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CONTENTS

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SYNTHESIS AND CRYSTAL STRUCTURE OF THE COMPLEX COMPOUND OF COPPER(II) ION WITH IBUPROFEN

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Annotatsiya. Ushbu maqolada $[Cu(l_1)_2(m\text{-}pir)_2]\cdot 2H_2O$($L_1$-ibuprofen, m-pir metilpiridin) kompleks birikmasi sintezi va uning kristall tuzilishi muhokama qilingan. Asosiy ligand sifatida olingan modda ibuprofen ((rs)-2-(4-izobutilfenil)-propion kislota) va yordamchi ligand 4-metilpiridin, hamda kompleks birikma tuzilishi infraqizil (IQ) spektroskopiya, skanerlovchi elektron mikroskop-energiya dispersion tahlil (SEM-EDX), barqarorligi TG-DSK usulida, shuningdek kompleks birikma monokristaliga tegishli parametrlar esa rentgen tuzilish tahlili (RTT) metodlari yordamida o'rganildi. Olingan koordinatsion birikmada, misning koordinatsion soni 6 ga teng bo'lib, kompleks birikma hosil bo'lishida ikkita o'rinni ibuprofen molekulasi, yana ikkita o'rinni esa 4-metilpiridin molekulasi, qolgan o'rinlarni esa suv molekulasi egallagan. (RS)-2-(4-izobutilfenil)-propion kislota tarkibida kislorod atomi tutgan monodentat ligand sifatida ko'pchilik oraliq metallar ionlari bilan barqaror kompleks birikmalar hosil qilishi tufayli ahamiyatli hisoblanadi. Yangi olingan kompleks birikmalarning antibakterial faolligini o'rganish tadqiqotlari, gram musbat bakteriyalar *Staphylococcus aureus, Bacillus subtilis*, gram manfiy bakteriyalar *Escherichia coli va Candida albicans* zamburug'i shtammlarida *in vitro* sharoitida aniqlandi. Olib borilgan tadqiqotlar natijasida yangi olingan kompleks birikmalarning antibakterial faolligi ibuprofenga nisbatan sezilarli darajada

ortganligi, bundan tashqari monoligandli metallokomplekslarga nisbatan aralash-ligandli kompleks birikmalarda biologik faollik yuqori samaradorligi isbotlandi.

Kalit so‘zlar: *Koordinatsion birikma, koordinatsion son, ibuprofen, 4-metilpiridin, infraqizil (IQ) spektroskopiya, SEM-EDT, rentgenstrukturaviy analiz, monokristall, reaksiya unumi, mis kuporosi, vodorod bog‘lanish, barqarorlik konstantasi, dimetilformamid (DMFA).*

Аннотация. В статье рассмотрен синтез комплексного соединения $[Cu(L_1)_2(м\text{-пир})_2]\cdot 2H_2O$ (L_1-ибупрофен, м-пир метилпиридин) и его кристаллическая структура. Получено вещество в качестве основного лиганда ибупрофен ((RS)-2-(4-изобутилфенил) пропионовая кислота) и вспомогательного лиганда 4-метилпиридин, а строение комплексного соединения установлено методами инфракрасной (ИК) спектроскопии, сканирующей электронной микроскопически-энергодисперсионный анализ (СЭМ-ЭДТ), его стабильность изучена методом ТГ-ДСК, а параметры, относящиеся к монокристаллу комплексного соединения, изучены методами рентгеноструктурного анализа (РСА). В полученном координационном соединении координационное число меди равно 6, причем при образовании комплексного соединения два места занимает молекула ибупрофена, еще два места - молекула 4-метилпиридина, а остальные места заняты молекулой воды. (RS)-2-(4-изобутилфенил) пропионовая кислота как монодентатный лиганд, содержащий атом кислорода, важна, поскольку образует устойчивые комплексные соединения с большинством промежуточных ионов металлов. Антибактериальную активность вновь полученных комплексных соединений определяли in vitro на штаммах грамположительных бактерий Staphylococcus aureus, Bacillus subtilis, грамотрицательных бактерий Escherichia coli и Candida albicans. В результате проведенных исследований антибактериальная активность вновь полученных комплексных соединений значительно повышена по сравнению с ибупрофеном, кроме того, доказана биологическая активность разнолигандных комплексных соединений по сравнению с монолигандными металлокомплексами.

Ключевые слова: *Координационное соединение, координационное число, ибупрофен, 4-метилпиридин, инфракрасная (ИК) спектроскопия, SEM-EDX, рентгеноструктурный анализ, монокристалл, продукт реакции, сульфат меди, водородная связь, константа устойчивости, диметилформамид (ДМФА).*

Abstract. This article discusses the synthesis of the complex compound $[Cu(L_1)_2(m\text{-pyr})_2]\cdot 2H_2O$ (L_1-ibuprofen, m-pyr methylpyridine) and its crystal structure. The substance obtained as the main ligand is ibuprofen ((RS)-2-(4-isobutylphenyl)-propionic acid) and auxiliary ligand 4-methylpyridine, and the structure of the complex compound was determined by infrared (IR) spectroscopy, scanning electron microscope-energy dispersive analysis (SEM-EDX), its stability was studied by the TG-DSK method, and the parameters related to the single crystal of the complex compound were studied using X-ray

structure analysis (XRD) methods. In the obtained coordination compound, the coordination number of copper is equal to 6, and in the formation of the complex compound, two places are occupied by the ibuprofen molecule, two more places are occupied by the 4-methylpyridine molecule, and the remaining places are occupied by the water molecule. (RS)-2-(4-isobutylphenyl)-propionic acid as a monodentate ligand containing an oxygen atom is important because it forms stable complex compounds with most intermediate metal ions. Antibacterial activity of newly obtained complex compounds was determined in vitro in strains of gram-positive bacteria Staphylococcus aureus, Bacillus subtilis, gram-negative bacteria Escherichia coli and Candida albicans. As a result of the conducted research, the antibacterial activity of newly obtained complex compounds has been significantly increased compared to ibuprofen, besides, the biological activity of mixed-ligand complex compounds compared to monoligand metallocomplexes has been proved.

