literature Review

General information about the history of the emergence and development of mobile communication in our country during the years of independence in L.N. Djuraev, G.R. Mamatkulov, R.F. Khudoyberdiev, B.I. Akhtamov, I.S. Yusupov, B. Bobodjonov and A. Abdurakhmanov's books contain information, but not enough space allocated. In addition, it shows the need to include articles on the topic in newspapers, magazines and websites that provide information on the directions of development of mobile communication companies, and to draw scientific conclusions.

Research Methodology

During the years of independence, necessary conditions were created for the development of mobile communication in our country. Mobile communication has become the fastest growing and most competitive sphere of the communication market of Uzbekistan.

By 2017, the number of mobile subscribers in Uzbekistan increased by 1.4 million and reached 22.8 million [1]. In 2017, the number of mobile Internet users in the world reached 4.3 billion, which means that the number of users is increasing by 20% every year. The number of wired Internet users is increasing by 9 percent per year. Such indicators are provided by more than 10 million mobile base stations installed worldwide.

These growth rates can be seen in the example of our country too. In 2015, the number of mobile users exceeded 20 million, and in 2017 -by 21.5 million. In 2015, the total number of Internet users reached 10.2 million, and in 2017, it reached almost 15 million. The quality of mobile communication is directly related to the number of these mobile base stations and their location. In 2016, the total number of mobile base stations in our country reached 15,200, and in 2017, it reached 18,690. In turn, the volume of services in this direction increased by 18.6% in the first half of 2017 compared to the same period of 2016 [2].

In the autumn of 2019, the COVID-19 disease, which started in the Chinese city of Wuhan, began to spread rapidly throughout the world. On March 16, 2020, the first patient with this disease was identified in our country. As a result, along with many countries, quarantine rules were strengthened in our country, and educational institutions, enterprises and organizations were transferred to remote work at home. The process of transitioning to remote work requires certain changes. In March-April 2020, for the convenience of subscribers, the company provided free viewing of more than 60 channels through the "Beeline TV" digital service. In addition, the self-isolation mode of the company "Gigs for Steps" has become more popular. As a result, the number of bonuses credited to users increased by 41.6 percent. The service for online delivery and sale of SIM cards has been launched. This innovative project was implemented in just 30 days. It is for this purpose that the website nomer.beeline.uz was opened, where it is possible to reserve the desired number.

Also, work on the online sale of SIM cards through partners such as Express 24, Mobile Zone has been launched. Since the beginning of 2020, the company has launched more than 2 thousand different technological base stations. This year, the 4G network grew by 75 percent, which allowed not only to increase the coverage, but also to significantly increase the speed of the network. The average speed on the 4G network has increased by 45% since the beginning of the year [3]. During the pandemic, not only "Beeline" company, but also other mobile communication companies carried out work to ensure their quality communication services to customers.

Starting from December 5, 2018, LLC "COSCOM" ("Ucell" trademark) became a 100% state-owned company [4]. In 2019, the team achieved a number of positive results. Positive changes were observed in the first half of the year compared to the same period of 2018. SIM card sales increased by 14.3% and the subscriber base grew by 8%. As part of the annual "ICT Expo" exhibition, "Ucell" company, for the first time in Uzbekistan, symbolically launched the stage of implementation of the 5G network expansion project and demonstrated the operation of 5G commercial device. After permission to use mobile communication in Tashkent metro stations, "Ucell" cellular connection was

established in all metro stations. The fifth generation network was launched in the area of “Tashkent City” [5]. On August 1, 2021, Ucell’s 2G network covered 97.8% of the population, while the company’s 3G network covered 73.2% of the country’s population settlements. 4G network covers 73.4% of the territory of large cities. The largest mobile communication operator of Uzbekistan “Ucell”, strives to make the best conveniences of life useful for everyone everywhere through the modern technologies it is introducing [6].

“Mobiuz” (“UMS” LLC) is a telecommunications company that provides mobile communication and mobile Internet services in the territory of the Republic of Uzbekistan. The founder of “Mobiuz” is the Ministry of Development of Information Technologies and Communications of the Republic of Uzbekistan. “Mobiuz” started its commercial activities on December 1, 2014. In May 2016, absolutely free chat services were introduced within the network for most tariff plans. In June 2016, the operator launched 4G LTE in Tashkent and became the first telecommunications company to fully cover the capital of Uzbekistan with the fourth generation network. In November 2016, using the company's high-speed 4G LTE Internet, live television was broadcast for the first time in Uzbekistan. In August 2017, the 4G LTE network was launched in Samarkand. In March 2018, special tourist tariff plans were introduced in the mobile market. In 2018, for the first time in the history of the mobile communications market, the operator gave its subscribers (regardless of tariffs) the opportunity to make free unlimited calls to city numbers for 3 months to subscribers of all mobile operators in Uzbekistan [7].

At the beginning of 2019, the concept of the development of the mobile communication operator in 2019-2021 was developed and adopted. In 2019, the 4G LTE network covered all major cities, regional centres and a number of villages of the republic. In August 2019, a memorandum was signed by the People’s Republic of China on a loan of 150 million dollars for the development of the company's telecommunications network. Starting from December 2, 2019, the company completely changed its brand and started operating under the current "Mobiuz" trademark. In 2020, the mobile communications operator installed and modernized a record number of more than 1,300 base stations throughout the country. In 2020, “Mobiuz” completely updated the billing system, which created the basis for the introduction of unique products and services. In January-March 2021, “Mobiuz” carried out reconfirmation of 2G (GSM) frequencies and significantly increased the level of coverage of settlements with the 4G LTE network. In April 2021, another important event took place in the field of telecommunications of Uzbekistan - Mobiuz eSIM technology was launched among mobile operators [8].

In 2017, the UZMOBILE national communications operator created a safe environment on the Internet for the growing generation, allowing them to connect to useful sites, effectively protecting them from the effects of information that harms their minds and health, and based on the experiences of developed countries, UZMOBILE launched a series of special tariff plans and useful content for mobile introduced additional services of secure connection through the communication network [9]. During 2018, more than 4,000 base stations were installed in order to expand the coverage of the mobile communication network in the regions [10]. By 2019, the company has launched more than ten tariff plans, including a new special tariff plan for employees of 41 enterprises included in the Ministry of Finance and a tariff for members of the Youth Union of Uzbekistan, 60 additional services, as well as many content services [11]. In 2020 alone, more than three thousand base stations were modernized and a number of conveniences were created for customers and users. In August of this year, the number of “UzMobile” subscribers in our country was 6 million, and by December it reached 7 million [12].

In October 2021, 303,303 mobile phones with a total value of 20.9 million dollars were imported to Uzbekistan from abroad, while the number of mobile phones imported in October increased by 5,460 compared to September. In January-October 2021, 2.2 million mobile phones worth 154.2 million dollars were imported to Uzbekistan from abroad. Import of phones increased by 1.5 million units compared to the same period of last year. In 2020, 345,431 units of mobile phones were produced in Uzbekistan [13]. Telephones for cellular and other wireless networks as of January 1, 2021, the number of subscribers connected to the Internet in Uzbekistan was about 20 million. In

January-August 2021, Uzbekistan bought 1.6 million mobile phones from abroad. This is 1.2 million more compared to the same period last year. According to the information of the State Statistics Committee of Uzbekistan, the price of phones imported into the country in the last 8 months amounted to 117.4 million dollars. Most mobile phones were brought to our country from countries such as China, Vietnam, India, Kazakhstan, the United Arab Emirates, Germany, South Korea and Russia[14].

Information technology is rapidly developing in the world. In the world, its growth rate is 10 percent per year, and it is expected to reach 4 trillion 300 billion dollars this year. In order to gain a solid place in this market, great work has begun in our country. Over the past five years, 2 billion dollars, including \$700 million has been invested directly into the industry. The level of coverage of regions of our country with high-speed Internet was around 70 percent. 118 villages have neither internet nor mobile communication. However, in spite of this, the price of mobile internet had decreased by 9 times in the last three years. Our country rose from 68th to 15th place in the international ranking in this regard [15]. As of January 2021, the world population is 7.83 billion people. The Internet is used by 4.66 billion people or 53.6% of the population of the planet, and social networks are used by 4.2 billion people. 5.22 billion people or 66.6% of the Earth's population own personal mobile phones [16].

Analysis and Results

Cellular communication has become the fastest growing and most competitive branch of the communication market of Uzbekistan. To date, 6 mobile operator companies have started providing services to the population of our country, and 22,178 communication stations have been launched in them. Mobile communication service is developing rapidly due to strong competition and interest. "Nokia" (Finland), "Panasonic" (Japan), "LG", "Samsung" (South Korea), "Artel" (Uzbekistan) cell phones have even become a means of communication used by school children on a daily basis. Some of them were produced in the free economic zone in Navoi region of Uzbekistan in cooperation with companies from countries such as South Korea, Malaysia, Singapore, and increased their competitiveness.

Conclusions

Thirty years ago, no one expected that the mobile communication means would become so popular in our country. For a long time, mobile phones were used only by businessmen and civil servants due to their high cost. In recent years, the quality of communication has improved to an unprecedented level as a result of offering new high-quality services by "Ucell", "Beeline", "UMS" and other mobile communication companies in our country.

It is considered appropriate to establish and expand the training of qualified specialists in cellular communications technology at the Tashkent University of Information Technologies and its regional branches, and to open special extramural departments.

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MORAL AND ETHICAL ASPECTS OF ALISHER NAVOI HUMANISM

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Annotatsiya. Ushbu maqolada Alisher Navoiyning yuksak ma'naviy-axloqiy g'oyalari asosidagi insonparvarligining axloqiy-axloqiy jihatlarini falsafiy tahlil qilinadi. Maqolada uning insonparvarligining asosiy axloqiy va axloqiy jihatlarini, ayniqsa uning ijtimoiy adolatga intilishi, axloqiy o'zini-o'zi takomillashtirish va ta'limning ahamiyati kontekstida tahlil qilinadi. Asosiy e'tibor Navoiyning islom falsafasi va mahalliy an'analarni birlashtirib, inson qadr-qimmatini, shafqat va fidoyilik muhimligini ta'kidlagan o'ziga xos sintetik tafakkur tizimiga aylantira olganiga qaratiladi. Uning san'at va adabiyotning shaxs va jamiyat shakllanishidagi o'rni haqidagi qarashlari ham o'rganilib, ularning tarbiyaviy va tarbiyaviy ahamiyati ta'kidlanadi.

Kalit so'zlar: insonparvarlik, inson, axloq, axloq, shaxs, shaxs, jamiyat, mehnat, inson qadr-qimmatini

Аннотация. В данной статье сделан философский анализ нравственно-этических аспектов гуманизма Алишера Навои, основанием которой служат его высокие духовно-нравственные идеалы. В статье анализируются ключевые нравственно-этические аспекты его гуманизма, особенно в контексте его стремления к социальной справедливости, моральному самосовершенствованию и важности образования. Основное внимание уделено тому, как Навои смог соединить исламскую философию и местные традиции в уникальную синтетическую систему мышления, которая акцентировала важность человеческого достоинства, сострадания и альтруизма. Рассматриваются также его взгляды на роль искусства и литературы в формировании личности и общества, подчеркивая их воспитательное и просветительское значение.

Ключевые слова: гуманизм, человек, мораль, нравственность, личность, индивид, общество, труд, человеческое достоинство

Abstract. This article makes a philosophical analysis of the moral and ethical aspects of Alisher Navoi's humanism, which is based on his high spiritual and moral ideals. The article analyzes the key moral and ethical aspects of his humanism, especially in the context of his desire for social justice, moral self-improvement and the importance of education. The focus is on how Navoi was able to combine Islamic philosophy and local traditions into a unique synthetic system of thought that emphasized the importance of human dignity, compassion and altruism. His views on the role of art and literature in the formation of personality and society are also examined, emphasizing their educational and educational significance.

Keywords: humanism, man, morality, morality, personality, individual, society, work, human dignity.

Introduction

Man, and society are inextricable links of one common chain of historical process and form the unity of part and whole. Medieval Eastern thinkers, including Alisher Navoi, approached the problem

of man and society from this angle. In their views on society, the dominant position is occupied by reason, the rational, creative activity of people, as the main factor of social development.

Literature Review

The problem of the moral and ethical foundations of humanism in the works of Alisher Navoi is touched upon in the works of many scientists, among which it is worth highlighting the works of Alisher Navoi themselves, where an idea is given of how the author embodied his humanistic ideas in practice. Edward Allworth, in *Alisher Navoi and the Dawn of Humanism in Central Asia*, explores how Navoi became a key figure in the development of humanist thought in Central Asia, highlighting his contributions to the culture and literature of the region [1]. S. Rychkova's work "The Influence of Persian Literature on Uzbek Poetics" discusses the influence of Persian literature on Navoi's work, which allows us to understand the context in which his humanism developed [4]. R. Karimov's work "Philosophical Poetics of Alisher Navoi" is devoted to the analysis of philosophical aspects in Navoi's poetry, exploring how poetic images and ideas reflect his humanistic beliefs [2]. The work "Sufism and Society in Medieval Central Asia" by Shahram Rezaev is devoted to the analysis of the influence of Sufi ideas on the society of Central Asia in the Middle Ages, which helps to understand the spiritual roots of Navoi's humanism [3]. Lilia Zakirova's "The Role of Poets in the Culture of the Timurid Renaissance" examines the role of poets in the culture of the Timurid Renaissance, highlighting how Navoi used his creativity to promote social and ethical ideas [5].

Research Methodology

In this study, methods of scientific knowledge were used, such as analysis and synthesis, complex and systemic analysis, the existential method, comparison of conceptual theories, generality and particularity, continuity, historicity and logic.

Analysis and Results

The improvement of man, the development of his spiritual world is the basis for the improvement of society. Both man and society go through various stages in their development, moving from ignorance to perfection, from darkness to light. The struggle of these opposing principles determines the dialectic of human life and society and promotes self-knowledge of a person as a bearer of reason. This approach, recognized as idealistic, from the point of view of medieval figures, and even in terms of universal human values, corresponds to the attitudes of people's lives. Today it is clear to everyone that without moral principles, human society not only cannot function normally, but is degrading and heading towards its destruction.

Moral perception of the surrounding world was inherent in people at all stages of their historical development. People have always perceived all phenomena and events through the prism of the concepts of good and evil, and assessed them through the distinction between good and evil.

In the ancient beliefs of the peoples of Central Asia and Iran, ideas about good and evil took shape in a peculiar form: good and evil were considered in the form of an eternal struggle between two principles - light and darkness. Thus, in Zoroastrianism the idea of the "eternal" struggle between good and evil is presented in the form of the eternal struggle of Ahuramazda (Light) and Ahriman (Darkness). The development of life, its moral progress is presented by Zoroastrians as a gradual victory of light over darkness. The religion of the Manichaeans proceeded from dualism, recognizing in God the original source of pure good, the primary light, and in the opposing kingdom of darkness the beginning of evil and destruction. The Manichaeans viewed the course of development of the universe and moral life as a process of continuous struggle between these two forces.

Obviously, these ancient ideas about the eternal struggle between two principals were a kind of attempt by people to explain the disorder of earthly life. Dualism as the perception of the contradictory nature of everything around us in nature (light and darkness, heat and cold) is transferred to the sphere of social life. Polarity of ideas and fantasy are essential features of the thinking of primitive people. Remnants of these ideas about the polarity of all surrounding phenomena were preserved in the folklore and everyday life of peoples, including the peoples of Central Asia.

Undoubtedly, in the history of the development of social thought, the concepts of good and evil received different interpretations, their content was constantly transformed along with changes in the

social life of people. However, their essence basically boiled down to the fact that in everyday life people meant by good what was in their own interests or the interests of society as a whole. Everything that harmed them was called evil. This interpretation of the concepts of good and evil is accepted in Soviet scientific literature on ethics.

The problem of good and evil has been the subject of heated ideological debate in Muslim social thought. Back in the 9th century, Muslim rationalists - the Mutazilites - put forward the idea that man is subject to both good and evil to the same extent and that he has complete free will in choosing good and evil. Because of this, a person may not take the path of good.

In a slightly different form, this issue was resolved in Sufism, whose representatives believed that good and evil in the world exist objectively and come from God, believing that evil is objective and is a necessary condition for the realization of good. This thesis underlies the moral doctrine of the Mutasawwifs and Eastern Peripatetics. The goal of moral life is seen in the continuous struggle between virtue and vice, good and evil [12].

This basic position of ethical thought was also accepted by Navoi. His views on good and evil are based on the idea of the need for spiritual improvement of the individual, which is expressed in the process of a person's continuous struggle with vicious inclinations, in overcoming the passions of the soul. The poet does not consider the spiritual improvement of the individual as religious piety, expressed in the observance of religious rituals and regulations. He rejects this path of "piety." This is observed in many of the poet's arguments. There is a well-known parable about Navoi and a young man: one very energetic and friendly young man constantly communicated with people and provided them with all possible help. Navoi was the first to greet him when he met, which flattered the young man's vanity. But in order to further win the poet's favor, the young man decided to lead a pious lifestyle, found himself a spiritual mentor and began to indulge in prayer, rarely appearing in public places. However, contrary to the young man's expectations, Navoi, having learned about this, stopped greeting him during meetings.