Keywords: *Coordination compound, coordination number, ibuprofen, 4-methylpyridine, infrared (IR) spectroscopy, SEM-EDX, X-ray structural analysis, single crystal, reaction product, copper sulfate, hydrogen bonding, stability constant, dimethylformamide (DMFA).*

Introduction

In the developing condition of bacterial resistance to medical preparations, the creation of new therapeutic agents with a strong range of action has become a major problem in the field of bioinorganic chemistry [1, 2]. Research on the synthesis of metal complexes with active pharmaceutical drugs, in which drug molecules play the role of ligands, is considered as a field of increasing interest for inorganic, pharmaceutical and medicinal chemistry [3]. Ibuprofen (RS)-2-(4-isobutylphenyl)-propionic acid belongs to the group of propionic acid derivatives and is a widely used nonsteroidal anti-inflammatory drug. Ibuprofen is a nonsteroidal anti-inflammatory drug (NSAID) widely used in medical practice for the treatment of pain and inflammatory diseases such as rheumatoid arthritis, post-traumatic pain, migraine, and fever. Like other nonsteroidal anti-inflammatory drugs, ibuprofen works by inhibiting cyclooxygenase-1 (COX-1) and cyclooxygenase-2 (COX-2) by reducing prostaglandin biosynthesis.

Furthermore, ibuprofen can reduce the activity of the enzyme phospholipase A2, which promotes inflammation through the production of eicosanoids, by 92% and directly activates inflammatory cells in patients with acute pancreatitis [5]. Anti-inflammatory activity of NSAID’s has been found to increase when coordinated with metals [4].

In recent years, many new metal complexes have been synthesized with transition metals such as copper, zinc, cobalt, manganese, and nickel. The reason for this is the low cost and low toxicity, as well as the high efficiency of their biocompatibility in living organisms [6-8].

Copper, Cu(II), is a $3d^9$ metal cation that participates in several biological processes, such as structural and catalytic, cellular respiration or neurotransmitter biosynthesis, by serving as a cofactor of many metalloproteins and stimulating several enzymatic processes [9, 10].

Due to the high redox activity, the therapeutic effectiveness of copper coordination compounds is not limited to the antiproliferative effect. Copper coordination compounds can be highly effective in the treatment of viral infections, inflammatory diseases, and microbial infections due to their several mechanisms of action. Coordination compounds of NSAIDs and Cu(II) are currently used in veterinary practice as anti-inflammatory drugs. In addition, it is used as an antibacterial agent against cancer, tuberculosis, inflammation, and microbes, as well as in the diagnosis of malignant tumor cells and Alzheimer's disease by positron emission tomography (PET) [11].

Literature Review

Scientific research on obtaining complex compounds of bioactive ligands with biometals and studying their range of influence is one of the widely studied fields today. In particular, many complex compounds of ibuprofen with 3d metals have been synthesized today, and their composition and structure have been studied. In the article "Combination of Ibuprofen and Paracetamol: The First Step in Effective Control of Musculoskeletal Pain" by A.E.Karateev [12], it is recommended to use a combination of ibuprofen and paracetamol as the first step in the treatment of acute and chronic pain of the musculoskeletal system. They are characterized by high impact potential, ease of use and availability. This paper briefly reviews the efficacy and safety of these drugs. In the paper "Anti-inflammatory effect of ibuprofen ethers using low-frequency ultrasound" by B.V.Pristupa, I.A.Kravchenko, P.A.Snegur, Y.I.Lepix [13], the anti-inflammatory activity of newly synthesized ethers with ibuprofen was studied and information was given on the method of application with low frequency ultrasound. In the paper "Porous metal-organic frameworks for a controlled drug delivery" by P.Horcajada, C.Serre, G.Maurin, N.A.Ramsahye, F.Balas, M.Vallet-Regi, M.Sebban, F.Taulelle, G.Ferey, a complex compound of ibuprofen with an iron element was obtained and a single crystal was grown, and its structural information (spatial structure and all crystallographic sizes) was placed in the Cambridge Crystallographic Structures database for use in the synthesis of similar compounds (https://www.ccdc.cam .ac.uk/structures/ CCDC Deposit Number №695105) [14].

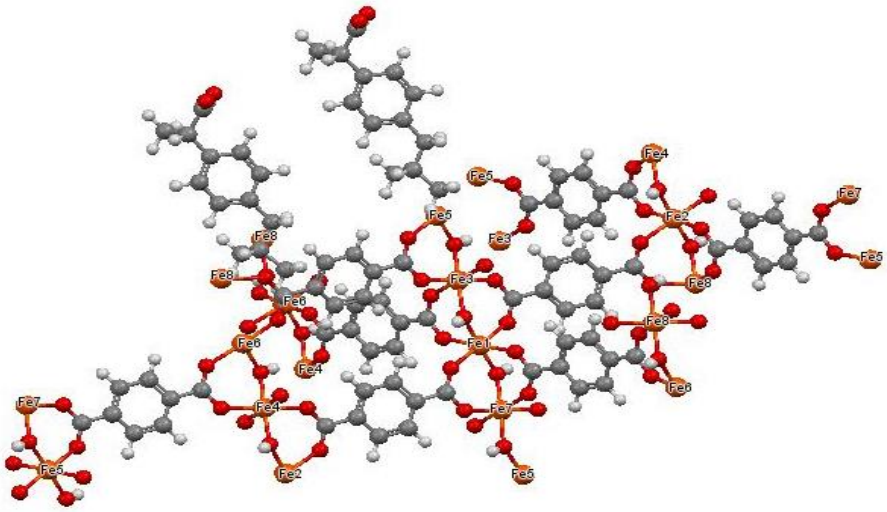


Figure 1. The structure of the complex compound molecule obtained with iron and ibuprofen.

Research Methodology

For the synthesis of $CuC_{38}H_{54}N_2O_7$, a solution of 0.02 mol (4.12 g) of ibuprofen ((RS)-2-(4-isobutylphenyl)-propionic acid) in 50 ml of methanol was poured into a 100 ml round bottom flask. 0.01 mol (2.5 g) of $CuSO_4 \cdot 5H_2O$ was dissolved in a large amount of water and methyl alcohol in a beaker, a 10% solution was prepared, and then placed in a flask.

A reflux condenser was connected to the flask and heated in a water bath with stirring for 30 minutes. Then, 0.01% alcohol solution of 4-methylpyridine was added dropwise and stirred for another 30 minutes on a magnetic stirrer. This mixture was then cooled at room temperature for 1 day. Then, the formed dark green $CuC_{38}H_{54}N_2O_7$ precipitate was filtered, washed first in water, then in ethanol and left at room temperature for 12 days. As a result, a single crystal of a complex compound of copper with ibuprofen and 4-methylpyridine was grown [15]. Element analysis results: obtained - Cu-8,96 %, C-63,86 %, H-7,563 %, N-3,92 %, O-15,686 % and calculated: Cu-7,92 %, C-58,52 %; H-7,454 %, N-3,84 %, O-14,642 %. Mr =714 g/mol. T_{Liquid}= 244 ^oC. 5 g, yield 78.55 % was obtained.

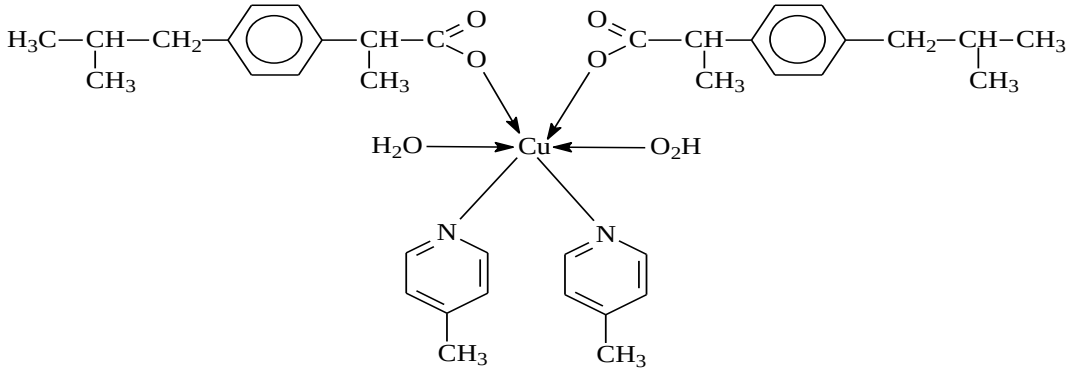


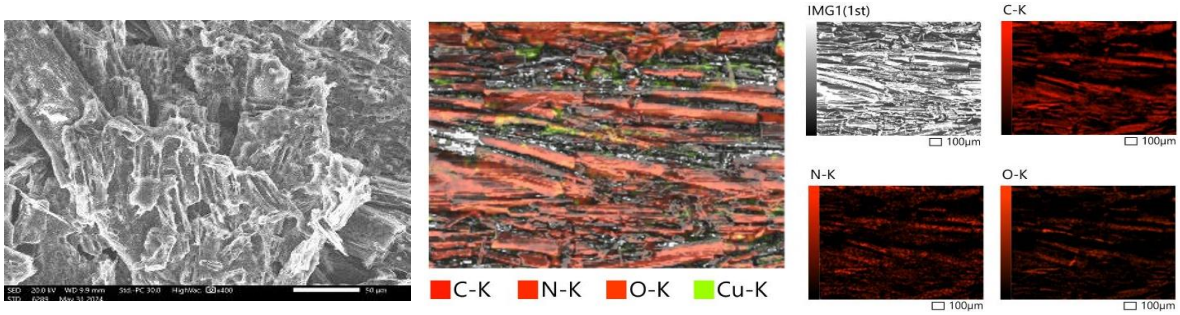
Figure 2. The chemical structure formula of the synthesized complex compound $[Cu(L_1)_2(m\text{-pyridine})_2]\cdot 2H_2O$

Analysis and Results

The structure of the synthesized $[Cu(L_1)_2(m\text{-pyridine})_2]\cdot 2H_2O$ complex compound was studied using infrared (IR) spectroscopy, scanning electron microscope-energy dispersive analysis (SEM-EDA) methods, stability was studied by the TG-DSK method, and the parameters related to the single crystal of the complex compound were studied using X-ray structure analysis (XSA) methods and relevant conclusions were obtained.

In the IR-spectra of the complex compound, it is observed that the absorption lines corresponding to the -C-O, -C=O- groups in the ibuprofen molecule are shifted by ~20-40 cm^{-1} towards the high-frequency region and by ~30-40 cm^{-1} in the low-frequency region. Absorption lines corresponding to N-M valence oscillations at 467 cm^{-1} are observed in the spectra of the complex compound at short wavelengths. Vibrations related to the -CH group of the benzene ring remain unchanged and are located in the region of 2980-3100 cm^{-1}. The carboxyl group (vC-O) in the complex compound shifts to short wavelengths and is observed in the 1205-1085 cm^{-1} region, which indicates that it is involved in coordination. This situation is also confirmed by the results of quantum-chemical calculations carried out on the ligand molecule [16]. The number of

elements (carbon, oxygen and metal atoms) in the synthesized complex was analyzed using the SEM-EDA method [17]. The microstructures and EDA diagrams of the complexes are presented in Figure 3. In SEM, electrons interact with atoms in the sample and create various signals that contain information about the surface topography and composition of the sample.



Element	Line	Mass%	Atom%
C	K	48.84±0.03	55.05±0.03
N	K	14.93±0.06	14.43±0.06
O	K	35.96±0.07	30.43±0.06
Cu	K	0.18±0.00	0.07±0.00
H	K	0.09±0.00	0.02±0.00
Total		100.00	100.00

Figure 3. Microstructure, mapping and elemental analysis results of $[Cu(L_1)_2(m\text{-pyridine})_2]\cdot 2H_2O$.

The electron beam is scanned in raster scan mode and the position of the beam is combined with the intensity of the detected signal to create an image. Using the Cif file obtained by the XRD analysis, the crystal parameters were determined with the mercury program and expressed using table data [18].

Table 1. Crystallographic data and structure clarification parameters of copper(II) ion ibuprofen and methylpyridine-complex compound.