This parable confirms the main position of tasawwuf that the path to God is not in prayers and rituals prescribed by the clergy, but in purity of heart and purity of actions, in good deeds.

In Navoi's understanding, good is good deeds, everything that saves the people from need, from suffering and oppression. In this regard, it acts as a very broad social concept that characterizes the behavior of rulers and ruling classes, and is expressed in compliance with the principle of justice, in the manifestation of generosity, nobility and other virtues. In interpersonal relationships, goodness is expressed in honesty and truthfulness, in love and respect for each other, in cooperation and mutual assistance, in sympathy and compassion for others, in honest work. Anything that contradicts this is evil. The rational point in Navoi's reasoning about good and evil is that he considers them in connection with certain human actions that are related to the interests of other people. He considers evil to be the source of all human troubles and suffering. Therefore, every person is called to "sow the seeds of goodness" and refrain from vicious actions. He states: "what goes around comes around." In the poem "The Wall of Iskandar" he writes: "If someone sows the seeds of barley, he will not reap the harvest of wheat... There are noble and base deeds. Whoever performs good actions will receive good from them. He who shows evil will receive evil from evil" [11].

The traditional idea of the struggle between two principles - light and darkness in Navoi's ethical views is expressed in specific phenomena and acts as a social conflict. In his poems "The Confusion of the Righteous" and "Beloved of Hearts," the poet with great power of artistic expression shows that goodness lies in justice and the correct laws of government.

Navoi sees the greatest evil in injustice and oppression towards the people. Exposing social evil, he mercilessly criticizes the vices and inhumanity of the ruling classes, exposes the oppressors of the people in the person of the unjust Shah, the bribe-taking judge, the greedy and hypocritical mullah, the hapless and ignorant madrasah teacher. Defending the interests of the oppressed and weak, Navoi reveals behind the apparent decency and philanthropy of the masters their true appearance - depravity, hypocrisy and deceit: "The nobility chose as their banner the path of the devil and the custom of the deva (evil spirit). Her mannerisms are subterfuge and malice. Her voice of justice is only suspicion and deceit, and her honesty and nobility are only betrayal and cunning" [10].

Navoi considers the main causes of social evil to be parasitism and idleness of the nobility, corruption and greed of judges, violence and arbitrariness on the part of the “guardians of order”: “Villains and monsters (judges) for the sake of one dirham turn hundreds of injustices into justice, for the sake of a small bribe they harm the well-being of many”. Dignitaries and nobles, says Navoi, “like scorpions, harm the people. Their deeds, like the sting of a scorpion, threaten the life of society”. The poet believes that “these tyrants are destroying the foundations of the state, plundering the wealth accumulated by the people...” [7] Navoi denounces petty-bourgeois indifference and indifference to the fate of other people, to the life of society: “The inhabitants are like cattle. For them, the greatest joy comes from sleep and food. Their will is subject to the power of decoration and luxury, and dress is the object of their cult, carelessness is their occupation, and the achievement of glory in their base actions is their desired goal. Navoi considers people with vile natures, captive of their own selfish interests, to be incorrigible; education does not have a beneficial influence on them.

He's writing:

“Do not strive to make (a child) a vile and insignificant person.
Do not labor (in vain), for the center of abomination will not become graceful.

No matter how long you raise a puppy or a donkey,
A dog or a donkey will grow up, but a person will never grow up” [7].

The poet warns the ruler to appoint worthy, noble-hearted people to government positions, believing that not every person is worthy of power and not everyone can handle it. If an unworthy person finds himself at the helm of power, he will cause innumerable disasters not only to the people, but also to himself. The sages say that a falcon's cap is not fit for a small bird:

“Place the crown of happiness on the head of the despicable one,”
Clearly, it will be the cause of his own suffering.

For a falcon's cap is not suitable for a small bird.
He will be the cause of her torment and unrest” [7].

Since the Shah's state policy is carried out through the activities of the dignitaries around him, he must select the worthiest. The poet warns that the Shah is responsible for the atrocities of those around him: “He who surrounds himself with villains is also responsible for evil. For he gets his hands dirty who fiddles with his hands in the coal.” Hence a very important conclusion: the mistakes of rulers are tantamount to a crime against the people.

In Navoi's moral views, an important place is also given to the problem of labor and the moral qualities of working people. Attitude to work is one of the important principles of any morality and humanism. Labor, as an eternal social necessity, accompanies humanity throughout its historical development. Labor in the aspect of relations between people is an economic category. The moral aspect of work is what motives determine a person's attitude to work. Attitude to work is one of the main criteria in determining the ideological and civic position of each thinker.

This tradition of respect for work, love for workers as the breadwinners of society, you strong moral assessment of working people, their protection to We find dignity and honor in Navoi's views, in his criteria for the values of life. The poet does not distinguish between people of mental and physical labor, as “good relatives” and “ignoble”, does not tear apart “idea” and “craft”, does not contrast them. He puts a broad meaning into the concept of “labor”, close to our modern different idea of work. For Navoi, the work of a scientist or statesman, artisan or cre a farmer, a merchant or a teacher at school has one great value for society if the deeds of people with mental labor are aimed at the benefit of society, at educating people, and the work of others has as its goal an honest income to earn their living. Navoi races views any socially useful work as a criterion of human dignity and considers its character the national responsibility of every person. In work, he sees, on the one hand, a means of livelihood, and on the other, a person's personal independence: “Two coppers earned by the labor of one's own hands is better than the generous alms of the Shah. A simple stew that you eat with a calm heart is better than a sweet pie given to you out of mercy by others.” In the work of Navoi

he sees the dignity of man, his freedom and personal privacy addiction: “Sitting on the ground in an old robe and feeling. It is better to feel free than to sit in front of another in a gilded caftan with your head bowed” [6].

The idea of work as a moral obligation for everyone long person and the necessary condition of his personal dependence, is most figuratively stated in the parable of Khatam of Thailand, where a simple worker - a thorn collector in the desert refuses the bounty of the ruler and does not go to visit him [6]. The poem “Farhad and Shirin”, which Navoi called “a book about work”, presented. It is, as it were, a hymn to labor, the creative activity of man. It most clearly embodies the poet’s idea that man is born to accomplish great things.

The peculiarity of Navoi’s view of labor is that he evaluates any work according to its social significance, according to its results for people, for the generative. Thus, the poet considers the work of merchants not so much a source of their personal enrichment, but rather it contains an important means of helping to educate people and meet the needs of society, increasing for his well-being: in foreign lands, merchants owe We should strive to communicate with sages and scientists, study the life and customs of other peoples and about everything we see tell their compatriots what they have heard and heard in new lands, and they must use their wealth also call for assistance to the disadvantaged.

Closely related to the problem of labor is the idea of social determinism, the need for interconnection and mutual interaction. The conditionality of people’s lives in society. In production in his poems “Beloved of Hearts”, “The Confusion of the Righteous”, Navoi repeatedly expresses the idea that the good of an individual person is connected with the good of others, and that in society a person cannot live only for the purpose of his own economic well-being, since the interests of people are interconnected knitted: “If you have made it your banner to benefit people, then this benefit will be yours too. He who follows a harmful path will harm himself more” [10].

Navoi realizes that a person can only exist in community with other people. The most important my relationship with people is friendship, which eases the bitterness of loneliness and unhappiness, and the joy of barks more fully. A man without a friend is like a friend. What’s without a flame? He condemns himself to loneliness and aggravates his unhappiness. Mutual sympathy for each other and their love, shown in friendship, are based on loyalty. Navoi’s category of fidelity steps into the absolute and unconditional law of morality in relationships between people, it is a kind of categorical imperative in the poet’s system of ethical views. This virtue - loyalty - requires a person to constantly demonstrate a feeling of love and responsiveness to others in any situation in life. It requires selflessness from a person like the sun, which brings life to people without demanding anything from them in return men.

Ideas about the liberation of a person from worldly goods, the need to cultivate moderation and spiritual nobility in a person are the basic moral principles and norms of Tasawwuf. Navoi not only accepts them, but believes that they are an integral part of his worldview. In many of his works, the main issue is the problem of the meaning of life, human value, and the eternity of life. According to Navoi, the world is transitory, but the soul is eternal. In the poem “The Confusion of the Righteous,” Navoi pays special attention to the question of man’s relationship to the surrounding reality. Using the example of the life of the great rulers Jamshid, Manuchehr, Iskandar, Genghis Khan, Amir Timur, he convinces us that no matter how high the creator raised these people in their glory and honors, they were nevertheless cast into the dust [11].

Alisher Navoi sees the eternity of life not in the riches of this world, not in power and glory, but in the good deeds that every person in this world is able to leave behind. A person has a good name only thanks to his good deeds. Wealth should be a means for the manifestation of virtues. First of all, Navoi calls for giving up anger, calls for sowing the seeds of fidelity and love. Calls on everyone to sow the seeds of goodness so that this goodness will be revived a hundredfold [10].

Conclusions

Navoi, in his extensive spiritual heritage, points to the value of man as capable of joining moral and ethical virtues, of despising wealth, power, nobility and honors and in his desire to acquire the nobility of the soul. In general, the spiritual heritage of Alisher Navoi examines a large range of moral



and ethical problems, which the thinker tries to consider through the prism of his worldview, which makes many of his thoughts and ideas most valuable.

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MODERN PROBLEMS OF PEDAGOGY AND PSYCHOLOGY

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SHIHABIDDIN SUHRAWARDI'S VIEWS ON STUDENT ETIQUETTE ARE ALSO SET OUT IN HIS BOOK "KITAB UL FUTUVVAT".

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Annotatsiya. Ushbu maqolada "Kitob ul futuvvat"da keltirilgan g'oyalarning zamonaviy pedagogik mazmun-mohiyati talaba va o'qituvchi o'rtasida hurmatga asoslangan munosabatlarni tarbiyalash, o'dob-axloq, kamtarlik, samarali muloqotga urg'u berishga qaratilganligi haqida fikr yuritilgan. Maqolada keltirilgan tamoyillar ijobiy va qulay ta'lim muhitini yaratishga intiladigan zamonaviy ta'lim falsafalariga mos keladi.

Kalit so'zlar: o'dob-axloq, kamtarlik, samarali muloqot, pedagogik g'oya, bilim, tafakkur, ilm, tarbiya.

Аннотация. в данной статье рассматривается современное педагогическое содержание идей, представленных в "Китаб уль футувват", направленных на формирование уважительных отношений между учеником и учителем с акцентом на этикет, скромность и эффективное общение. Принципы, изложенные в статье, соответствуют современной философии образования, которая направлена на создание позитивной и поддерживающей учебной среды.

Ключевые слова: порядочность, скромность, эффективное общение, педагогическая идея, знание, мышление, наука, образование

Abstract. this article examines the modern pedagogical content of the ideas presented in Kitab ul futuvvat aimed at fostering respectful relationships between student and teacher, with an emphasis on etiquette, modesty, and effective communication. The principles outlined in the article correspond to the modern philosophy of education, which seeks to create a positive and supportive learning environment.

Keywords: decency, modesty, effective communication, pedagogical idea, knowledge, thinking, science, education

Introduction

The modern pedagogical approach in Kitab ul Futuvvat aims to promote respectful relationships between students and teachers, emphasizing the importance of morality, modesty, and effective communication. This approach is consistent with modern educational philosophy, which seeks to create a positive learning environment that supports students. The idea of allowing students to stand or sit in different positions reflects modern concepts of inclusivity, respect for personal boundaries, and the recognition of the teacher's role as an authority figure. Modern pedagogy emphasizes creating an inclusive learning environment where every student feels valued and respected.

Literature Review

Shihabiddin Suhrawardi's views on student etiquette are reflected in two of his books, "Aworif ul-maorif" and "Kitab-ul futuvvat", which focus on the duties and responsibilities of students towards their teachers, as well as their behavior in front of them. In conclusion, Suhrawardi's ideas on student ethics are grounded in a number of key principles.

The research on the scientific heritage of Shihabiddin Suhrawardi has been conducted not only by Uzbek scholars, but also by international researchers. These include A. Hartman, H. K. Yilmaz, L. Netton, R. A. Nicholson, V. Clark, H. Algar, E. Palmer, J. Baldyk, N. Ritter and A. Rizvi [2]. In Arberry's work [2], the role of this thinker in the field of mysticism and his views on pedagogy in his scientific works have been explored. From the mystical researchers of the CIS countries, A. Crimean,

in their work, turn to the theosophical ideas of Suhrawardi and J. D. Bertels, instead of adhering to them in mystical literature. M. T. Stepanyans conducted scientific research on the philosophical interpretation of these thinkers' work. As a separate object of research, F. M. Akhrorov examines the Sufi essence of the Sufi view, while A. D. Knish occupies a place among thinkers in world mysticism. Z. A. Mansurova describes the influence of their views on the work of historians and scientists from a later period. From the works of Uzbek scientists, M. Khairullaev, G. Alikulov, S. Karimov, R. Shodiev, G. Navruzov, and others, we can see an analysis of the history of tazaufi and its educational significance. In particular, V. M. To's approach to the scientific heritage of Shihabiddin Suhrawardi, as a separate object of study, is notable in his analysis of Sufi concepts in Nirshi's "Aworif ul-Maorif". This is also evident in the works of S. B. Murtozaev, who focuses on the epistemological essence of this concept.

Research Methodology

Shihabiddin Suhrawardy, in his book "Kitab ul futuvvat", also perfectly outlined his views on the etiquette of a student. In the third chapter, speaking about the role of the student and teacher, he emphasized that students should not sit in a shoulder-to-shoulder position in front of their teacher. They should sit politely, with their legs crossed, leaning on nothing, and not stretch their legs out. Students should not speak impolitely, rub their mustaches or beards, or interrupt others when they are speaking. If someone tells a joke, students should not laugh, but if they do laugh, they should cover their mouths with their hands. When someone speaks to them, students should respond politely. If they have to speak, they should speak slowly and not brag about their abilities. They should not say "I did it" or "I said it" if they did not do or say something. These are some of the important points that Shihabiddin Suhrawardy emphasized in his work. If a person speaks in a way that is incorrect or inappropriate, it is best not to correct them or say that they are wrong. It is only acceptable to do so if they are alone and it is a situation where it is appropriate. If it is not appropriate, it does not matter whether or not you tell them. Both standing up and sitting down, give others space. As can be seen, the modern pedagogical ideas presented in Kitab al-Futuwwa aim to foster respectful relationships between students and teachers, focusing on ethics, modesty, and effective communication. These principles are in line with the modern philosophy of education, which strives to create a positive and supportive learning environment. In the context of modern pedagogy, the emphasis on not being "shoulder to shoulder" with the teacher acknowledges the role of the teacher as an authority. The idea of giving others space, whether standing or sitting, reflects modern concepts of inclusivity and respect for personal boundaries. The idea of providing a place for others to stand or sit reflects modern concepts of inclusivity and respect for personal boundaries. Modern pedagogy aims to create an inclusive environment where every student feels respected and valued. When it comes to the morality of students, Suhrawardy emphasizes that they should not be seen as servants or slaves. If they have debts, they should pay them. This reflects his pragmatic and principle-based approach to personal behavior. The concepts of financial independence and responsibility emphasize the importance of a moral culture, as seen in Suhrawardi's teachings. A student must master many crafts, as they will be called upon to participate in discussions with sages, religious scholars, and representatives of various fields. These crafts are essential for a student's intellectual and spiritual development. The essence of Suhrawardy's idea is that students should acquire a variety of skills, as this not only contributes to their personal competence but also helps them find their place in different intellectual and spiritual settings. In other words, Suhrawardy aims to educate individuals who are financially responsible, versatile, and capable of actively engaging in various intellectual and spiritual communities. These individuals will become comprehensively harmonious and morally developed personalities.

Analysis and Results

To summarize the analysis, Shihabiddin Suhrawardi's views on student etiquette can be found in two of his books: "Aworif ul-Maorif" and "Kitab-ul Futuvvat". These books focus on the duties and responsibilities of students towards their teachers, as well as the appropriate behavior expected from students in front of their teachers. Suhrawardi's views are based on several key concepts, which we can roughly describe as follows: the hierarchical relationship between students and teachers is

essential. Students should respect their teachers and follow their instructions. They should also be polite and courteous in their interactions with their teachers.

Shaxsiy qobiliyatlarni ifodalovchi konseptsiyalar

- tanqidiy fikrlash
- ijodkorlik
- mustaqil izlanish
- ochiq fikrlilik
- ruhiy-ma'naviy intizom
- taym-menejment
- konstruktiv fikrlash
- ko'p qirralilik

Axloqiy fazilatlarni ifodalovchi konseptsiyalar

- qat'iyatlilik
- bir so'zlilik
- kamtarlik
- e'tiborlilik
- shaxsiy mas'uliyat
- o'z-o'zini tarbiyalash
- o'z-o'zini boshqarish

Emotsional fazilatlarni aks ettiruvchi konseptsiyalar

- mehr-oqibatlilik
- emotsional bilim
- empatiya
- emotsional yordam so'rash va berish
- shaxsiy ehtiyojlarni tushunish
- kontekstual sezgirlik

Conclusions

It can be concluded that Suhrawardy emphasizes the importance of good behavior for students. He believes that a student's moral character is essential for gaining the respect and trust of their mentor, as well as for creating a healthy learning environment. This environment should foster respectful and constructive behavior between students and mentors, allowing for the exchange of ideas and collaboration. Furthermore, the student-mentor relationship plays a significant role not only in academic matters, but also in personal development and spiritual growth. This demonstrates Suhrawardy's holistic approach to education, which integrates intellectual, spiritual, and moral aspects into the learning process. Thirdly, mindfulness promotes a clear and constructive exchange of ideas between teachers and students, helping to establish effective communication during lessons and ensuring a better understanding of the information provided. Fourth, Suhrawardi's ideas, aimed at self-education and emotional development, reflect on reflective practice, where students take personal responsibility for their desires and emotions. Fifth, Suhrawardi emphasizes seven key concepts in his approach to teaching ethics, including personal abilities, moral and emotional qualities, the educational process, communication skills, cultural awareness, and economic responsibility.

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APPLICATION OF PEDAGOGICAL IDEAS OF UNSURUL-MA'OLI KAYKOVUS

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Annotatsiya. Ushbu maqolada Unsurulma'oliy Kaykovus pedagogik g'oyalarining tarbiyaviy roli va uning ta'limoti, ijtimoiy ta'sirga yo'naltirilganligini, ma'naviy qadriyatlar tizimidagi o'rni haqida fikr yuritilgan bo'lib turli masalalar yuzasidan keng mulohaza yuritilgan, "Qobusnoma" asarining pedagogik g'oyalarining ilmiy qarashlari asosida sifatlar mushohadasi asosida tahlil qilib berilgan.

Kalit so'zlar: *pedagogik qarash, pedagogik g'oya, bilim, tafakkur, ilm, tarbiya.*

Аннотация. В данной статье обсуждается воспитательная роль педагогических идей Унсурулмаоли Кайковуса, его учение, ориентация на социальное влияние, его место в системе духовных ценностей, широко рассматриваются различные вопросы педагогических идей Кабуснома», анализируются на основе наблюдения за качествами, исходя из научных взглядов.

Ключевые слова: *педагогический взгляд, педагогическая идея, знание, мышление, наука, образование.*

Abstract. In this article the educational role of the pedagogical ideas of Unsurul-ma'oli Kaykovus and his teaching, orientation to social influence, spiritual value system place and discussed various issues, the pedagogical ideas of the work "Nightmare" based on scientific views. It is analyzed based on the observation of qualities.

Keywords: *pedagogical vision, pedagogical idea, knowledge, thinking, science, education*

Introduction

The study of "Nightmare" is important not only for determining the worldview of Unsurul-ma'oli Kaykovus, but also for creating a complete picture of the development levels of the socio-pedagogical thinking of the peoples of the East in the 11th century. Because the thinker's pedagogy had a significant impact on the general development of pedagogical ideas of the peoples of the Near and Middle East. The need to approach the work from a scientific point of view arises not only from the theoretical

understanding of the heritage of the past, but also from the task of promoting and applying advanced models of spiritual values in the present era.

Literature Review

Unsurulmaoli Kaikovus is a thinker who lived and created during the Karakhanid period after the fall of the great Samanid kingdom. At the same time, as a result of mutual conflicts and wars, various feudal states such as Ghaznavids, Seljuks, Ghurians appeared in the political space of Khurasan, Movarannahr region [1]. Before analyzing the socio-cultural life of the Unsurul-ma'oli Kaykovus period, firstly, the study of the influence of the socio-political and cultural environment and traditions of the Samani people on the worldview of Unsurul-ma'oli Kaykovus, and secondly, the professional activity of Unsurulmaoli Kaikovus, in particular It is important to consider the teaching activity and the status of the pedagogue at that time. Because the social environment in which he lived has a significant impact on the spiritual development of a person in all aspects. It is said that he was a representative of a famous pilgrim family that ruled the southern part of Iran [2]. Now, in order to constantly improve human thinking, Unsurul-ma'oli Kaykovus said: "...don't get tired of listening to the word. A person can be eloquent only if he knows how to listen to words" warns that a person should constantly improve his mind. K. Ushinsky also views pedagogical knowledge on the basis of pedagogical tact, which helps to reveal the child's personality together. Advises to develop the teacher's moral beliefs, spiritual worldview, scientific-pedagogical thinking and increase its high social importance [10]. It is known that the level of development of society is determined by the nature and development of spiritual culture. In this respect, the period and social environment in which Kaykovus lived is related to the 11th century, when science was much more advanced and culture was much more advanced. During this period, the pedagogical ideas of Central Asian thinkers began to have a positive impact on the spiritual life of the society, therefore, it is important to study the specific features of this period separately. X-XI centuries are a period rich in historical events. The main feature of this period was the flourishing of economy, culture and science. But there social relations and class struggles became more complicated due to continuous political changes of the feudal state power.

In Central Asia, the era of the Somanids is characterized by the flourishing of cultural life. Science, literature and architecture have reached the limit of extraordinary prosperity [3]. According to historical data, the influence of Islam was high in the political and social life of Unsurul-ma'oli Kaykovus during the Samanid period. According to Orientalist I. Zemeney, from the period when Islam entered Turkestan and Iran until the 13th century, before the campaign of Genghis Khan, the cultural and spiritual relations between the two countries were conducted in the context of the Muslim worldview.

The growth and spread of Islam in Central Asia was directly related to the political conditions of that time. Consequently, during the time of Unsurul-ma'oli Kaykovus, the Islamic religion and Islamic culture, common to Persians, Arabs, and Turks, were acquired. The rise of the Samanids, a Balkh nobility, marked the rise of a legitimate Iranian dynasty. King Ismail (849-908) founded the Saman dynasty. Bukhara was the capital of Soman power during his reign. The townspeople lived well [4].

We will dwell on issues such as the historical period in which Unsurul-ma'oli Kaykovus lived, the scientific-pedagogical significance of his work "Nightmare", and the need to study it. We found it permissible to analyze the opinions of a number of scientists on the issue. GRSaidullayeva stated, Ethics, like other philosophical sciences, has developed its own system of concepts and categories for many centuries. Therefore, in order to create an adequate picture of its formation and completion of its categorical apparatus, a deep and comprehensive study of the worldview of individual thinkers of the past who contributed to its development is also necessary. From this point of view, the study of the moral views of the famous thinker of the Persian-speaking peoples - Unsurul-ma'oli Kaykovus (1020-1083) is relevant and arouses certain historical-philosophical interest [5].

"Nightmare" is an immortal work that brought world fame and love to the famous medieval thinker Unsurul-ma'oli Kaykovus. It leaves an impression on the reader as a work of folk educational traditions. The language and style of the story for pedagogical purposes is very impressive, simple

and easy. Unsurul-ma'oli Kaykovus's approval and use of such a method may be due to the fact that he takes into account the child's youth psychology and the level of understanding of new things, and aims to clearly convey his pedagogical ideas.

Research Methodology

Unsurul-ma'oli Kaykovus' unlimited knowledge and worldview, unique way of thinking and perception, emotions caused the creation of such a wonderful pedagogical and didactic work as "Nightmare". In describing each chapter of the work, the author uses "my child", "know", "son", "try", "be aware", "dear" and others. Such pleasant appeals and requests, expressed in good words, give confidence to the idea in order to attract the attention of students and increase their desire for it. Unsurulma'ali Kaikovus in his educational instructions highly appreciates these words and calls them "God's gift". Kaykovus' work "Nightmare" also gives special importance to the issues of a perfect person, a highly spiritual person. The book is aimed at revealing a number of desirable characteristics and qualities in a person and correcting them. That is why this work has been attracting the attention of the peoples of the world for almost nine centuries as a collection of Persian-Tajik pedagogy [9].

The sentences in "Nightmare" are mostly short, clear and meaningful, and logical from the point of view of appropriate use of various aspects of the image of human life, conclusions of famous philosophers, kings, scientists and thinkers as real and vital information in terms of form and moral. based on consistency.

Another feature of "Nightmare" is that the author was able to use relevant and practical stories and narratives to prove his point at the end of a chapter. For example, "Everybody knows a set, but a set is not yet born of matter" [7]; "A lie like the truth better than falsehood" [7]; "Frugality", etc. In addition, there are other folk proverbs that the author uses in the process of telling a certain topic in order to realize his purpose and logical thoughts. For example: "Do good, throw it in the water, it will bear fruit after a while"; "Don't plant a seed in the ground, it won't sprout anyway, your work will be wasted" and others [7].

Such diverse wise words in "Nightmare" are dedicated to the pedagogical topic and have a very high educational quality. However, the history of the origin of these folk proverbs, testaments and articles in the "Nightmare" still requires research. M. Fozilov, one of the researchers of proverbs in the Tadjik literary language, says in his monograph that the author of "Nightmare" took most of the proverbs and sayings from Kalila and Dimna when writing the book [8]. On the one hand, this opinion of the researcher can be supported, because the book "Kalila and Dimna" was used as a spiritual and educational guide in all eras and was very popular, and on the other hand, to confirm his opinions, the researcher should give examples and prove them with facts. We cannot agree with M. Fazilov's opinion that "Nightmare" is only a "literary work". Because its content has a pedagogical nature. Unfortunately, most of the literary experts studying "Nightmare" analyzed the work from a literary point of view and did not take into account its moral and educational aspect.

Analysis and Results

Another aspect of "Nightmare" that attracts readers is that its structure is based on folk pedagogy. Wise words, aphorisms, proverbs, etc. It has entered the life and creativity of the people for thousands of years, played a great educational role in the development of written literature and oral speech. Such is the historical folk art. Many proverbs of Unsurul-ma'oli Kaykovus are so close to folklore that it is difficult to say whether Unsurul-ma'oli Kaikovus took them from folklore or not, on the contrary, he assimilated them into folklore. Many of his comments have become "wing words". And his campaign is a model of behavior. Pedagogical ideas presented by Unsurul-ma'oli Kaykovus can encourage readers to think about educational issues. In the main part of the work, the author addresses his son and expresses his views on various issues of education. The tone of the advice and conversation is subtle and is usually described as firm, commanding, and sometimes disapproving or dismissive of the behavior. Kaykovus paid special attention to the spiritual image of a person in his work. In his opinion, it is important for a person not to tell lies, to be honest and truthful. If it is necessary to use a lie, he should explain it openly to others [6], is called.

Conclusions

After Unsurulma'ali Kaikovus, Ansari, Sana'i, Attar, Rumi, Sa'di, Jami and other famous thinkers relied on and imitated his views and wrote many educational books. Eastern pedagogical ideas belonging to Europeans are called "Eastern education style". However, as a result of the analysis of the above research literature, it was found that pedagogical ideas in "Nightmare" have not been fully studied, unless there are special aspects. The following can be concluded from the above:

- 1) The ideas of the author of "Nightmare" as a born aristocrat and a truly advanced thinker-pedagogue cannot be changed.
- 2) It is possible to prove the moral idealism in the testaments of Unsurul-ma'oli Kaykovus to his son Gilonshah.
- 3) These unique conclusions are very valuable for a complete and comprehensive study of Unsurul-ma'oli Kaykovus' ideas about educational theory.

Analyzing the importance of applying the pedagogical ideas of Unsurul-ma'oli Kaykovus in personal education requires determining the directions of its implementation and the methodological basis of organizing the training of a future teacher. In our study, personal action, anthropological, ethical and systematic principles, which consider events and processes as complex systems and form their respective elements in the state of interaction and interaction, were based on harmony with the pedagogical ideas of Unsurul-ma'oli Kaykovus.

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CONTENT OF THE CONCEPT OF SPIRITUAL CULTURE AND ITS FUNCTIONS

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Annatotsiya. Ushbu maqolada inson shaxsini shakllantiruvchi ma'naviy qadriyat tushunchasi uning fe'l-atvori va xulq-atvoridagi asosiy tendentsiyalarni belgilab beradi, shuningdek, ma'naviyat va ma'naviy qadriyatlarga tahdid soluvchi zamonaviy madaniyatning salbiy tendentsiyalarini o'rganadi.

Kalit so'zlar: *Ma'naviy madaniyat, yoshlarning ma'naviy madaniyatining yetarli darajasi, ma'naviy madaniyati, axloqiy kategoriyalari, shaxsiy ijobiy fazilatlari, xususan, hamdardlik, halollik va bag'rikenglik, yoshlarning dunyoqarashini kengaytirish, dunyoqarashini, ongi, qalbi va dunyoqarashini chuqurlashtirish. ma'naviyatni rivojlantirish.*

Аннотация. В данной статье понятие духовной ценности, формирующее личность человека, определяет основные тенденции в его характере и поведении, а также рассматриваются негативные тенденции современной культуры, угрожающие духовности и духовным ценностям.

Ключевые слова: *Духовная культура, адекватный уровень духовной культуры молодежи, духовная культура, моральные категории, личностные положительные качества, в частности, сочувствие, честность и толерантность, расширение мировоззрения молодежи, углубление ее понимания мира, ума., сердце и развивать духовность.*

Abstract. In this article, the concept of spiritual value, which shapes a person's personality, determines the main trends in his character and behavior, and also examines the negative trends of modern culture that threaten spirituality and spiritual values.

Keywords: *Spiritual culture, adequate level of spiritual culture of youth, spiritual culture, moral categories, personal positive qualities, in particular, empathy, honesty and tolerance, expanding the worldview of youth, deepening their understanding of the world and mind, heart and develop spirituality.*

Introduction

The spiritual culture of a person reveals the unique essence of every aspect of his life, and also shows the individual, unique diversity of each person, and this diversity serves the development of a person as a perfect person. Spiritual culture regulates the factors that are contrary to the spiritual freedom of a person, and keeps the balance and norm stable in human life. But here it is worth noting that spiritual culture is a relative concept, and it is impossible to make it absolute. The main reason for this is that the categories and characteristics interpreted as "good" or "bad" that form the basis of spirituality have had different boundaries in different conditions, times, eras and countries.

At this point, it should be noted that the problem of developing spiritual culture arises in the process of formation of any society, social, economic, educational, cultural changes that take place over time, with the world community of people. as a result of factors such as the change of relations between the two countries, the increase of opportunities for inter-ethnic communication, the need for constant improvement of the approaches aimed at its development arises. After all, the spiritual world of a person is formed and developed within the framework of both religious and secular influences. Therefore, it is natural that the dimensions of the concept of spiritual culture cover a wide range. The principles of open voluntarism, honesty, personal freedom and social equality, preservation, respect and transmission to the next generation make it possible to create conditions for the development and improvement of spiritual culture. Based on these principles, the analysis of the conditions that

regulate and organize spiritual culture affects the social relations of a person's spiritual culture, the processes of acquiring future professional competence and becoming a mature specialist.

Based on the world experience, the fact that there is a crisis of spiritual culture in Europe and developed countries is proven by the amount and value of the researches carried out in this regard. This situation is studied in the literature in connection with the economic crisis. Unfortunately, the crisis of moral foundations in social life is manifested in the problems of the "lost generation", the weakness or absence of social security, the breakdown of the system of social values, and the lack of moral rules that form the basis of individual behavior.

Before discussing the essence of the concept of spiritual culture, its functions and problems of its development, it is necessary to explain that cultural values and moral norms are the basis of human activity. In world science, from the middle of the 20th century, various researchers began to identify and systematize the unique characteristics of the phenomenon of spiritual culture. Although the concept of spiritual culture has been studied by many scientists, there is no clear and universally accepted definition of it. Some scientists interpret the concept of spiritual culture as an integral part of the spiritual phenomenon, while others interpret it as a level of wisdom, while others interpret it as abnormal internal actions. EJ Tisdell discusses the relationship of spirituality to cultural identity and its importance in higher education. He emphasizes that research and teaching are both spiritual and intellectual processes. Because education has a transformative power, it should help students discover and reclaim their cultural identity. Because this process often affects spirituality. J. Dyson suggests that spirituality should not be considered synonymous or related to religion. According to R.A. Tanyi, spirituality is an integral part of a person and has a subjective, immaterial and multifaceted nature. Spirituality and religion are often used interchangeably, but these two concepts are quite different. Spirituality involves a person's search for meaning in life, while religion involves a view of a higher power or God. For some people, spirituality may be related to religion, but not for everyone.

Literature Review

V. S. Barulin interprets the concept of spiritual culture as a person's ability to create and improve his inner world, G. Shevchenko defines a person's personal and life values, and interprets it as a tool that serves a person to become a person, while V. Dudchenko defines it as the basis of transhumanism. According to M. Roganova, S. Rashidova, M. Roganov, spiritual culture is a sum of positive human qualities. According to L.P. Bueva and V.G. Fedotova, spiritual culture is the consciousness that dominates the life values of a person and reflects his main life direction. According to the views of M. Yanich, V. Maikova, V. Pesotzky, E. Molchan, spiritual culture consists of a set of qualities formed based on the social needs of a person. Speaking about the relationship between spirituality and culture, N. Bell, D. Teysy, the equality of the external (social) and internal (spiritual) worlds of a person, self-expression and self-expression of a person They emphasize that the ability to educate is manifested through spiritual culture. Due to the diversity of the above definitions given to spiritual culture today, determining the relationship between the concept of spiritual culture and the spiritual values of a person helps to understand this concept as a whole.