Parameter	Values	Parameter	Values
$CuC_{38}H_{54}N_2O_7$			
Formula	$CuC_{38}H_{54}N_2O_7$	Crystal size, [mm]	0.23×0.38×0.41
Molecular mass	696.35	Temperature T, °K	295
Syngonia	trichylinic	Scan interval θ,°degree.	5,1; -28,12
Spatial group	P-1	Interval h,k,l	-13:13; -15:15; -21:22
a, Å	10.27	Total reflexes	8977
b, Å	11.82	Quantity of independent reflexes	1872
c, Å	17.23	R_{int}	0.055
α °	104.38	$F^2 \geq 2\sigma(F^2)$ Criteria	7084
β °	95.617		
γ °	109.56		
V, Å^3	1872.2	Determined parameters	432

Z	2	Quality of structure detection	2.64
D_x, g/cm^{-3}	1.232	R_1, $wR_2(I>2\sigma(I))$	0.0490, 0.1452, 1.04
μ(CuK_α), mm^{-1}	0.629	$\Delta\rho$min/max, eÅ^{-3}	0.744, 0.055

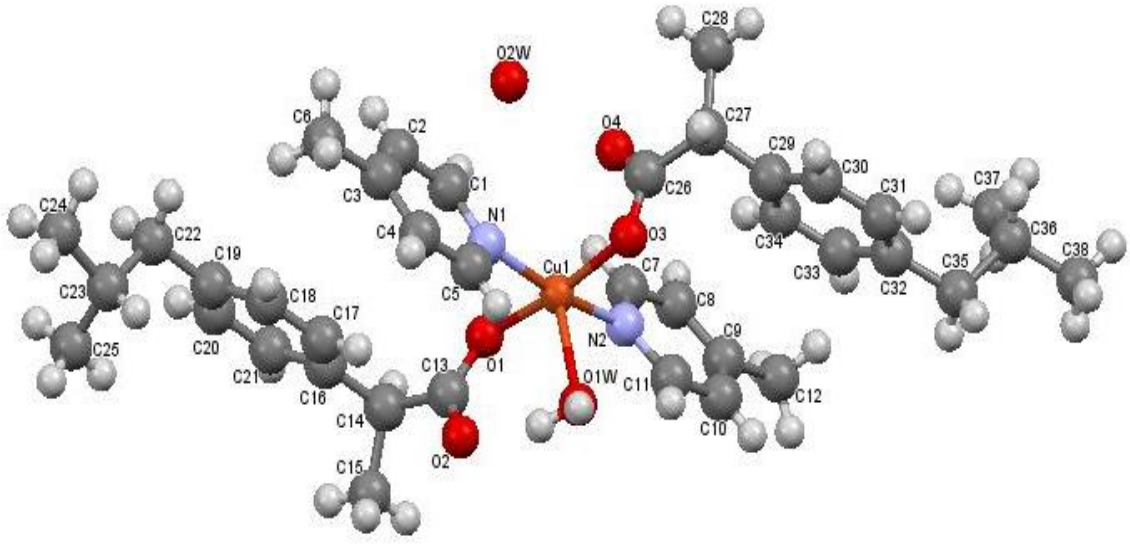


Figure 4. Image of the synthesized complex compound [Cu(L_1)$_2$(m-pyridine)$_2$]·2H$_2$O.

Table 2. Bond lengths and bond angles of a complex compound.

Bond	d, Å	Angle	ω, degree
Cu(1)-O(1)	1.9788(16)	O(1)-Cu(1)-O(2)	97.63(7)
Cu(1)-O(2)	2.326(2)	O(1)-Cu(1)-O(3)	171.8(7)
Cu(1)-O(3)	1.9856(14)	O(1)-Cu(1)-O(4)	120.2(7)
Cu(1)-O(4)	2.813(2)	O(1)-Cu(1)-N(1)	88.18(7)
Cu(1)-N(1)	2.0212(19)	O(1)-Cu(1)-N(2)	89.92(8)
Cu(1)-N(2)	2.015(2)	O(1)W-Cu(1)-O(3)	91.07(6)
O(1)-C(13)	1.279(3)	O(1)W-Cu(1)-O(4)	140.6(6)
O(2)-C(13)	1.228(3)	O(1)W-Cu(1)-N(1)	99.48(7)
O(3)-C(26)	1.285(3)	O(1)W-Cu(1)-N(2)	92.04(7)
O(4)-C(26)	1.224(3)	O(3)-Cu(1)-O(4)	51.13(6)

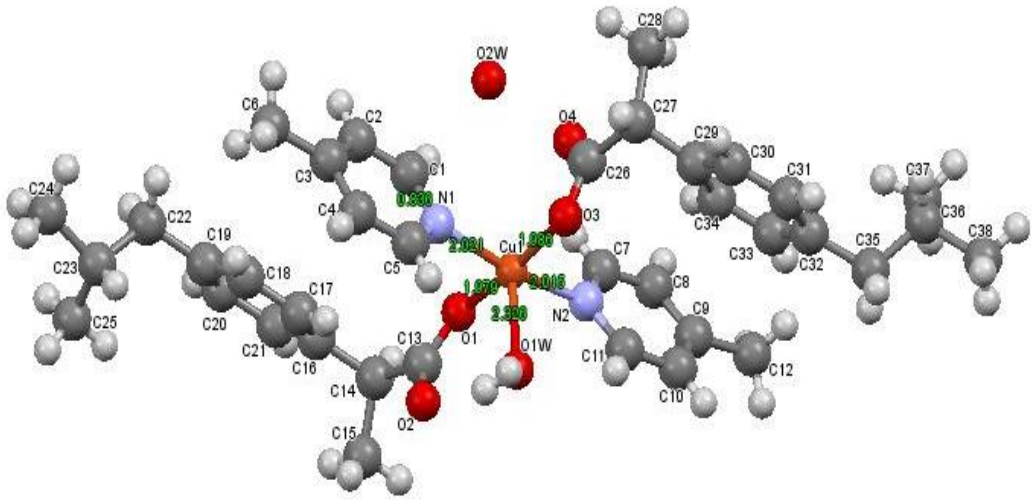


Figure 5. Interatomic bonding and bond length of the resulting complex compound [Cu(L_1)$_2$(m-pyridine)$_2$]·2H$_2$O.

Table 3. Hydrogen bonds in the crystal structure (Å).