The concept of moral value is a basis that forms the identity of a person, determines the main directions of his character and behavior, and generally controls his behavior. The only tool that determines the presence of a person in this life, the meaning of his life, and his attitude to this world is the spiritual elevation of a person. In fact, the threat to spirituality and spiritual values is manifested in modern culture's absorption of negative tendencies, loss of sense of belonging to others (culture of narcissism, civilization of hedonism). A threat to the moral values of a person and society is equivalent to locking a person's soul. As Gustave Le Bon pointed out, "people's loss of their moral values can lead to unimaginable disasters". That is why it is important to preserve spiritual values and pass them on from generation to generation.

Research Methodology

It is no coincidence that the relevance of analyzing the essence of the concept of spiritual culture is manifested in the education of young people, who are the backbone of the future. Because, first of all, developing the spiritual culture of young people at an adequate level allows them to set the right



goals in life and define their own directions, to understand their place in the world, to have endurance and determination in difficult and difficult situations. helps to cope with Secondly, spirituality includes the study and acquisition of positive personal qualities, in particular, values such as compassion, honesty and tolerance, mainly due to the fact that culture is closely connected with moral categories. Education of these values serves to form young people who control their own decisions and actions, become more responsible and have a strong moral foundation. Thirdly, spiritual culture not only contributes to the establishment of strong ties in social relations, to the development of a sense of belonging, but also helps young people to expand their worldview and gain a deeper understanding of themselves and the world around them. In general, raising the spiritual culture of young people leads to their all-round maturity, development of mind, heart and spirituality, leading a purposeful life. While we dwell on this matter, it is permissible to emphasize the role of spiritual culture in the education of young people, its development features, including its functions.

Analysis and Results

In this regard, it is not for nothing that L.A. Kharisova noted such aspects as the culture of knowledge, moral culture, national culture, secular culture, culture of healthy lifestyle, culture of worldview as the main aspects of forming the spiritual culture of young people. G. Makhmutova, explaining the criteria of spiritual formation of students, to understand that service for the development of the country is a high human duty, to serve the country, to have certain ideas about the concept of a perfect person, social cooperation, it shows the importance of having a sense of internationality, interreligious tolerance, and human qualities.

Summarizing the above, it is worth noting that the characteristics of spiritual culture in youth education consist of the following:

First, as a leading factor of behavior, spiritual culture is characterized by the formation of character based on high human values in the young generation.

Secondly, as a psychological phenomenon, spiritual culture is the ability of young people to help themselves and other people, self-awareness, self-knowledge, self-management, determining the meaning of their lives, their abilities. occupies a central place in development.

Thirdly, as a stabilizing factor of social relations, spiritual culture provides young people with empathy, tolerance, altruism, and personal qualities such as compassion, respect, and forgiveness.

Fourth, as a means of ensuring an active and positive life position, spiritual culture serves to increase the ability of young people to take responsibility for their own lives, give priority to positive emotions, and overcome negative emotions.

Fifth, as a means of developing creativity, spiritual culture serves as a leading factor in the realization of the creative potential of young people, in the manifestation of their internal and external abilities, in the development of their worldview, in intellectual maturity, in expanding the scope of knowledge and thinking.

Sixth, as the basis of a person's relationship with the surrounding world, spiritual culture serves to form a sense of beauty, aesthetics, environmental consciousness, etc. in young people. Spiritual culture promotes the theory of interconnectedness and interconnectedness of all living beings and the environment. Instilling such integrity into the minds of young people encourages them to appreciate the beauty and harmony of nature, to recognize their place in the ecosystem. Spiritual culture not only develops values such as respect, care and preservation in young people, but also motivates them to pay attention to the environment and to act in the way of preserving our planet for future generations.

Also, through it, emphasis is placed on cultivating the inner qualities of a person, such as kindness, compassion, and correctness, which are considered important aspects of true beauty. By cultivating these inner qualities, young people perceive the world around them in everyday life.

Seventh, as a factor that develops nationalism, spiritual culture encourages the development of national pride, national consciousness, national thinking, and patriotism in young people. It should be noted that spiritual culture is often an integral part of the identity and cultural heritage of society. Young people who respect their national culture develop a sense of belonging to the history, traditions and values of their nation. After all, many spiritual traditions have deep historical roots that are closely related to the history of the people.



Conclusions

Summarizing the above points, spiritual culture is a leading factor of behavior in youth education, as a psychological phenomenon, a factor that stabilizes social relations, provides an active and positive life position, a tool that develops creativity, the basis of a person's relationship with the surrounding world, and develops nationalism. Its unique characteristics as a factor are revealed.

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THE PROBLEM OF FORMING STUDENT-YOUTHS' NATIONAL IDENTITY, MORAL EDUCATION THROUGH THE EXTRA-CULLICULAR ACTIVITIES

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Annotatsiya. Ushbu maqolada talaba-yoshlarni universitet va undan tashqari ta'lim va tarbiya jarayonlariga jalb qilish va uning yordamida yoshlarda milliy o'zlikni anglash, vatanga faxr, muhabbat va milliy san'atimizga bo'lgan chuqur qiziqishni yuklsaltirish masalalari bayon qilingan. Shuningdek, maqolada go'zallik insonni eng asosiy ruhlantiruvchi omil ekanligi faktlar bilan isbotlangan.

Kalit so'zlar: *axloqiy mehnat, o'zbek rassomlari, axloqiy meyorlar, badiiy did, jamiyat yuksalishi, rahbarlarini tayyorlash, xalq ijodiyoti, auditoriya, psixologik-pedagogik bilimlar, rivojlanish, tasviriy san'at, san'atvatanparvarlik, insonparvarlik.*

Аннотация. В данной статье освещаются вопросы вовлечения студенческой молодежи в учебные и внеучебные процессы в университете, повышения через эти процессы осознания национальной идентичности, гордости и любви к Родине, глубокого интереса к нашему национальному искусству. Кроме того, в статье фактами доказано, что красота является основным мотивирующим фактором для человека.

Ключевые слова: *этическая работа, узбекские художники, нравственные нормы, художественный вкус, подъем общества, подготовка лидеров, народное искусство, публика, психолого-педагогические знания, развитие, изобразительное искусство, художественный патриотизм, гуманизм.*

Abstract. This article highlights the issues of involving the student-youth in the curricular and extracurricular processes at the university, and increasing the awareness of the national identity, pride and love for the motherland, and deep interest in our national art through this processes. Furthermore, the article proves with facts that beauty is the main motivating factor for a person.

Keywords: *ethical work, uzbek artists, moral standards, artistic taste, the rise of society, training of leaders, folk art, audience, psychological-pedagogical knowledge, development, visual arts, artistic patriotism, humanitarianism.*

Introduction

The content of education and upbringing of students at the university and beyond is inextricably linked with the life and experience of building a democratic, legal and social society. It should be noted that in the conditions of the development of our modern society, education of the young generation should be a priority. Because it is based on the national, regional and social characteristics of the environment.

Curricular and extracurricular education is an integral part of the entire education system: it is aimed at developing the abilities of students and young people in various fields of science, technology, literature, art, physical education and sports, satisfying their interests, forming and developing moral qualities, spiritual needs.

Curricular and extra-curricular processes have a great place in the general system of creative work. The system of Curricular and extra-curricular institutions includes: palaces, houses, stations, clubs and creative centers for students and youth, sports schools for children and teenagers, art studios, music, health care institutions, etc. Beauty is one of the most important human qualities. The source of beauty include nature, all kinds of photographs, paintings, sculptures and structures, stage works, songs and music, clothes, historical and cultural monuments, home furnishings, etc., which create a sense of beauty in a person.

Research Methodology

Recognition of beauty encourages, inspires, motivates a person to walk in the world of beauty. Understanding beauty allows citizens to enrich their moral, spiritual and cognitive wealth and organize a beautiful life.

The main components of the moral education are:

- ✓ education of humanity, kindness and benevolence;
- ✓ education of patriotism, heroism, bravery, honesty and justice;
- ✓ educating young people in the spirit of love and respect for labor and workers;
- ✓ respect for adults, increasing the feeling of love for children and poor society;
- ✓ increase the level of organization and discipline;
- ✓ subordinating personal desires to the interests of society;
- ✓ education of positive moral qualities of a person, etc.

It should be noted that great scientists attribute these qualities to the most important moral qualities of a human personality:

- ✓ humanitarianism;
- ✓ patriotism;
- ✓ goodness;
- ✓ justice;
- ✓ honesty;
- ✓ modesty;
- ✓ hard work, etc

The moral, spiritual and beauty education of students should be carried out through the national characteristics of visual arts in classes outside the auditorium. This was manifested in the process of training and education of students and young people in general higher education institutions of our republic. It should be implemented within the framework of the form developed by the science of pedagogy.

The results of extracurricular activities are performed in such forms, as travel, preparing the building for the holidays, exhibitions, parties, meetings, debates and interviews at the institutional review, art week, the best artist, etc. V.G. Belinsky says: "People will never go to art until they are prepared to develop a sense of beauty, if they do not have ambition, if they do not work hard, if they do not show determination [1]." We remind you that in general higher education institutions in our country, art classes are held for 1 hour per week.

This time is not enough to fulfill the tasks of teaching and education through visual arts. Therefore, training outside the auditorium is very important. Outside the classroom, work involves extensive and in-depth study. Rostovsev noted: "... training outside the auditorium made it possible for children to continue to develop, to improve their skills, and for the image in children's drawings to be skillful and real". At the beginning of the 21st century, renowned educators discovered the significance of non-auditory training in enhancing the education and skills of students and young individuals based on their interests. The famous pedagogue V.A. Sukhomlinsky wrote: "If teachers conduct interesting lessons in terms of meaning and form, the school becomes a source of spiritual life... But the best and highest lesson is in the place where all different forms of formation of students and youth are used outside the auditorium [2]."

In classes outside the auditorium, the leadership role of the teacher is more and fully preserved than in regular classes, students are mentally free. The most important thing is that here children are engaged in their favorite work, create, and get spiritual and aesthetic pleasure from their work.

Analysis and Results

A leader who has knowledge in psychology and education, and is capable of teaching fine arts to students and young people, while also working outside the audience, is highly important. It is necessary to determine the goals and objectives of the extracurricular activities of visual arts based on the goals and objectives of the educational activity. As a result of orderly and consistent organization of non-auditory classes on visual arts, it is very important to connect the extra-auditory classes with the knowledge that students learn and acquire in class, and to fill the knowledge

completely. As a result, they will be able to achieve their goals while developing their practical activities.

In order to effectively organize activities outside the audience, it is necessary to first of all determine the content and methods of their organization. In particular, the training of the leaders of the folk art circle is important in practical decoration, they take into account national types of folk art: various patterns, miniatures, carpet weaving, pottery, coinage.

Extra-curricular art classes have the following advantages:

a) to provide students and young people with full knowledge, to form the foundations of a scientific worldview, and to help them acquire information and skills that can raise them to the level of a person who can logically observe and clearly imagine the foundations of production;

b) has a positive effect on a more complete understanding of the importance of visual works in everyday life, in the life of people and society, on expanding their imagination about the practical use of visual art, and on solving issues related to the choice of visual art.

In order to enhance students' interest in extracurricular activities, the following methods are recommended:

1. Determining the level of knowledge of students and young people in visual arts, according to the tasks given from textbooks and additional literature, it is possible to arouse their interest in works outside the auditorium.

2. Student-youth can be encouraged to participate in training so that they can fully acquire the knowledge and skills they will attain in the future.

3. It is possible to increase the love and affection of students and young people by organizing various educational activities outside of the classroom and the auditorium. The use of the knowledge gained in performing independent work plays a big role in developing the skills of solving various problems, performing graphic actions of different complexity, working with educational literature, as well as conducting public events in the field of visual arts. Special attention should be paid to the use of special measures and unique tasks to attract the attention of young students.

4. It is possible to increase the interest of students by using a wide range of teaching methods and organizing classes in the form of lectures, seminars - consultations, Olympiads and games. It follows from this that the special training of the leaders of art circles in the institution should be established. Our research is the question of moral and spiritual education and beauty of students and young people in extracurricular activities, the role of educational activities in the realization of the goal of moral education.

Teaching fine arts serves to develop morals and artistic culture of students. Accordingly, one of the main tasks of fine art is, first of all, to develop a taste for beauty, hard work, creative interest. It consists of educating in the spirit of faith in the motherland and realizing the noble dreams of a person. Therefore, fine art should have an educational character. Teaching fine arts is important in the comprehensive education of students.

Studying the rich spiritual heritage makes sure that their services are great in forming the theoretical foundations of the system of moral education of the young generation. In turn, the level of preparation of such a leader who has knowledge, skills and qualifications in applied decorative art based on the heritage of folk art depends entirely on the level of development of the structure of use of folk art. It follows from this that the basis of the educational approach to the study of the examples of folk decorative art, the beauty heritage of various artistic products and its research allows students to create endless colorful images, and the beginning of beauty is a full motivation. As you can see, entertainment plays an important role here.

The education of artistic taste is becoming increasingly important in today's society and is an essential part of the education system.

Pleasure is a feeling that moves a person. Any activity or action performed by a person is aimed at achieving certain goals. When individuals want to get something as a result of their actions, the main desire that drives the action is a need. The need to understand the surrounding reality and deep knowledge and similar things are organized and formed in addition to spiritual and material requirements. Moral standards are also reflected in moral requirements. These feelings come from



common taste, respect for society's opinion, love for one's country, friendship, mutual support. Such demands are solved through the activity, work and movement of students. Activity has its own goal, means, approach and result. For this reason, it is necessary to carefully select the tools that affect the student to ensure the structure of the moral topic.

A discussion event or a competition event dedicated to the work of Uzbek artists, a theoretical competition of Central Asian and European artists, viewing architectural sculptures, art museums, and folk workshops will have a great impact on building a system of works outside the audience. As for students, it is interesting to have the opportunity to present their work in competitions, for example, in the "Best Uzbek work" competition, as well as in creative works of Uzbek, Russian, Tajik, Kazakh and other nationalities. An example of this is a collective album, congratulation with examples of fine art of different nations, etc.

It was determined as a result of the analysis of scientific and methodical literature. The work to be done in this process is mainly divided into 4 groups:

1. Club for organizational learning. Its task is to attract students to the topic, learn the techniques and methods of performing graphic actions.
2. The task of the clubs adapted to the curriculum of general education schools is to strengthen the knowledge gained from the lesson, and they are implemented directly during the lesson.
3. Parties focused on students' practical activities.
4. The curriculum of the circles is aimed at the scientific justification of a specific problem, and differs from the curriculum aimed at a deeper study of visual arts.

In this regard, T.Y.Shipikalov said, "Today, the study of fine art shows the need to use the creative skills of representatives of different nationalities in practice. At this time, children see the richness of folk art. Arts and crafts not only have a positive impact on moral education but also promote the education of beauty." Then, he said that "...the role of visual art works of the past and present years plays a decisive role, allowing children to see with the eyes of an artist - that is, it creates the basis for the formation of creative and artistic creativity [3]."

Conclusions

A distinctive feature of students' understanding is their sensitivity, which allows the teacher to directly use emotional impressions and practical decorations from works of art in the educational process. The productivity method is effective in the approach to the formation of moral character.

Ethical work planning is the planning of school students' activities. The only and necessary thing that determines the actions taken to achieve the planned goal or the desired result is the goal itself.

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CREATIVITY OF STUDENTS OF MILITARY EDUCATION FACULTIES PEDAGOGICAL ANALYSIS OF THE DEVELOPMENT OF QUALITIES

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Annotatsiya. Ushbu maqolada harbiy ta'lim fakultetlari talabalarining kreativ sifatlarini rivojlantirish orqali kelajakda oqilona qarorlarni qabul qilish, mahsulotni o'zgacha ko'rinishda talqin etish, uni original elementlar bilan boyitish orqali amaliy qiymatga ega ekanligi pedagogik tahlil qilingan.

Kalit so'zlar: kreativ, texnologiya, intellekt, ijodkorlik, operatsiya, kognitiv, innovatsiya, konvergent, divergent.

Аннотация. В данной статье производится педагогический анализ практической ценности принятия мудрых решений в будущем путем развития творческих качеств студентов факультетов военного обучения, иной интерпретации продукта, обогащения его оригинальными элементами.

Ключевые слова: креатив, технология, интеллект, креативность, операция, когнитивный, инновационный, конвергентный, дивергентный.

Abstract. In this article, a pedagogical analysis of the practical value of making wise decisions in the future by developing the creative qualities of students of military education faculties, interpreting the product in a different way, and enriching it with original elements is made.

Keywords: creative, technology, intelligence, creativity, operation, cognitive, innovation, convergent, divergent.

Introduction

At the core of the reforms implemented in the education system of our country, education of people with modern skills, who master information technologies, who think creatively, who can make independent decisions, and who have a broad worldview is promoted as a priority task. In this place, the President of the Republic of Uzbekistan Sh.M. Mirziyoyev, in his speech at the solemn ceremony dedicated to the 31st anniversary of our independence, said, "A graduate of the New Uzbekistan school has acquired modern skills, thoroughly mastered information technologies, creative thinking, independent they will become a person who can make decisions and have a broad worldview" [1]-are of great importance.

Literature Review

The concept of creativity was first applied by American and European scientists. In particular, the issues of creativity and qualities of personal creativity development were first used as a basic concept by Ray M. Simpson in 1922 in the USA, while the first theoretical and practical studies belong to the American psychologist J.P. Guilford: he introduced the term "creativity" in 1959, called it a special type of thinking - divergent ("divergent, going in different directions") thinking, which provides many ways to solve a problem, leads to unexpected conclusions and results. Contrasting this thinking with the convergent focus on the single correct solution, he proposes the "structure model of intelligence", i.e., "ISM". Based on his model, a model of the intellectual structure of "reaction", "operation", "content", "result" was created [2].

E.P. Torrence defined creativity as a person's non-standard creative thinking ability, the person's learning and ways to solve them, and identifying these problems, looking for their solutions, considering creativity as a process and the conditions that stimulate this process [3].

In particular, Dr. E. De Bono believes that "people can learn to be creative. For this, they need motivation, as well as a set of techniques that help them find new alternatives. According to him, this means having the ability to find unknown differences and create new categories" [4].

P. Drapeau says "Creativity is a type of thinking that requires a person to come up with several solutions to a problem or issue at once, and helps to understand the qualities of uniqueness and uniqueness in the essence of things and events, unlike templated, boring thinking" gives an opinion.[5]

S.A. Mednick "Creative individuals take into account past events using convergent thinking, but with divergent thinking they find new applications for a previously familiar topic and thereby avoid old solutions. According to the scientist, it is necessary to distinguish between verbal and non-verbal creative qualities. Verbal creativity is expressed in a verbal form, for example, in the ability to propose unique ideas in the field of problem situations, in the ability to find long verbal combinations, and non-verbal creativity is expressed in creative abilities in the form of artistic images, pictures manifestation [6].

Research Methodology

On the development of creative qualities Y.R. Varlakova [7] from the scientists of the Commonwealth of Independent States on the development of creativity of future bachelors of pedagogical education in higher educational institutions, N.M. Gnatko [8] on the creativity of primary school students about, V.F. Lugovaya [9] creativity as a component of the adaptive potential of the individual, L.A. Zatsepilova [10], O.G. Pozdnyakov [11], O.N. Ovsyannikova [12] researched the issues of developing creative qualities of students of higher military educational institutions.

For example, Y.A. Ponomaryov, "the result of creative activity involves the input of intuition and it cannot be obtained on the basis of a logical conclusion. Two personal qualities are related to creativity, that is, the motivation of search that appears in the process of thinking, and the intensity of sensitivity to related products" [13] In our opinion, it is a process related to the level of manifestation of creative abilities in the stages of development of students' creative qualities.

Analysis and Results

Professor N.A. Muslimov, one of the scientists of our country, said, "An important condition for the development of creative qualities of students is to create an atmosphere of creativity during training, because in this case there is an opportunity to demonstrate abilities only in various educational activities". In addition, the contribution of each person to the common work is important, it is necessary to develop and stimulate his interest, increase their motivation, freedom of speech and action [14].

Psychologist and scientist Y.M. Asadov the most valuable feature of creative potential is its high role in the field of innovation. "Innovation is the most systematic and visual result of the use of creative potential as an intellectual line that is mainly a product of the human mind" [15].

T.Ch. Aliboyev is a person with the quality of creativity, consistently promoting new ideas in his activities, making rational decisions when finding a solution to a problem, interpreting the product in a unique way, enriching it with original elements to a practical value result. the ability to create opportunities is reflected [16].

T.T. Kaziyeva's scientific research involves the development of modular educational technologies, following the principle of inter-level and inter-discipline communication, the systematic teaching of the phonetic level to students, the development of the student's creative thinking. aims to direct research, develop a continuous system of educational tasks and find its solution by putting it into practice. From this point of view, creativity is manifested and improved in interdisciplinary integration [17].

Conclusions

As a conclusion, we can say that in general, the important microelements of pedagogical activity consist of non-standard solutions, although the pedagogical situations in the teacher's activity seem similar to each other at first glance, each behavior of the teacher in these situations is considered important. In the process of developing the students' critical thinking skills, which are important for



them, improving their creative thinking skills in harmony with each other plays a key role.

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PEDAGOGICAL FEATURES OF THE FORMATION OF A NATIONAL SENSE OF PRIDE OF TEACHERS OF ELEMENTARY PREPARATION UNTIL THE UPCOMING CALL

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Annatatsiya: Maqolada bo'lajak chaqiriqqacha harbiy ta'lim o'qituvchilarining milliy iftixor tuyg'usini shakllantirishning pedagogik xususiyatlari va yoshlarda vatanga sadoqatni, milliy qadriyatlar, an'analarni e'zozlashni, o'zi tanlagan yo'lga, kasbiga, e'tiqodiga sodiqlikni kabi muhim xususiyatlari haqida batafsil bayon qilingan.

Kalit so'zlar: o'quvchi-yoshlar, pedagog, ma'naviy, ma'naviy savodxonlik, iftixor tuyg'usi, milliy istiqloq, istiqloq g'oyasi, ilm-fan.

Аннотация: В статье подробно описаны педагогические особенности формирования чувства национальной гордости у педагогов военного образования до предстоящего призыва и такие важные особенности воспитания у молодежи, как преданность Родине, уважение к национальным ценностям, традициям, верность выбранному пути, профессии, убеждениям.

Ключевые слова: студенческая молодежь, педагог, духовность, духовная грамотность, чувство гордости, национальная независимость, идея независимости, наука.

Annotation: The article details the pedagogical features of the formation of a national sense of pride of teachers of military education up to the upcoming Call and such important features as loyalty to the motherland in youth, respect for national values, traditions, loyalty to the path of his choice, profession, faith.

Keywords: student youth, teacher, spirituality, spiritual literacy, sense of pride, national independence, idea of independence, science.

Introduction

In the years of independence, the idea of new independence, its main principles, the tasks of forming a sense of national pride and national pride in our youth are included in the "Law on Education" of the Republic of Uzbekistan [1]. They are intended to inform young students of the most advanced scientific achievements, study the heritage of great scientists, organize the educational process based on modern technologies, and create all the conditions for making young people spiritual and enlightened. These efforts will certainly serve to build national pride in our students.

The new worldview formed during the period of independence implies loyalty to the Motherland, respect for national values, traditions, and loyalty to the chosen path, profession, and faith in young people. At the heart of education of these qualities and outlook lies the formation of national consciousness.

In the formation of national consciousness among young people, all kinds of information that they read and learn (books, mass media, communication processes, subjects taught directly to them) are the ground for forming new imaginations, new education and a new worldview [2].

In our country, the issues of improving the education system and raising a well-rounded generation have been raised to the level of the priority direction of the state policy. In the education system of our country, large-scale reforms are being implemented to introduce innovative technologies and information and communication tools into the educational process, to increase the intensity and efficiency of education, and to adapt them to world standards [3].



In the concept of development of the system of public education of the Republic of Uzbekistan until 2030, the tasks of “introduction of modern information and communication technologies and innovative projects into the field of public education with the pedagogical features of forming a sense of national pride in students” [4].

Research Methodology

We studied the importance of the qualities of pedagogues, who are the direct participants and responsible for the formation of national consciousness among students:

-first of all, the educator should have his own position in the society where he lives, be an example to others in every way, and students should see this, admire him and aspire to him. If the teacher is morally retarded, quarrelsome, or comes late to classes, is lazy, such a teacher will not be able to achieve any results in the audience;

-secondly, today it is very important for a knowledgeable pedagogue to have his own independent opinion. Today's student learns to think freely, to understand the novelties of the time through independent observation, to fearlessly open his heart and ask what he does not understand. This will help them to remember the information that they have analyzed on their own, and to be able to promote it to others;

-thirdly, our professors and teachers should be distinguished by their knowledge of the society in which they live, their quick understanding of news, deep knowledge of the history and culture of our nation, and their patriotism. In simpler words, a pedagogue should be distinguished by his spiritual literacy among the members of the society in which he lives;

-fourthly, the pedagogue himself should have a perfect and deep knowledge of the idea of national independence, the greatness of our nation, the history of our invaluable national culture and statehood, and believe in the greatness of the future of Uzbekistan. If the thoughts of an educator trying to instill a sense of national pride in the minds of students are shallow and unreliable, a modern resourceful student quickly realizes this and does not trust him, and his efforts are wasted;

-fifth, it would be appropriate for a modern teacher-pedagogue to bring new teaching technologies to the lesson, to use more non-traditional methods to instill a sense of national pride in students;

sixth, one of the main factors for achieving good results in any lesson is the ability to get along with the audience and create a healthy environment.

Analysis and Results

It will be necessary to connect the development of the country with the subject it is teaching, and to educate the children in the sense of responsibility for the future of the nation. Because today's student has a lot of information, conditions and opportunities, working with them, dealing with their demands and suggestions in depth, being able to get along with them leads to achieving good results in pedagogy [7].

In psychology, there is a word of faith directly related to the concept of faith, whose dictionary meaning is “belief”. “To love the country is from faith,” it is said in the hadiths. Those who betray their patriotism and raise their hands against their parents are called “unbelievers” among the people. Recognizing the land where one was born and grew up as sacred, loving the soil where one's navel blood was spilled, missing one's country, conscientiously working for the Motherland is a sign of faith.

The sense of national pride, first of all, the traditions of upbringing in the Uzbek family and their improvement, turning our national values into an integral part of the way of life, harmonizing the Eastern culture and modern forms in mutual communication, the education of labor and heritage to our people, it is formed by achieving its appreciation as the basis of a prosperous life.

In the family, parents should monitor, supervise and give advice on the child's activities, such as what kind of work he is doing, what books he is interested in, what movies he watches, what music he is interested in, and his aspirations in choosing a profession [7].

What are the results of inculcating our national customs and traditions into our lives within the framework of family relationships, instilling love for our values in our children, instilling the wisdom of the proverb “The motherland begins at the threshold”, instilling a sense of national pride, we think

that it will be easier to work with our children in educational institutions if our parents understand the meaning of concepts such as the fact that our child who has reached perfection makes the family happy [8].

Another important aspect of upbringing in Uzbek families is that grandparents are directly involved in the upbringing of children. Uzbek children are rarely told that they should respect elders, because they see daily examples of their parents' treatment of elders, not abandoning the elderly, asking about the sick, and helping the helpless. These qualities are our heritage from our ancestors and our national pride [3].

In history, for example, Amir Temur found it necessary for his elderly grandmothers to take care of the education of the princes, Shahrukh Mirza, grandsons Muhammad Sultan Mirza, Khalil Sultan Mirza, Ulugbek Mirza were brought up by Mrs. Saray Mulk.

Conclusions

In Uzbekistan, the family is always under the protection of the state, a number of things are being done by our government to ensure that children have a healthy education in the family, and to create conditions for studying and learning a profession. A clear example of this is the fact that the years are called "Family", "Women", "Healthy Generation", "Mothers and Children", "Year of Health" and a number of events have been developed and implemented in this regard.

The problem of formation of national consciousness among students of educational institutions has a social character. Therefore, the formation of national consciousness among students should make them work selflessly for the development of the Motherland, prosperity of the country and the well-being of the people, fight for the stability of peace and security in the society in which they live, and between people of different nationalities and peoples. the formation of the skills of striving to contribute to the resolution of mutual harmony and the realization of one's value as a representative of the nation.

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MODERN PROBLEMS OF TOURISM AND ECONOMICS

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THE DEVELOPMENT OF THE ENTREPRENEURIAL ABILITY FACTOR AND NEW APPROACHES TO IT

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Annotatsiya. Ushbu maqolada xorijlik va o'zbekistonlik olimlarning tadbirkorlik va tadbirkorlik qobiliyati haqidagi qarashlari va evolyutsiyasi, shuningdek, tadbirkorlik qobiliyatining zamonaviy nazariyalari, bugungi kunda taklif etilayotgan tadbirkorlikning qattiq, yumshoq va raqamli ko'nikmalari ko'rib chiqiladi.

Kalit so'zlar: *tadbirkorlik, tadbirkorlik sub'ektlari, qattiq qobiliyatlar, yumshoq qobiliyatlar, raqamli ko'nikmalar, tadbirkorlik faoliyati, tadbirkorlik qobiliyati.*

Аннотация. В данной статье рассматриваются взгляды и эволюция зарубежных и узбекских ученых на предпринимательство и предпринимательские способности, а также современные теории предпринимательских способностей, жестких, мягких и цифровых навыков предпринимательства, предлагаемые сегодня.

Ключевое слово: *предпринимательство, предпринимательские субъекты, твердые навыки, мягкие навыки, цифровые навыки, предпринимательская активность, предпринимательские способности.*

Abstract. This article examines the views and evolution of foreign and Uzbek scientists on entrepreneur and entrepreneurial ability, as well as modern theories of entrepreneurial ability, hard, soft and digital skills of entrepreneurship offered today.

Keywords: *entrepreneurship, entrepreneurial subjects, hard skills, soft skills, digital skills, entrepreneurial activity, entrepreneurial ability.*

Introduction

In the Decree of the President of the Republic of Uzbekistan "On the Development Strategy of New Uzbekistan for 2022-2026" "Creating conditions for the organization of business activities and the formation of permanent sources of income, increasing the share of the private sector in GDP to 80% and the share of exports to 60%..." [1] was defined as the main task. To implement this important task, small business and private entrepreneurship (SBPE) entities should not be developed only in terms of numbers, but also focusing on quality improvement, There is a need to research the term "entrepreneurial ability", which is a measure of the quality of entrepreneurial activity, and to study new modern approaches to this term.

Literature Review

For the first time, the scientific, theoretical basis and methods of researching the development of KBXT and the entrepreneurial ability of entrepreneurs Wide coverage reflected in the scientific works of classical economists such as Richard Cantillon, Adam Smith, Jean-Baptiste Say, Francis Walker, W. Zombart, Joseph Schumpeter, John Keynes, David McClelland, Peter Drucker [11-13, 15, 16, 18].

CIS scientists T. Matveeva, S. V. Terebova, P. S. Pleshakov, E.A. Chekmareva, O.R. Verkhovskaya, M.V. Dorukhina, E.K. Klimova, T.A. Fotekova, S.V. Mitrukhnina, E.N. Vlasova in their studies, work was carried out on methodological approaches to assessing the entrepreneurial ability of business subjects [33, 36]. Scientific and methodological problems of the development of SBPE in Uzbekistan, economists such as S.Gulomov, Yo.Abdullaev, T.Doschanov, S.Salaev, N.Murodova, U.Gafurov, M.Eshov, B.Tadjiev [21, 22, 24, 25] widely covered in their works.

However, in the scientific research conducted by economists, the issues of the evaluation mechanism of entrepreneurship, which is a measure of the quality of entrepreneurship, have not been researched in a separate, monographic plan.

Therefore, the concepts of “entrepreneurship” and “entrepreneurial ability” and stages of formation, traditional and modern forms of manifestation of human entrepreneurial ability, classification of its qualitative characteristics in order to assess human entrepreneurial ability, improvement of mechanisms for qualitative assessment of entrepreneurial ability and determination of priorities, in developed countries to research the best practices of entrepreneurship development and qualitative assessment of entrepreneurial ability, to ensure the stable and balanced development of entrepreneurship in our republic with the help of the mechanism for assessing human entrepreneurial ability by means of “key skill indicators” (KPI) and methods and models that are effectively used in assessing entrepreneurial ability, to monitor their " there is a real need to extend the “life cycle”, to solve scientific-practical problems and to apply them in practice.

Research Methodology

The methodological basis of the research is the legal and normative legal documents in the field of development of SBPE, in particular, the Decree of the President of the Republic of Uzbekistan dated January 28, 2022 No. PF-60 “On the Development Strategy of New Uzbekistan for 2022-2026” [1], Decree No. PF-158 of September 11, 2023 “On the Strategy of Uzbekistan – 2030”, Presidential Decree No. PQ-306 dated September 14, 2023 “On measures of financial and institutional support for the development of small businesses”, No. PF-29 of December 3, 2021 “On the priority directions of the state policy on the development of entrepreneurship in the neighborhood, ensuring employment of the population and reducing poverty” [2], Decisions PQ-5087 dated April 24, 2021 “On additional measures to improve the business support system and further improve the business environment” were received.

Also, in these decrees and decisions, reducing state participation in the economy, protecting private property rights and further strengthening its priority position, modern statistical methods and observations, comparative and systematic, analysis and synthesis, induction and deduction methods are widely used in the collection and processing of relevant statistical data, suggestions and recommendations regarding the main directions of continuing the institutional and structural reforms aimed at stimulating the further development of the SBPE activity.

Analysis and results

Looking at the history of the emergence of the terms “entrepreneurship” and “entrepreneurial ability”, the word “entrepreneur” comes from the French word “entreprendre” and means “to undertake” in Uzbek. The term “entrepreneur” first appeared in literature in 1253 and was widely used in the 1500s and 1600s [10].

There are different opinions and classifications in the literature on the entrepreneurial ability of entrepreneurs. We begin by studying the views of classical economists on these classifications.