Bond D–H···A	Distance, Å			Angle D–H···A, degree.	Atomic coordinates, A (i)
	D–H	H···A	D···A		
$Cu(L_1)_2(m\text{-pyridine})_2]\cdot H_2O$					
O(1)W--H(1)W..O(3)	0.84(3)	1.98(3)	2.808(2)	169(4)	1-x,1-y,-z
O1(W)--H(2)W..O(2)	0.87(3)	1.84(4)	2.648(3)	155(4)	-x,-y,-z
C(1)--H(1)..O(2)W	0.93	2.44	3.295(4)	152	2-x,1-y,-z
C(5)--H(5)..O(3)	0.93	2.56	3.485(3)	170	1-x,1-y,-z
C(10)--H(10)..O(2)W	0.93	2.53	3.386(4)	153	1+x,y,z
C(11)--H(11)..(1)W	0.93	2.43	3.073(3)	126	-1+x,y,z

D-donor, A- acceptor. i-symmetry

The parameters of the unit cell of the crystal are as follows: spatial group P-1, a=10.27 Å, b=11.82 Å, c=17.23 Å, α =104.38°, β=95.617°, γ=109.56°, V=1872.2 $Å^3$, Z=2. The complex compound $[Cu(L_1)_2(m\text{-pyridine})_2]\cdot 2H_2O$ is mononuclear, formed by ibuprofen and 4-methylpyridine molecules of Cu^{2+} ions, and has a neutral nature (Fig. 4). The value of the distance between Cu-O(1), Cu-O(2), Cu-O(3), Cu-O(4), Cu-N(1) and Cu-N(2) bonds in the complex equals to 1.9788Å, 2.326Å, 1.9856Å, 2.813Å, 2.0212Å and 2.015Å, respectively (Table 2, Figure 5). It can be seen that angle values of O(1)-Cu-O(2), O(1)-Cu-O(3), O(1)-Cu-O(4), O(1)-Cu-N(1), O (1)-Cu-N(2) and O(1)W-Cu(1)-O(3) are 97.63, 171.8, 120.2, 88.18, 89.92 and 91.07, respectively.

Conclusions

In the formation of a complex compound of copper(II) ion with ibuprofen and 4-methylpyridine mixed ligand, the central copper atom formed cross-links with the oxygen atoms of the carbonyl group with the main ligand ibuprofen, and with the nitrogen atom of the molecule of 4-methylpyridine. In addition, two water molecules are connected to the central atom through an oxygen atom. Therefore, the central atomic copper has a coordination number of 6 and is hybridized in the sp3d2 state. This process can also be proven using X-ray structure analysis data. The synthesized complex compound with the composition $[Cu(L_1)_2(m\text{-pyridine})_2]\cdot 2H_2O$ made it possible to use the above synthesis method in the synthesis of similar compounds, as well as in the description of their structure.

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AIR POLLUTION IN LARGE CITIES AND ITS SOURCES (Tashkent city as an example)

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Annotatsiya. Ushbu maqolada shaharlarda atmosfera havosining ifloslanishi, uning oqibatlari, inson salomatligiga ta’siri, atmosferani ifloslovchi manbalar, Toshkent shahrida havoning ifloslanishi va uning sabablari yoritilgan. Atmosferaning ifloslovchi manbalarning kelib chiqishi, tarqalishi, salbiy oqibatlariga alohida to‘xtalib o‘tilgan.

Kalit so‘zlar: *Havo ifloslanish indeksi, yashil maydonlar, aerozol, $PM_{2.5}$ zarrachalari, biologik yoqilg‘i, smog.*

Аннотация. В данной статье рассмотрено загрязнение воздуха в городах, его последствия, влияние на здоровье человека, источники загрязнения атмосферы, загрязнение воздуха в Ташкенте и его причины. Отдельно обсуждаются происхождение, распространение и негативные последствия источников загрязнения атмосферы.

Ключевые слова: *Индекс загрязнения воздуха, зеленые зоны, аэрозоли, частицы $PM_{2,5}$, биотопливо, смог.*

Abstract. This article covers air pollution in cities, its consequences, effects on human health, sources of air pollution, air pollution in Tashkent and its causes. The origin, distribution, and negative consequences of atmospheric polluting sources are emphasized.

Keywords: *Air pollution index, green areas, aerosol, $PM_{2.5}$ particles, biofuel, smog.*

Introduction

Today, more than 57% of the world's population lives in urbanized areas. The share of such areas in the world land fund does not even reach 2%. In our country, more than half of the population lives in cities and towns. One of the characteristics of urbanized areas is the dense concentration of population and production in relatively small areas. The dense location of population and production enterprises in cities leads to pollution of soil, water, air, urban surfaces. Among them, the biggest threat to public health is

air pollution. According to the World Health Organization (WHO), 98 percent of cities with a population of more than 100,000 in developing countries do not meet the organization's air quality standards.

Research methodology

The following methods were used in this research: remote sensing, software processing of satellite images, field research methods, cartographic and aerospace methods.

Atmospheric air pollution is monitored by the Sentinel-5 satellite. This satellite monitors O_3, NO_2, SO_2, HCHO, CHOCHO and aerosols, and monitors the distribution areas. Sentinel-5 images are processed in software such as ArcGIS, QGIS.

At the stations of the Hydrometeorological Services Center in Tashkent, air pollution is recorded online. The amount and level of air pollution sources can be monitored through the website https://monitoring.meteo.uz/ (Figure 1). The method of summarizing the data obtained from this site was also used in the research work.