Having studied the opinions of classical economists, in order to distinguish the qualities of entrepreneurial ability, we can put together the definitions given to the “entrepreneurial” person and his abilities in Table 1, study and review their opinions.

As can be seen from the various definitions of entrepreneurship in Table 1, the meaning of this term has been greatly enriched over 230 years.

According to Uzbek economists Ahmadjon Olmasov and Murad Sharifkhojaev: “Entrepreneurship is not only about making money, but also about generating income through creative activity” [19]. These scientists focused on the qualitative aspect of entrepreneurship.

Economist M. Rasulov said, “Entrepreneur is basically an owner, owner of medium and large property. By the class of owners, we understand, first of all, entrepreneurship. An entrepreneur uses his property as capital to establish enterprises, engage in commerce, add wealth to wealth, and increase the country's economic power. Even if the business is conducted on the basis of rent and

debt, still the product, goods are his property” [20], and distinguished the nature of entrepreneurship as ownership.

Academician S. Emphasizing the close connection between entrepreneurship and innovative activity, Ghulomov elaborated that “an entrepreneur is a person who collects money, materials and labor and creates a new product, a new business, a new production process” [21].

Sh. Shodmonov defines that “Entrepreneurial activity is an economic activity aimed at the purpose of obtaining profit and its effective use, regardless of its form and field” [22].

H. Abulkasimov states that entrepreneurship is “not prohibited by law... a type of economically productive activity” [23].

Economists S. Salaev and T. Doschanov defined entrepreneurship and entrepreneurial activity in a broad and narrow sense: Entrepreneurship in a broad sense is based on personal interest, aimed at achieving a goal before the subject, carried out with his direct participation, based on his personal factors, from running a family business, is the mental activity related to production and sale of goods and services. In a narrow sense, they defined that “entrepreneurial activity represents only production processes at various levels of the economic sphere, i.e., entrepreneurship” [24].

Table 1. Chronological evolution of the concept of “entrepreneur” [26].

Year	The author	Detail
1734	Richard Cantillon	was one of the first to define an entrepreneur as a person who makes decisions and satisfies his needs in conditions of uncertainty [11].
1776	Adam Smith	almost the first to clearly reveal the egoistic nature of entrepreneurship, he wrote that the entrepreneur is the owner of the enterprise and the implementer of risky commercial ideas, and his main task is to organize and manage production within the framework of normal economic activity [12].
1803	Jean-Baptiste Sey	an entrepreneur is a person who combines and mixes factors of production in order to achieve maximum socio-economic efficiency [13].
1876	Francis Walker	it is necessary to distinguish between those who give capital and receive interest in return, those who benefit due to their organizational skills [14].
1913	V. Zombart	being in an entrepreneurial spirit, hungry for money, eager for adventure, clever, careful, diligent, able to influence people [15].
1926	Joseph Alois Schumpeter	an entrepreneur is a natural person who has the ability to develop new products and performs his activities in conditions of uncertainty [16].
1936	John Maynard Keynes	the main qualities of entrepreneurship: the ability to connect consumption and savings, the ability to take risks, the spirit of activity, confidence in the future, etc. [14].
1961	David McClelland	an entrepreneur is an energetic person who works in conditions of moderate risk [17].
1964	Peter Drucker	an entrepreneur is a person who makes the most of any opportunity [18].

Uzbek economist-scientist Nodira Murodova researched “entrepreneurship as a category of economic management in the form of different ownership”, its dual nature: on the one hand, based on different forms of ownership of the entrepreneur, using their property as capital, they establish enterprises and engage in commerce, adding wealth to wealth using new methods and technologies. On the other hand, using management principles and marketing methods as a method of economic management, it ensures the interrelationship of production factors [25].

According to the Law of the Republic of Uzbekistan “On Entrepreneurship”: “Entrepreneurship is an independent, initiative activity of citizens aimed at obtaining profit or personal income, it is an

initiative activity carried out by a citizen on his own behalf, at his own risk and on the basis of his own or a legal entity's property responsibility" [8].

Taking into account the modern views on entrepreneurial ability, in order to determine its characteristics, the forms of its manifestation can be broadly divided into 2 groups:

I. **Traditional forms** of manifestation of human entrepreneurial ability, such as “individual entrepreneur”, “small entrepreneur”, “manager”, “family entrepreneur”.

II. **Modern forms** of manifestation of human entrepreneurial ability, such as “self-employed persons”, “internal entrepreneur”, “innovative entrepreneur”, “investor”, “business consultant”, “organizer of entrepreneurship in the neighborhood”.

While a person’s professional success was determined by reading and writing skills in the 19th century, by the 20th century, success in the profession has become dependent on English language skills and business computer skills. “Today, in the 21st century, *the ability to think and act like an entrepreneur* is especially important, because the transition from a mercenary society to entrepreneurship is inevitable,” says professor Nicholas Frank, head of the Vienna Institute of Entrepreneurship and Innovation [31].

Table 2. Details on the forms of manifestation of human entrepreneurial ability [26].

№	Forms of manifestation of entrepreneurial ability	Detail
1	Individual entrepreneur	an individual who independently performs on the basis of the property owned by him on the basis of the property right, as well as on the basis of the property owned by him due to the ownership and (or) other material right that allows him to use the property [9] and now up to five persons has the right to hire employees [3].
2	A small businessman	the owner of entrepreneurship, enterprises and micro-enterprises that use the labor of hired workers in a limited amount [27].
3	Manager (eng. manager, - "management")	a qualified specialist-hired manager who is not the owner of the enterprise and company, has received special training, and knows the rules of management in depth [28].
4	Family entrepreneur	who is engaged in entrepreneurial activities carried out by family members at the risk and under their own property responsibility for the purpose of obtaining income (profit) [7].
5	Domestic entrepreneur	this is a hired employee of a business enterprise, who, like a business owner, takes risks and tries his best to solve all problems [29].
6	Self-employed persons	focused on obtaining labor income, providing services to individuals and legal entities, During the conversation, the parties expressed satisfaction with the development of cooperation between Tajikistan and China., individuals who are not registered as individual entrepreneurs, registered with the bodies of the state tax service with the right to take into account the length of Service and use incentive benefits [4].
7	Innovative entrepreneur	Individuals who carry out innovative activities on the organization of new developments, as well as ensuring their transfer and implementation in the field of production [5].
8	Investor	subject of investment activity that invests its own funds and (or) borrowed funds or other investment resources involved in investment activity objects for profit [6].
9	Business consultant	providing expert assistance to entrepreneurs and management in order to increase business efficiency, productivity of business processes and company's profit [30].

10	Business organizer in the neighborhood	assistant to the mayor, who helps the unemployed and low-income people to realize their work capacity and entrepreneurial ability in exchange for creating suitable opportunities for the residents of the neighborhood to engage in various forms of entrepreneurial activity [2].
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Development of business and entrepreneurship often depends on insufficient knowledge and skills of the entrepreneur. Therefore, we believe that “*entrepreneurs must have entrepreneurial skills capable of adding value*” to be successful in the field of entrepreneurship.

The presence and quality of entrepreneurial ability depends on a number of personal qualities, professional skills and entrepreneurial skills of the entrepreneur.

Determination of entrepreneurial skills is based on the Hall-Tonna (Hall-Tonna Model) model, which distinguishes four types of skills [32]:

1. *Instrumental skills*. A unique combination of mental and physical abilities allows a person to feel competent. These skills are task-oriented and appear as irreplaceable, indispensable qualities for an entrepreneur.

2. *Interpersonal skills*. It is related to behavior towards others and therefore plays a key role in establishing connections and relationships between people.

3. *Imaginative skills*. As a unique mixture of imagination and feelings, it allows the expression of new ideas. These skills are implemented through language and serve as a foundation for personal growth by creating synergy and enhancing other skills..

4. *Systematic skills*. A mixture of imagination, sensitivity and skill represents the various parts of the system as a whole. Such skills are a holistic view of reality, which gives rise to the ability to fragment it, then integrate it, finding places of intersection and interrelationship of its components.

According to the *psychological approach* to the classification of entrepreneurial ability, the personal qualities that determine the inclination and psychological readiness for entrepreneurial activity are divided into the following three groups [33]:

1. Group “*Qualities describing the characteristics of the nervous system and thinking*”. They include: variability, flexibility, strategic thinking, resistance to stress, resistance to loads, the ability to act in situations of uncertainty, willingness to take risks.

2. “*Characteristics of the motivational field*” group. This group includes qualities such as entrepreneurial intention (desire to engage in entrepreneurial activities), motivation to achieve success, and ambition.

3. The “*Leadership Phenomenon*” group includes qualities such as leadership and organizational skills, responsibility, decision-making ability, openness to communication, the ability to establish relationships, and a tendency to negotiate.

In our opinion, the classification of human entrepreneurship ability into qualities based on knowledge and experience would make it possible to assess this ability more precisely in terms of quality.

On the basis of the advanced foreign and national experiences of the classification of entrepreneurial qualities described above, we offer the following 3 types of “*Three-level – and*” classification based on the quality characteristics of an entrepreneur, with the aim of assessing entrepreneurial ability:

1. *solid business skills (hard skills)*
2. *soft entrepreneurial skills (soft skills)*
3. *digital entrepreneurship skills (digital skills)*.

In this case, the development of entrepreneurship is associated with the degree of development of entrepreneurial skills. The Cambridge dictionary defines “skill” as “the ability to do an activity or job well, especially because you have practiced it” [34]. In the literature, the skills describing the specialist are divided into the following categories [35]:

1. **Hard skills** - technical skills directly related to professional qualifications and acquired as a result of studies, training, seminars.

2. **Soft skills** - personal, interpersonal or adaptive skills.

3. **Digital skills** is the ability to solve various problems in the field of information and communication technologies (ICT) [36].

In order to achieve success in the field of entrepreneurship, it is desirable for an entrepreneur to demonstrate a combination of hard, soft and digital skills. Hard skills for entrepreneurship are technical skills directly related to professional qualifications and acquired as a result of studies, training, seminars. Soft skills for entrepreneurship are personal, interpersonal or adaptive skills. Digital skills for entrepreneurship is the ability to solve various problems in the field of information and communication technologies (ICT).

In our opinion, based on the research we have conducted above, the decisions and decrees being adopted for the further development of SBPE entities and the increase of employment and the reduction of informal employment with the help of new approaches to the development of entrepreneurship and entrepreneurial ability and new methods of evaluation, given benefits and wide opportunities create the ground for further development of small business and entrepreneurship in our country.

Conclusions

As a result of the research conducted on the development of entrepreneurship and entrepreneurial ability and new views on it, the following conclusions were reached:

1. As the third priority direction of the development strategy of New Uzbekistan in 2022-2026, the task of rapid development of entrepreneurship to ensure rapid development of the national economy and high growth rates has been determined, in the implementation of this important task, it is necessary to pay attention not only to the development of SBPE entities in terms of quantity, but also to improve them in terms of quality. This requires, first of all, the research of the term “*entrepreneurial ability*”, which is a measure of the quality of entrepreneurial activity.

2. We believe that in order to succeed in the field of entrepreneurship, an entrepreneur should demonstrate a combination of hard, soft and digital entrepreneurial skills. Hard skills for entrepreneurship - skills directly related to professional qualifications and acquired as a result of studies, training, seminars, soft entrepreneurship skills - personal, interpersonal or flexible skills, as well as digital entrepreneurship skills cover the ability to solve various business problems with the help of information and communication technologies.

In our opinion, business entities operating in the field of entrepreneurship have this strict, through the development of soft and digital entrepreneurship skills and by paying great attention to the green economy in the field of entrepreneurship, the implementation of entrepreneurial activities will further develop entrepreneurship in our country, creates a basis for the increase in the level of employment of the population, an increase in the types of substitute goods and services in our markets, and an increase in the number of import-substituting and exportable goods and services.

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AUTOMATED SUMMARIZING OF THE UZBEK TEXT**Bekchanov Shukurla Kurbanbayevich***Lecturer at the Department of Computer Science,**Urgench State University*Shukurla15@gmail.com

Annotatsiya. Kam resursli tillar uchun tabiiy tilni qayta ishlash (NLP) vazifalarining real dunyoda qo'llanilishi tez sur'atlar bilan o'sib bormoqda. Hozirgi vaqtda ushbu muammolarga javoblar sifatini oshirishning turli usullari o'rganilmoqda. Ushbu maqola TF-IDF yondashuvidan foydalangan holda o'zbek matnlaridan avtomatlashtirilgan xulosaga bag'ishlangan.

Kalit so'zlar: *TF-IDF, matn xulosasi, so'zlar vazni, gaplar vazni, matnning muhim qismi, nomuhim so'zlar.*

Абстракт. Реальное применение задач обработки естественного языка (NLP) для языков с малыми ресурсами быстро растет. В настоящее время изучаются различные способы повышения качества ответов на эти задачи. Данная статья посвящена автоматизированному выводу из узбекских текстов с использованием TF-IDF подхода.

Ключевые слова: *TF-IDF, обобщение текста, весь слова, весь предложения, важная часть текста, стоп-слова*

Abstract. The real-world application of Natural Language Processing (NLP) challenges for low-resource languages is growing rapidly. There has been a considerable deal of study using various ways to increase the quality of answers to these problems. This paper is devoted to automated inference from Uzbek texts using the TF-IDF approach.

Keywords: *TF-IDF, text summarizer, weight word, weight sentence, an important part of the text, stop words*

Introduction

The primary purpose of scientific researchers is to expand their expertise by learning about their topic from the daily news. In this scenario, the researcher has the challenge of ending the text to assess the text data. Automatic text summarizing is a major challenge in NLP. Two ways to automatic text conclusion were identified: the first is to summarise the text, expressing the summary of the text using terms equal to it; and the second is to clarify essential sentences from within the text sentences and summarise the text. Summarising a text is to provide it in a shorter form while maintaining the most significant information. Extracting the relevant textual information from massive datasets normally takes a long time. In this situation, we are tasked with summarising the text to examine the text data. Automatic text generalisation is a critical subject in NLP. This article describes a text summarization model and algorithm based on the TF-IDF (Term Frequency-Inverse Document Frequency) method, as part of the second approach to mechanically summarizing Uzbek texts. In this scenario, unique terms identify a major portion of the Uzbek-language text. The sentence weight normalized from the segregated portion of the text is determined. Sentences related to weight are discriminated using the introduced criterion, and the n-gram model is applied. Before making any inferences from the text, we must first determine whether terms are not stop words. Because there are less stop words throughout a significant portion of the text. Words are called stop words if, when they are removed from a text, its meaning remains effectively unchanged. We attribute a significant portion of the text to the group of sentences in the section of the text where the use of stop words is uncommon. Based on statistical predictions, a significant portion of the text will be located at the start, middle, or end of the text. We do the work to find and study a noteworthy fragment of the provided text.

Literature Review

Automatic inference of the text was originally the result of research by Hans Peter Luhn in the 1950s. For the first time, Luhn created a model for inference of scientific and technical articles [2]. Inspired by his work, many other studies have been done. For example, [3] those who have developed an automatic inference system using methods for selecting and removing sentences. The Uzbek language belongs to the family of agglutinative languages, and most of the methods of concluding the text for reflective languages cannot be directly applied to the Uzbek language. In recent years, research has been conducted on the process of processing natural languages in the example of the Uzbek language is presented [4]. A syntactic analysis of the sentence to the study of the process of natural language processing of the Uzbek language [5]; accuracy of stop words [6]; assimilation and lemmatization of the Uzbek language [7] are cited in such research work. Recent growth trends in the production of NLP-related research work and resources, including machine transliteration tools [8], sensory analysis datasets, and analyzer models [9] are observed in Uzbek. It is also cited in the work of the semantic assessment dataset [10]. The article [11] examines the complex task of automating the transformation of dialect word forms into their standard literary analogs in the Uzbek language. This is a serious problem because the Uzbek language has a wide range of dialects, each with its own unique linguistic features. These dialectal variations can create barriers to communication and standardization of language, which are critical for effective linguistic and academic purposes. The authors developed a morphological analysis algorithm that uses a dictionary approach using two specialized databases. These databases contain words from the North Oguz and South Khorezm dialects of the Uzbek language and their corresponding standard literary forms. The algorithm works by comparing dialect word forms against these databases to find their standard equivalents. This process involves complex morphological analysis and conversion of word forms, largely dependent on the completeness and accuracy of the databases. This approach is designed to bridge the gap between dialects and the literary language, expanding the communicative and research capabilities of the Uzbek language.

A significant drawback of the proposed solution is its strong dependence on databases. The algorithm shows high accuracy for words present in the database, but its performance drops noticeably for words not included in the database. This limitation suggests the need to continually update and expand databases to cover a wider range of dialect words.

Research Methodology

Let the text be given. Let suppose that the important part of the text is defined. We will work on an important part of the text. The important part of the text contains sentences, u_1, u_2, \dots, u_n (n is the number of sentences in the text), where n is the text's total number of sentences. u_{ij} (i -sentences, words inside the j -sentence) is used to express the words in the sentences. We create a dictionary of distinct terms from each of the text's u_{ij} words. Through a_k , we speak for them. We compute the value of the words TF-IDF at a_k .

$$TF(a_i) = \frac{k_j}{h_j},$$

where h_j - is the number of words in the j document. $k_j - a_i$ - is the number of repetitions of a word in document j .