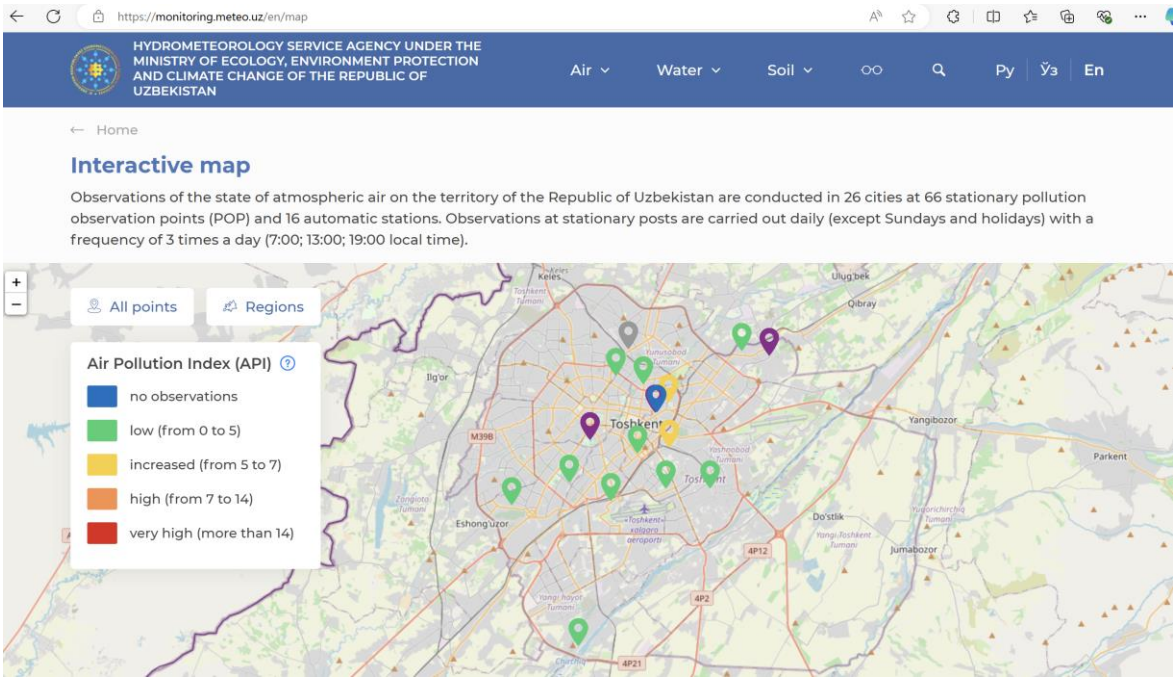

Figure 1. Air pollution monitoring stations in Tashkent city.

Analysis and Results

As we all know, the air of urban areas differs from other areas in terms of its level of pollution. Industrial enterprises and transport contribute the most to urban air pollution.

In cities, 10 sources of pollution are considered the most important (Figure 2, c, d, e). They include gases (CO_2, CO, SO_2, NO_x, HC), compounds and aerosols (heavy metals, dusts, O_3(Ozone) smog, CFL(chlorofluorocarbon)), toxic compounds. Gases are light and invisible, compounds are heavier and visible. Airborne compounds and aerosols are often grouped together because compounds are "dry" while aerosols are composed of water droplets [3]. Ozone smog is formed by the combination of nitrogen oxides, hydrocarbons and solar energy in the atmosphere.

Differences in pollution levels vary greatly by city and by region within cities. Urban air pollution levels sometimes rise or fall rapidly. Countless pollutants produced by

industry and transport are added to urban air, sometimes at higher, sometimes lower levels.

Biofuels - diesel, coal, oil, natural gas - produce various chemical pollutants, most of which are indirect, and are a source of urban air pollution.

Direct pollutant sources produce different pollutants. Transport and industry are the largest sources of air pollution (each emits seven pollutants). Some sources produce only two main pollutants (Figure 2). Various compounds are extracted from 6 sources [4]. CO_2 is emitted from 5 sources, NO_x from 4 sources. CO and CFL are emitted from only one source.

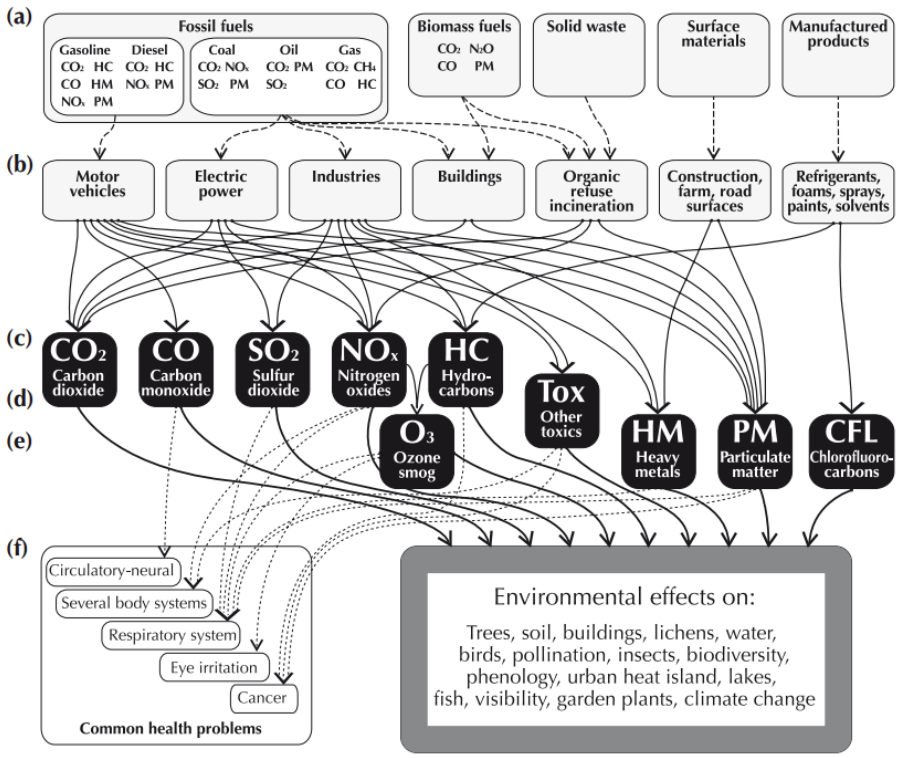

Figure 2. Top 10 urban air pollutants and their sources. c-gases, d-aerosol and gases, e-compounds and aerosols (according to Hartshorne, Moran and Morgan).

The effects of urban air pollutants are diverse, ranging from human health to environmental impacts. The main effect on human health is observed in the respiratory system, and the secondary effect is observed in cancer. Some cancers are found in the lungs, so damage to the respiratory system is a major problem in cities.

The impact of various pollutants on the environment and human health in cities is as follows:

*CO_2.*This gas is related to anaerobes (oxygen-free environment) in the soil, when its amount increases, root growth slows down, soil animals do not develop well, anaerobic bacteria exist and rot. Also, this gas is the main greenhouse gas that causes global warming.

CO. Slows the movement of O_2 in the blood of vertebrates, causing death.

SO_2. It damages the root tissue and causes the plants to die. Acid rain, consisting of sulfur dioxide, chemically corrodes limestone, concrete, mortar, and some sculptures.

NO_x. Nitrogen dioxide (NO_2) is the main problem. N_2O is produced by heating the stove with wood, forest fires. NO_x causes smog [2].

HCs. Hydrocarbons, or volatile organic compounds, include compounds derived from petroleum, including odors from processing. Hydrocarbons can cause smog.

O_3 smog. In the presence of NO_x and HCs when the sun shines, it produces heat and O_2 smog, the intensity of which increases with increasing temperature. When ozone (O_3) is dominant, smog contains peroxidized nitrate, formaldehyde, ketones and other organic compounds. Corrodes metals and rubber.

Toxic compounds. Toxic substances include organic compounds such as benzene, formaldehyde, chloroform, methyl chloride, dioxin, and cadmium. Toxic inorganics include mercury, lead, and arsenic.

Heavy metals. Heavy metals interfere with various microbes and the process of rotting, the development of roots. They also reduce the diversity of aquatic organisms. In many developing countries, lead remains in transportation fuels. For example, the cities of Cairo, Lagos, Cape Town are polluted with lead, which damages the nervous system. In Athens, after the removal of lead from fuels, lead in the air decreased dramatically, and in city parks it slowly migrated to the A horizon of the soil.

Various compounds. Various compounds damage leaves, plant growth, and can inhibit the growth of moss and lichens. Airborne compounds block solar radiation and reflect it back into space. It increases the turbidity of the water, making it difficult for freshwater fish to survive. Large aggregates (diameter >10 μm) include pollen, furnace ash, dust from soil erosion, cement and coal dust. Compounds >2.5 μm in diameter (smaller coal particles, ash residues) play a major role in causing damage to the respiratory system in particular. Very small compounds <1 μm include photochemical smog, cigarette smoke, and automobile exhaust. Plants absorb various compounds from the air, these compounds accumulate on their leaves and are later washed to the ground by rainwater. Vertical vegetation layers and their diversity enhance the filtering capacity of certain deciduous trees.

Chlorofluorocarbon. This substance destroys the Ozone layer in the stratosphere, causing the "Ozone hole". As a result, the penetration of ultraviolet rays increases, such rays are harmful to living organisms.

Some air pollutants, such as NO_x and O_3, increase with temperature, making them particularly problematic in the intense urban heat island. In Thailand, which experiences a heat island of 0 °C to 4 °C, the relationship between increased heat and increased pollutant emissions has been studied. CO_2 did not change with air temperature, while CO increased slowly at the same rate, SO_2 increased sharply when the heat island increased from 2°C to 3°C, particulate matter increased sharply from 3 °C to 4 °C, NO_2 4 °C to 5 °C observed in the heat island [5]. Moreover, as the air temperature increases, various gases can be gradually added, creating a problematic situation.

According to the information of the Hydrometeorological Services Agency, the average air pollution index is 1.17 in Sergeli district of Tashkent city, 3.19 in Yunusabad district, 5.31 in Yashnabad district [10]. In February and June 2024, Tashkent was among the top 5 cities in terms of air pollution. The main pollutant was

contributed by PM2.5 particles.Air pollution in Tashkent is caused by the following factors:

a) the decrease of green spaces in the city of Tashkent; As a result of processing the image taken from the Sentinel 2 satellite in the ArcGis program, it was found that trees occupy 2.85% of the urban area in Tashkent, and grass plants occupy 2.71% of the area. Green spaces are widespread, mainly in the central areas of the city, where high-rise buildings are spread (Figure 3). The number of green spaces is decreasing due to construction works.

b) that due to the incomplete development of the master plan of the city of Tashkent, the weight of the construction works, which are being carried out in a chaotic manner, is high; The increase in the volume of construction is also caused by the increase in the flow of investments and the growth of production.

c) increasing number of motor vehicles and increasing traffic; On average, about 730,000 cars move through the city of Tashkent every day. Also, about 300,000 cars enter the capital from the regions per day [7].

d) An increase in the use of coal in thermal power plants near the city of Tashkent and an increase in the use of fuel oil as an additional fuel;

e) natural factors; Factors such as air currents entering the city of Tashkent bringing various dust particles from the sandy deserts of Central Asia, anticyclones standing over the city.

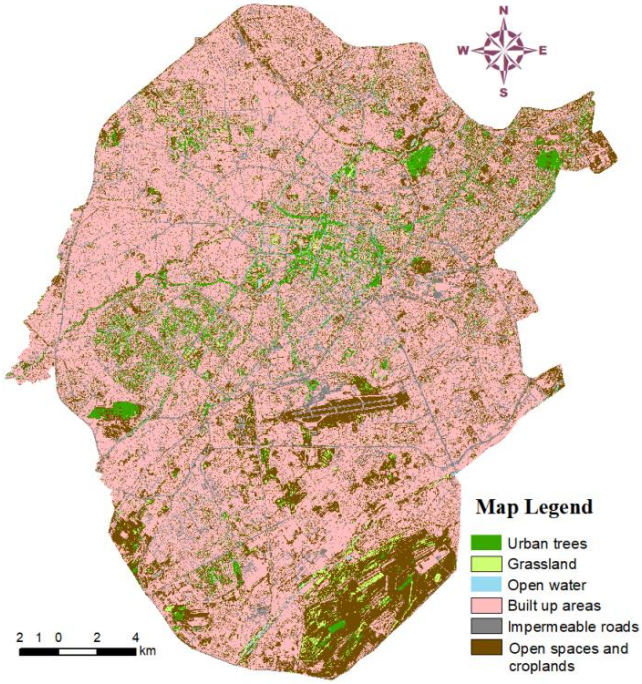

Figure 3. Types of land use in Tashkent city.

Conclusions

Pollutants tend to accumulate on the windward side of the city. In dry air, heavier compounds settle nearby, while lighter pollutants are carried downwind. Urban industrial areas are usually the source of condensation nuclei for cloud formation. In this respect, the level of pollution affects the weather. Precipitation can be higher in cities, on the windward side of cities.