Reverse document frequency IDF (Inverse Document Frequency) is defined as the number of texts (documents) being viewed and the presence of a given word in selected texts documents:

$$IDF(a_i) = \ln\left(\frac{M}{m}\right),$$

where M is the total number of documents, m is the number of documents containing a_i .

To calculate the weight of each word, we multiply the TF values by the IDF values, respectively, and get the middle arithmetic for the total documents:

$$TF - IDF(a_i) = \frac{1}{n} \sum_{j=1}^n TF_j(a_i) * IDF(a_i) \quad (1)$$

Through this, it is determined whether each word is important or imperfect depending on its weight, but this is not always true. In the course of the research, it became clear that by normalizing the TF-IDF value of all words in the text, we can clearly say that they are important or non-nominal words. We calculate it using the formula:

$$p_k = \frac{TF-IDF(a_i)}{\sum_{j=1}^n TF-IDF(a_i)} \quad (2)$$

Then, we determine (2) the likelihood that P_k is important. This allows us to determine the mathematical expectation.

$$E = \sum_{k=1}^m k * p_k$$

where P_k is the probability of each word's importance, k – is the word's index, and m – is the number of unique words.

$$D = \sum_{k=1}^m (k - E)^2 * p_k$$

We calculate the dispersion of word distribution through the Formula. We calculate the standard deviation of words by dispersion.

$$\sigma = \sqrt{D}$$

$$E_t = \sum_{k=1}^m p_k * k^t$$

The t – ordered moment of words can be found using the formula. We can use this to determine the words' third-order core moment.

$$\mu_3 = E_3 - 3 * E_1 * E_2 + 2 * E_1^3$$

We find the theoretical distribution asymmetry through the calculated central moment value:

$$A_s = \frac{\mu_3}{\sigma^3}$$

An important part of the text is determined by its asymmetric value. That is, if for a given text:

if $A_s < 0$, a significant part of the text is located at the end;

if $A_s > 0$, in the case, a significant part of the text is located at the beginning;

if $A_s = 0$, in the case, a significant part of the text will be located at the beginning and end.

(1) and (2) we mainly cite the algorithm of the method of inference of the Uzbek text.

The text is entered. $U = (u_1, u_2, \dots, u_n)$, $i = \overline{1, n}$ n - the total number of words in the text.

(2) every u_i unique word's probability of importance P_i is determined. An important part of the text is distinguished. Suppose that an important part of the text consists of M sentences.

The weight of each sentence is G_j . In this case, the significant probability of each word in a sentence is the sum of the numerical values.

$$G_j - j - \text{sentence}, 1 \leq j \leq m,$$

$$w(G_j) = \sum_{k=1}^{|G_j|} w(u_k),$$

$$w(u_k) = TF - IDF(u_k).$$

According to the weights of all sentences in the text, the largest and smallest values are obtained, namely:

$$k_1 = \max_{1 \leq j \leq m} \left\{ \frac{w(G_j)}{|G_j|} \right\},$$

$$k_2 = \min_{1 \leq j \leq m} \left\{ \frac{w(G_j)}{|G_j|} \right\}.$$

In exchange for selecting alpha in this $f(\alpha) = k_1 \times \alpha + k_2 \times (1 - \alpha)$, $0 \leq \alpha \leq 1$ (often $\alpha = \frac{1}{2}$) $w(G_j) \geq f(\alpha)$ condition G_j important statements are chosen.

We summarize the text using the algorithm of n-grams (3 grams) to the allocated important statements of the text.

Analysis and Results

We will consider the issue of automatic text summarization for the Uzbek language. As an example, for the experiment, we will choose the adventure novel “Riding the Yellow Giant” by Khudoiberdi Tokhtaboyev. The work consists of 3 chapters in total, Chapter I has 9 paragraphs, Chapter II has 15 paragraphs and Chapter III has 4 paragraphs. We treat each paragraph as a separate document. We will summarize a total of 28 documents and check their accuracy. We will prepare a questionnaire for verification. Many researches were conducted in the preparation of the questionnaire, and with the help of the source [12] it was concluded that it should include the following conditions:

- 1) Are there keywords in the text in the summary?
- 2) Are the facts in the text correctly interpreted in the conclusion?
- 3) Is the sequence of sentences logically coherent in the conclusion?
- 4) Are the sentences grammatically correct in the conclusion?

Based on the questionnaire, we will compile Table 1.

Table 1. The Table of the survey results of the selected work

Documents	Are there keywords in the text in the summary? (%)	Are the facts in the text correctly interpreted in the conclusion? (%)	Is the sequence of sentences logically coherent in the conclusion? (%)	Are the sentences grammatically correct in the conclusion? (%)
1_1_ch	100	100,0	99,82	98,5
1_2_ch	100	98,6	99,65	97,3
1_3_ch	83,33	97,2	73,55	97,2
1_4_ch	85,71	98,5	100	98,5
1_5_ch	86,66	100,0	100	98,8
1_6_ch	52,63	98,6	89,85	98,6
1_7_ch	52,94	92,3	100	92,3
1_8_9ch	100	93,0	100	98,2
1_10_ch	71,42	82,1	100	97,4
2_1_ch	36,36	83,3	100	96,7
2_2_ch	100	89,8	100	93,9
2_3_ch	75	86,5	100	97,3
2_4_ch	76,92	100,0	100	100,0
2_5_ch	64,28	100,0	100	95,1
2_6_ch	88,23	98,6	100	100,0
2_7_ch	100	93,1	100	100,0
2_8_ch	78,94	96,9	98,12	98,5
2_9_ch	86,95	94,3	100	100,0
2_10_ch	100	92,3	100	98,5
2_11_ch	76,47	93,3	94,66	93,3
2_12_ch	100	97,6	98,42	97,6
2_13_ch	84,61	100,0	92,36	97,6
2_14_ch	85,71	98,0	100	98,0
2_15_ch	100	100,0	100	92,9
3_1_ch	83,33	93,9	100	97,0

Documents	Are there keywords in the text in the summary? (%)	Are the facts in the text correctly interpreted in the conclusion? (%)	Is the sequence of sentences logically coherent in the conclusion? (%)	Are the sentences grammatically correct in the conclusion? (%)
3_2_ch	50	87,5	100	93,8
3_3_ch	87,5	97,7	100	100,0
3_4_ch	100	93,5	100	97,8

Conclusions

In summary, this work is characterized by textual summarize from a significant amount of data. Nowadays, the internet, web pages, news, articles, works, status updates, blogs, daily news, etc. are the sources of large amounts of textual information. In finding, processing and sharing the necessary information from the data set, we face the problem of text summarization. Of course, despite the fact that different approaches to the issue of text inference have been seen, the evaluation of text inference within the TF-IDF method is of great scientific importance. Despite its importance, there has been relatively little research into automatic textual summarizer for the Uzbek language. Our approach is aimed at filling this gap and providing a useful tool for automatic summarizer of the Uzbek text. In this sense, the issue of Uzbek text summarizing within the TF-IDF method was considered. In this article the possibility of obtaining the necessary information by reducing large texts is shown.

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FORMALIZATION OF MANAGEMENT PROCESSES OF EXECUTIVE AUTHORITIES BASED ON THE PRINCIPLES OF MATHEMATICAL LOGIC

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Аннотасија. Mazkur ijro hokimiyati organlarinda qaror qabul qilishga ko‘maklashuvchi intellektual alqoritmlarni ishlab chiqishda, xususan ijtimoiy guruh-mahalla fuqoralar yig‘ini (MFY) misolida metasistemaning ta‘sirida hamda ichki imkoniyatlarni hisobga olgan holda qaror qabul qilish va uni ijrosini ta‘minlash bo‘yicha MFY ob‘ekt sifatida o‘rganildi va uning faoliyatini statik, dinamik va noaniqliklar sharoitidagi funksional matematik modellar ko‘rinishida rasmiylashtirish amalga oshirildi.

Калит so‘zlar: *Boshqaruv jarayoni, modellashtirish, matematik mantiq, ma‘lumotlardagi noaniqlik, ekspert, noravshan mantiq, dinamik model.*

Аннотация. При разработке интеллектуальных алгоритмов, помогающих принимать решения в органах исполнительной власти, в частности, в случае социального сообщества граждан махалла, под влиянием метасистемы и с учетом внутренних возможностей, принятие решений и обеспечение его реализации через социального сообщества граждан махалла изучалось как объект исследования, а его деятельность формализовалась в виде функциональных математических моделей в условиях статичности, динамики и неопределенности.

Ключевые слова: *Процесс управления, моделирование, математическая логика, неопределенность данных, эксперт, норавшановская логика, динамическая модель.*

Abstract. This matic formalization was studied in the executive authorities, in particular, in the case of the social group-neighborhood assembly (NA), under the influence of the metasystem and taking into account internal capabilities, the AN as an object of decision-making and ensuring its implementation, and its operation in static, dynamic and conditions of uncertainty, and formalization was carried out in the form of functional mathematical models

Keywords: *Management process, modeling, mathematical logic, uncertainty in data, expert, fuzzy logic, dynamic model.*

Introduction

Management decision-making is one of the topical issues today, in the market economy, because for the effective and smooth operation of any organization, it is necessary to make management decisions correctly and on time. Nowadays, decision-makers are increasingly based on the analysis

of data in a given situation and are moving away from making decisions based on intuition. Mathematical formalization of decision-making processes in order to improve the perfection of management decisions, including a list of activities, methods of implementation, deadlines and limits of specified actions, the range of performers, as well as in the assessment of work activities of groups and employees in executive authorities based on planned results and their evaluation criteria, forecasting, we believe that it is appropriate to use mathematical modeling methods in the process of hiring such employees. These methods are based on mathematical modeling methods. So, as an object, in studying, analyzing and determining the processes of social processes (neighbourhood assembly - NA), if it is carried out according to A.N. Tikhonov's methodology, it is possible to achieve a clear result (see in Figure 1) [1].

Research Methodology

The social group-NA that we are studying does not conduct its activity in a static way, but in a dynamic time-dependent way. Therefore, formalization of NA activity in the method of dynamic modeling is required. Dynamic modeling – reflects the activity and behavior of the object, that is, the NA, in a time interval. In dynamic models, it is possible to reflect, analyze and make decisions on actions and processes in the conditions of management of social groups. The time factor is clearly manifested, for example, with the help of extrapolation methods, it is possible to predict the long-term development of a social group based on previous events and processes. Therefore, dynamic modeling can be used as a basis for evaluating and comparing the activity of social groups and its management efficiency. It is possible to recommend the use of a dynamic model for grouping the activities of social groups (see in Figure 2) [1-3].

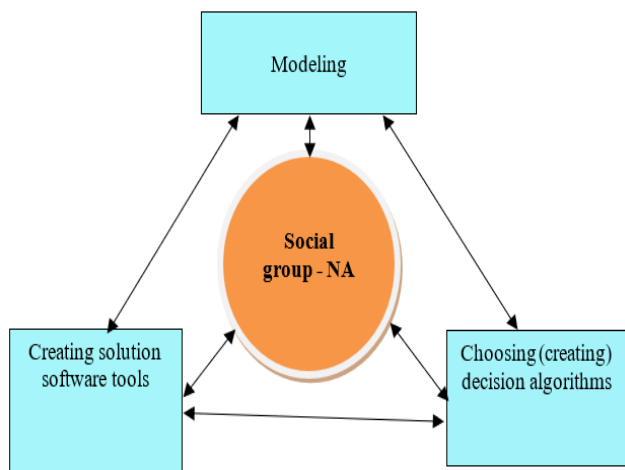


Figure 1. Methodology of object activity analysis.

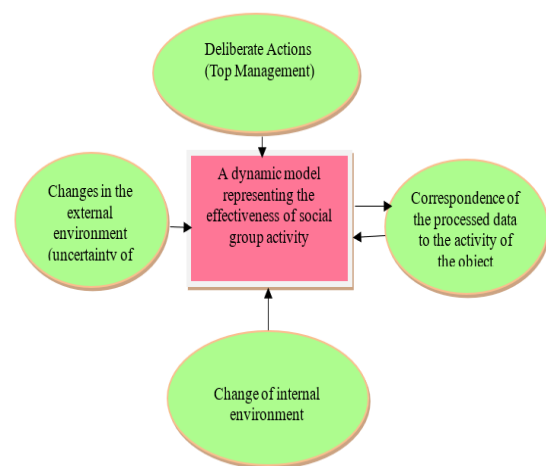


Figure 2. A dynamic model representing the activity of social group-NA.

This model monitors the necessary changes in the managed social group-NA under the influence of the purposeful measures adopted in the management process (by higher organizations), as well as under the real influence of the internal and external environment (data). A characteristic feature of dynamic information reflecting social group-NA activity is that regardless of the initial state and the initial solution, all subsequent decisions are reflected in the results of the previous solution [4].

The social group-NA time-dependent model can be used from the well-known French sociologist Michel Krauze's "Organization model - model of conflicts" [5]. In his many years of research, Michel Krauze researched the methods and ways of evaluating and predicting events, processes, and the interactions of the organization's main staff and groups. His attention is focused mainly on the study of management and decision-making processes in bureaucratic organizations. The conflict model of decision-making takes into account the following, that is, the adoption of important decisions is closely connected with the emotions of a person, a specialist, such as hatred, fear, envy, anger and, above all, stress. It was believed that stress should be moderate for effective behavior of the decision maker. "Organizational model - model of conflicts" helps to fully understand the characteristics of

the processes of making management decisions at the facility, because [5]: It doesn't matter how many managers there are or how skilled they are in running the organization. An economic crisis or an unstable (abnormal) situation in the market is always considered a serious problem for business and social group. Therefore, the task of the head of the social group-NA is to minimize the negative consequences of any solution (decision) using the most effective methods.

In the environment of the modern market economy, any organization, enterprise, social group-NA tries to ensure the continuity, improvement, and development of its activities in conditions of uncertainty and risk. The analysis and management of the organization's activities constitutes the main work content of enterprise managers, analysts, and specialists involved in information processing [5-10].

Analysis and Results

Description of parameters in the control scheme:

- $X = \{x_{ij}\} i \in I, j \in J$ - management effects on solving the j -problem of the i -th field;
- $Y = \{y_{ij}\} i \in I, j \in J$ - the results of solving the j -problem of the i -th field;
- $Z = \{z_i\} i \in I$ - a set of goals for i -th areas;
- $R = \{r_{ij}\} i \in I, j \in J$ - a set of available resources;
- $T = \{t_k\} k \in K$ - conditions of the external environment over time;

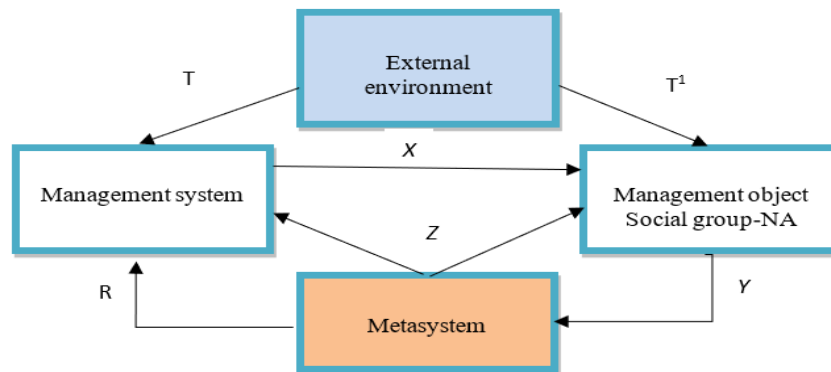


Figure 3. General management scheme

The operating process of the control system is set by the metasytem taking into account the set of goals Z , the available resources R and the possible conditions of the external environment, it is necessary to develop management effects X in the time interval T [2]. In these conditions, the functional model of the control system can be expressed as follows:

$$X = f(R, Z, T) \tag{1}$$

In turn, the output parameter of the object is determined by the resources r' , control effects x , and the state of the external environment t' available in the control object. The functional model of the operation process of the control object can be expressed as follows:

$$Y = f(X, R', T') \tag{2}$$

Functional models (1) and (2) determine the algorithms of operation of the system and control object. In order to describe the operation of the control system, it is necessary to define the control objectives, in accordance with which the control effects are developed. This is achieved by selecting control effects.

The performance quality of the control system is not determined by the actual values of control effects, but by the execution of control solutions. Therefore, in the process of evaluating the quality of the management system, the metasytem mainly implements the following functional model:

$$Q = f(R, Y, Z) \tag{3}$$

Here Q is an arbitrary set whose elements are ordered by the metasytem according to their degree

of preference. Also, under each set $(r, y, z) \in (R, Y, Z)$ respectively, Z corresponding to the target. An element that characterizes the level of rational use of management resources is placed to accept the Y solution $q \in Q$.

(3) let's take the functional model as a decision rule, with the help of which we can evaluate different solution options and find the optimal solution in a certain sense. Constructing decision rules that adequately reflect the decision maker's preference system is of great importance and ultimately determines the choice of solution. It is important that (3) evaluation of the solution option using the functional model is carried out taking into account the real conditions of the object in which the control system operates.

Finding management resources, using them, we need management effects X allows to obtain, which is expressed in the form of the following functional problem:

$$R = f(X, T) \quad (4)$$

(4) the functional problem provides such a rule that determines the choice of the resources necessary to achieve the goals of the metasystem, that is, the management strategy. Given $x \in X$ since management effects are carried out using different sets of resources, The control strategies R can also be obtained in different ways, and thus not one, but many strategies $\{r\}$ can be obtained. Then the decision-making problem has a clear physical meaning: from the set of possible strategies $\{r\}$, it is necessary to choose a strategy r such that it leads to the selection of the best set of management resources. Based on the above considerations, the functional model that determines the quality (usefulness) of the decision made can be expressed as follows:

$$Q = f(X, T, Y, Z) \quad (5)$$

Depending on the state of the control system, the control object, (1) and (2) the completeness and accuracy of the functional model, and the level of awareness of the nature of their interactions with the environment, the decision-making process can be carried out in different conditions.

Decision making under uncertainty. In conditions of uncertainty, there is no clear relationship between the chosen strategy and the outcome of the execution. Furthermore, the probability of execution using the chosen strategy is either unknown or not meaningful in the context of the issue. Therefore, the decisive rule (5) is expressed in the form. As a result, a certain metasystem value (achievement) is assigned to each strategy-outcome pair. (5) The most common criterion for implementing the decision rule is obtaining the maximum guaranteed profit.

Conclusions

The activity of the social group-NA under the jurisdiction of the executive authorities was systematically analyzed statistically and dynamically as an object of study. Input, output, internal and external impact parameters representing the activity of NA were formalized. A dynamic model of systematic learning of the object and one variant of the meta-system of decision-making under uncertainty were developed. With the help of formalized functional models, it was possible to adequately analyze the activities of social groups. When making a decision and ensuring its implementation, first of all, it is necessary to take into account economic factors, technical and scientific basis, as well as social and purely human factors. Mathematical models and system management presented in the article can serve as a basis for creating an intelligent system of automated management of the activities of executive authorities.

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ACTUAL PROBLEMS IN MODERN ART AND ARCHITECTURE

UDC: 7.02,7.05,72,72.03

DEVELOPMENT OF INDUSTRIAL AND INTERIOR DESIGN

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Annotatsiya: Sanoat va interer dizayni rivojiga bag'ishlangan sanoqli dissertatsiya va umumiy tasavvurlar uyg'otuvchi ilmiy maqolalarni hamda dizayn nazariyasi bo'yicha ilmiy adabiyotlar o'rganildi.

Kalit so'zlar: *badiiy, sanoat, interer, metod, estetik, dizayn, tadqiqot, texnologiya, ilmiy-ijodiy, ilmiy-texnik.*

Аннотация: Изучен ряд диссертаций и общенаучных статей по вопросам развития промышленного и интерьерного дизайна, а также научная литература по теории дизайна.

Ключевые слова: *художественный, индустриальный, интерьер, метод, эстетический, дизайн, исследование, технология, научно-творческий, научно-технический.*

Annotation: A number of dissertations and general scientific articles on the development of industrial and interior design, as well as scientific literature on design theory, have been studied.

Keywords: *artistic, industrial, interior, method, aesthetic, design, research, technology, scientific and creative, scientific and technical.*

Introduction

In order to rapidly develop high-tech industries in Uzbekistan, to expand the production of competitive finished products by attracting private investments in industrial sectors, to increase the income of the population in exchange for the establishment of production enterprises in the regions, the President of the Republic of Uzbekistan dated October 12, 2023 Decree No. PF-169 "On additional measures for rapid development of industry and its basic sectors" was adopted [1].

Literature Review

The researches of Herbert Readn (1893-1968) have a great place in the development of design theory. He attributed the history of design to the movement of modernism, and tried to justify the role of researches related to the construction of one or another form coming from art in the artistic evolution of design. G. Reed's book "Art and Industry" is historically and theoretically devoted to the problems of two areas, and is dedicated to revealing the essence of form and shape construction, color and ornament [2]. His conclusions are still relevant today, based on the analysis of the relationship between beauty and form, he suggests that industrial products do not conform to aesthetic criteria, but the need to "develop new aesthetic criteria in accordance with new methods of production".

The researches of Nikolaus Pevzner (1902-1983), a historian of European architecture and design, are of particular importance in studying the theoretical foundations of design. Based on observation of the art industry in England, he wrote "Pioneers of the modern movement. From William Morris to Walter Gropius" [3], "Studies in the Industrial Arts of England", "Designer in Industry" he became the author of books. Pevzner explores the place of English design in the development of world design by covering archival data, static analysis of reports on the development of English manufacturing, art, architecture and design. Also, in his book "The Sources of Modern Architecture and Design", the scientist tries to clarify information about art nouveau and international style, which developed widely



in architecture and design at the beginning of the 20th century. Professor Pevzner sheds light on the methodological principles of a confusing period based on nearly two hundred examples of 20th century architecture and applied art [4].

Research Methodology

Developed countries, design theory and design education have more than a hundred years of history and experience, but in Uzbekistan this field is a relatively new field of education and is undergoing rapid development in the modern artistic process. Despite this, there is no scientific literature on the theory of design in Uzbekistan, except for a few dissertations and general scientific articles on the development of industrial and interior design. Often, pupils and students are given practical skills that are used in the process of working on design objects, but in this process, design philosophy or artistic concept is not given much importance. On the other hand, design theory is a relatively new field for researchers, and it has not been updated in the research code list.

I.S. Baidzhanov's study guide "Foreign Modern Architecture" describes the processes that took place in world architecture from the end of the 19th century to the present day, and the uniqueness of architectural styles [5]. Naturally, since design is inextricably linked with architecture, this methodological literature is considered appropriate for training design professionals.

M. Mirpolatova covered issues such as directions in architectural and interior design popularized in today's century, research on restoring and preserving the city's eco-balance, the role of ethno-design in preserving the national image and identity [6].

In the scientific article of Z. Boboyev and H. Rakhmonov the scientific research was carried out on methods of improving the design ability of students of secondary special educational institutions [7].

In the article "Subject and interior design Uzbekistan", Z. Aliyeva focuses on the approach of cultural studies in the field of design, the main factors of appeal to ethno-traditions, scientific and technical processes, ecological and social problems [8].

In the book "On Design: Essays on the Theory and Practice of Design in the West" by V. Glazichev, the factors of the history of the emergence of design, the characteristics of modern western design, theoretical ideas about design that remain relevant to this day aimed at clarifying. The author tries to determine the degree of its relationship with art based on the analysis of the viewpoints of design theorists [9].

From the beginning of the 21st century, it can be noticed that Russian scientists have paid more attention to the design-education model, its researches focused on the system of education in preschool, secondary and higher education institutions. First of all, scientists tried to understand the creative ideas and pedagogical concept of Bauhaus and VHUTEMAS, who founded design education. In them, the cultural-historical foundations of the emergence of two large educational institutions, the role of schools today as a socio-historical and pedagogical phenomenon, their specific features in the educational system, the concept related to the construction of the form, the The issues of education methodology are discussed in detail [10].

It is possible to understand the place of school traditions in modern art education based on the comparative analysis of the pedagogical system of Bauhaus and VHUTEMAS based on scientific works. Also, in L.N. Klimova's dissertation, analytical research was conducted based on foreign and local qualifications within the framework of the pedagogical model of innovative approaches to creative personality formation in author's schools, organizational-pedagogical foundations of project-artistic education in the system of secondary special schools and the technology of its implementation [11].

Analysis and Results

Theoretical recommendations on the design of industrial products from the point of view of design are summarized in the methodological manual "Design in industrial design" by O.V. Ilina [12]. It contains theoretical information on the raw material, construction, technology and artistic-constructive analysis of the form, specifications and tools of design, and the form and function of the object.

T.A. Smolitskaya's "Interior design" training manual is based on the tourist-hotel complex, and clarifies the issue of teaching interior design from the point of view of modern facilities, making changes to educational programs. The manual consists of sections "Historical uniqueness of hotel design" and "Unit firm stylistic concept" and is intended for students of secondary and special schools, students of higher education and pedagogues [13].

Covering design history and world trends with reference to analytical materials in modern scientific journals such as "interior +design", "Ideas of your home", "Art Chronicle", "Science and life", "100% furniture", Nina Sofiyeva's "interior design: styles, trends, materials" tutorial is significant for updated information and interesting methodology. The author argued that the emergence of design as art, while illuminating the stylistic aspects inherent in each style, illuminated a number of issues underlying the formation of the artistic thinking of each designer through modern illustrative examples. The manual also reveals the Basic Laws of applying components of modern interior design, the project of residential rooms, lighting factors, decorative materials and accessories that serve to create an emotional image of the interior in a simple and concise expressive way that is understandable to students [14].

Natalia Koveshnikova's educational manual "Design: History and Theory" provides extensive historical data on the development and formation of design in countries such as the history of Applied Art before industrialization, Western Europe, the United States, Japan, a detailed explanation of special terms is summarized [15].

Conclusions

As a conclusion, we can say that the educational literature analyzed above reflects in students the history of Interior and industrial design, knowledge and practical skills related to design theory and the formation of a scientific and creative worldview, as well as the main laws of students engaged in project activities as an independent type of artistic creation.

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DESIGNING TRANSFORMABLE CLOTHING BASED ON THE HARMONIZATION OF STRUCTURAL ELEMENTS

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Annotatsiya. Ushbu maqolada tarkibiy elementlarni uyg'unlashtirish asosida konvertatsiya qilinadigan kiyimlarni loyihalash va turli xil jinsiy va yosh guruhlari iste'molchilari uchun kiyim-kechaklarni loyihalashda modellarni uyg'unlashtirish darajasini baholashning taklif qilingan metodologiyasi asosida amalga oshirilgan kompleks tadqiqotlar natijasida mutanosiblik qonunining qo'llanilishi to'g'risida ma'lumotlar mavjud.

Kalit so'zlar: kompozitsiyalar, usul, modellar, metodologiya, dizaynlar, kiyim-kechak, dizayn, modul.

Аннотация. Данная статья содержит информацию о применении закона пропорций в результате комплексных исследований, в ходе которых было выполнено конструирование трансформируемой одежды на основе гармонизации конструктивных элементов и предложенной методики оценки степени гармонизации моделей при конструировании одежды для потребителей различных половых и возрастных групп.

Ключевые слова: композиции, метод, модели, методология, конструкции, одежды, проектировании, модуль.

Abstract. This article contains information on the application of the law of proportions as a result of comprehensive research, during which the design of transformable clothing was performed based on the harmonization of structural elements and the proposed methodology for assessing the degree of harmonization of models in the design of clothing for consumers of different genders and age groups.

Keywords: compositions, method, models, methodology, designs, clothing, design, module.

Introduction

The article proposes a study of the size of the ISB for the lines of harmonious division of clothing parts, inside which the change in the position of the dividing line remains unnoticeable (or barely noticeable), and allows you to move the patterns if necessary, to achieve better fixability of the parts, while the changes do not lead to a violation of the integrity of the composition of the model.

As a result of the comprehensive studies carried out, the applicability of the law of proportionating and the consistency of the proposed methodology for assessing the level of harmony of models in the design of clothing for consumers of different gender and age groups have been confirmed. The fourth

chapter addresses issues related to the development of design methods for transformable clothing based on the harmonization of its design elements [1].

As a result of the analysis of scientific research works, domestic and foreign patent developments in the field of design of technical equipment, the means and techniques of transformation, features of design of technical equipment have been studied, systematized and generalized. Transformation is considered as a morphological property in which morphology acquires the ability to change its spatial characteristics and thereby form new properties, modify the function of an object. The paper shows that the task of creating a TO is especially relevant for children of preschool and primary school age, whose body functions are changing and improving [2].

Literature Review

Particular social and economic interest is the use of morphological transformation (MT) tools and techniques to extend the active life of clothing. The rapid increase in the longitudinal dimensions of the human body dictates the need for the development of thermal energy, and the emergence of modern materials with high wear resistance and reliability expands the possibilities for designing clothes adapted to changes in body size.

In order to change the compositional solution of sewing products (including through various combinations of color combinations of materials), improving their thermal protection properties, the use of external means (“attachment-separation”, “folding – deployment” of individual elements, “regulation-fixation” of their sizes) and internal (“combination – embedding” thermal protection gaskets) transformation [3].

Since the developed clothing models must have harmony and proportionality of shape, and take into account the impact of visual illusions from the color combinations of materials used, new types of TE design solutions are proposed in the work, which contribute to improving the aesthetic and heat-protective properties of clothing: “turning out” - changing the color and material of the appearance of clothing through the use of internal reserves; “folding -unfolding” changing the length of the product without removing structural elements.

It is established that in order to ensure the required parameters of the microclimate under the clothing space, the transformed GCC clothing must have an adjustable thermal resistance, have a different degree of insulation for different parts of the body. In order to regulate the heat-protective properties of clothing, vest designs have been developed, the overall design parameters of which, as well as the places of articulation and the dimensions of the PDE are calculated according to the law of the golden section [4].

Research Methodology

Since MT techniques involve the use of interchangeable parts of different colors, the need to take into account the illusory properties of the color of materials when designing a nursery TO is especially relevant. In the work, it was experimentally established that, depending on the degree of contrast in the colors of the materials and the location of the darker one, the proportions of the suit or its individual parts look different, therefore, for their calculation, a clarification was made in the expression: where is the value of the adjustment of the length of the product and the width in the shoulders, or the length and width of the calculated section of the structure.

For the first time, it was experimentally established that in case of replacement of color combinations of clothing materials, in order to preserve the harmony of visual perception of the model, it is necessary to change the position of the divisions of the main parts. Moreover, the greater the amount of displacement, the higher the degree of contrast in the colors of the materials used [5].

The goals of clothing transformation are formulated: growth adaptation, adaptation to changes in fashion, expansion of aesthetic functions, expansion of wardrobe items, adaptation to changes in weather conditions, changes in production conditions, depending on which the formation of the TK route is regulated. Arrays of input information and databases of conditionally constant and conditionally variable information about the design object are determined, a method for forming the optimal route for developing a sketch of harmonious transformable clothing of high quality is proposed [6].

Each module is a schematic map of the selection of possible combinations of structural units of the product. The determination of the overall parameters of the product, the locations of the CC and the dimensions of the PDE of clothing is based on the laws of proportionation. Since the number is valid with some assumptions for the proportional structure of the figures of children of any age, the outline of the figure of a child in clothes is taken as a "golden rectangle", the sides of which are connected with longitudinal (length of the product, position of the waistline) and transverse (shoulder and pelvic diameter of the figure, the magnitude of the expansion a, B of the products in these areas) dimensions.

At the final stages of the formation of the information base, depending on the goals of transformation and the KKR of the model, the type of transformation, the location of the TE, the type and degree of preservation of the structural connection of the TE with the product are determined. Provided that the two arrays function correctly, the output information array, in the form of a TK form, will contain sketches of analog models of transformed garments. Thus, in the conditions of a specific TK, the proposed methodology allows us to form the optimal route for the development of a sketch of TO, i.e. from the whole set of design works, choose the sequence of their types, methods and techniques of execution, ensuring the harmony of clothing [7].

Analysis and Results

The procedure proposed in the paper for calculating the length of the designed product according to a known shoulder width necessitates a clear fixation of the shoulder line in the designed models. The work experimentally investigated the effect on the creation of a harmonious image of a "man – suit" of the design and thickness of the upper shoulder pads, as a result of which the need to take into account their parameters and integrated design with MK outerwear is shown.

Based on the research, systematization and generalization of the laws of artistic proportionation, a methodology for designing harmonious clothing was developed, within the framework of which for the first time a method was proposed for determining the optimal, from the point of view of artistic expressiveness, places of harmonious arrangement of KCH clothing parts, sizes and locations of PDE, establishing dimensionless coefficients for their boundary values. The values of the ISB for the lines of harmonious division of clothing parts have been experimentally established, changing the position of the dividing lines inside which does not lead to a violation of the compositional integrity of the model, contributes to better fixability of parts in the layouts of patterns and increases the level of efficiency of models [8].

On the basis of a comprehensive study of the compositional design solution (KCR) of clothing for men, women and children, the verification of the method for assessing the level of harmony was carried out and the applicability of the law of proportionation and the consistency of the proposed method for clothing of various types and for consumers of different age and gender groups was proved [9].

The regularities of the arrangement of structural lines on the main details of clothing, depending on the degree of contrast of colors of materials, have been established, on the basis of which reasonable recommendations for a harmonious quantitative combination of color groups and confection of materials for the design and production of competitive clothing have been developed; confidence intervals for moving divisions on materials with varying degrees of color contrast have been experimentally determined. The design of universal (for materials with varying degrees of color contrast) patterns of the main parts of clothing is proposed [10].

Conclusions

The methodological provisions of the theory of transformation have been studied, generalized and practically implemented using the example of sets of transformable clothing for children developed on the basis of the laws of harmonization and proportionation, which preserve the compositional integrity of models throughout their active operation and ensure a comfortable thermal condition of the child.



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