Cities in arid regions are special for several reasons. In such areas, the regional air temperature is usually high, the humidity level is low, and there are a lot of particulate compounds from soil erosion. Pollution accumulates in cities due to limited air circulation. Sufficient solar radiation, in addition to NOx and hydrocarbon emissions from traffic, are the main factors for the development of ozone smog in urban areas. Local construction areas are sources of particulate matter emissions. Continuous release of dust, lack of rain, damages plant covers and leaves. Traffic varies greatly during the day, weekdays and weekends. The level of pollution also depends on the speed of the vehicles. For maximum CO and hydrocarbon emissions, vehicle speeds should be less than 24 km/h and more than 60 km/h. In comparison, the highest NOx pollution occurs at the lowest vehicle speeds and at speeds above 80 km/h. Less connected streets lead to more pollution.

The distribution of particulate compounds is high at the intersection of Serkatnov streets. This is caused by the gas emitted from the traffic and the dust raised from the surface of the streets due to the constant movement of traffic and people. Street dust contains many chemical elements. At the intersection of streets, the nose and lungs are saturated with a mixture of various harmful gases.

It is appropriate to develop the following suggestions and recommendations aimed at reducing air pollution in Tashkent:

1) Increasing scientific research aimed at studying air pollution in the city of Tashkent, developing projects in this regard in international cooperation;

2) To increase the number of green spaces in the city of Tashkent, to design the size of newly renovated green spaces based on the efficiency of cooling;

3) Forming a list of enterprises contributing to air pollution and equipping them with modern cleaning filters;

4) The use of non-conventional energy resources and the promotion of the movement of electric cars. If electric cars are encouraged, they will replace cars that run on more polluting fuels.

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SYNTHESIS AND QUANTUM CHEMICAL ANALYSIS OF NICKEL (II) FORMATE METHREOXYACETATE ZINC COMPLEX COMPOUND

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Annotatsiya. Ushbu maqolada nikel (II) formiati va rux metakrezoksiatsetati asosida kompleks birikmasining sintez qilish usuli keltirilgan. Olingan kompleks birikmaning tarkibi element tahlili usuli yordamida o'rganilgan. Kompleks birikmaning tuzilishi va energetik parametrlari Gaussian 09 dasturi yordamida DFT nazariyasi doirasida kvant-kimyo tahlil qilingan.

Kalit so'zlar: *nikel (II) formiati, rux metakrezoksiatsetati, element tahlili, kvant-kimyoviy tahlil, HyperChem, Gaussian 09*

Аннотация. В статье представлен метод синтеза комплексного соединения на основе формиата никеля (II) и метакреоксиацетата цинка. Состав полученного комплексного соединения изучали методом элементного анализа. Структуру и энергетические параметры комплексного соединения проанализировали квантово-химически в рамках теории DFT с использованием программы Gaussian 09.

Ключевые слова: *формиат никеля (II), метакреоксиацетат цинка, элементный анализ, квантово-химический анализ, HyperChem, Gaussian 09.*

Abstract. This article presents a method of synthesis of a complex compound based on nickel (II) formate and zinc methacreoxyacetate. The composition of the obtained complex compound was studied using the method of elemental analysis. The structure and energy parameters of the complex compound were analyzed quantum-chemically within the DFT theory using Gaussian 09 software.

Keywords: *nickel (II) formate, zinc methacreoxyacetate, elemental analysis, quantum chemical analysis, HyperChem, Gaussian 09*

Introduction

Currently, a comprehensive study of the complexes obtained with intermediate metals based on biologically active ligands is a demanded and rapidly developing area of chemical knowledge, both fundamental and practical. Among the most popular and actively studied biofaolic ligands, acetatic acid derivatives occupy a special place. Intermediate metal complexes obtained on the basis of these compounds significantly affect a number of biologically important metal enzyme processes.

Literature Review

Among the Ni^{II} derivatives (d^8 configuration) containing o-iminobenzoquinone type ligands, the most frequently implemented coordination environment is a four-coordinate squared or slightly distorted planar one. A characteristic feature of the magnetic behavior of all monomeric Ni^{II} squamous complexes based on these ligands is the presence of strong antiferromagnetic exchange interactions “ligand-ligand” in a wide temperature range, which causes the diamagnetism of the compound [1]. The implementation of planar geometry assumes a low-spin ground state of the metal center ($S_{Ni} = 0$) and the presence of a vacant $d_{x^2-y^2}$ orbital [2]. It should be noted that the symmetry of the latter is not suitable for interaction with HOMO, which is a combination of orbitals of two anion radical ligands containing unpaired electrons. In this case, antiferromagnetic exchange between two o-iminobenzosemiquinones can be carried out by participating in the exchange interaction channel of filled d_{xz}, d_{yz} and vacant p_z atomic orbitals of the metal center, which can be transformed by the same symmetry operations as the group NMR (b_g) ligands [3-4]. Previously, it was shown that such magnetic behavior is characteristic of a number of homoleptic Ni^{II} derivatives based on both unsubstituted and functionalized o-iminobenzoquinone type ligands. The energy of the antiferromagnetic ligand-ligand exchange interaction in these coordination compounds is so high that thermal settlement of the triplet excited level does not occur even at T = 298 K, as evidenced by well-resolved NMR spectra of compounds [5]. Based on the above, bis-o-iminobenzosemiquinone Ni^{II} complexes in the low spin state ($S_{Ni} = 0$) can be interpreted as singlet biradicals.

To date, the number of neutral six-coordinate Ni^{II} compounds based on o-iminobenzoquinone type ligands is not so large compared with four-coordinate derivatives. This increase in the coordination number leads to the octahedral geometry of the complex, suggesting a high spin state of the Ni^{II} ion (d^8, $S_{Ni} = 1$). As a consequence, the magnetic behavior of the six-coordinate compound Ni^{II}, containing o-iminobenzosemiquinone ligand systems, may be due to the contribution of exchange interactions of both types: “ligand-ligand” and “metal-ligand” [6]. For comparison, in the case of planar coordination compounds characterized by a low-spin configuration

of the metal center, it is possible to realize magnetic interactions exclusively between unpaired electrons of anion radical ligands. In general, the magnetic behavior of neutral and ionic Ni^{II} o-iminobenzosemiquinone complexes with an octahedral coordination environment is determined by the ferromagnetic nature of the prevailing strong metal-ligand exchange interactions. The ferromagnetic nature of the latter is due to the orthogonality of the d_x^2-$_y^2$ and d_z^2 magnetic orbitals of the metal center and the π orbitals of ligands containing unpaired electrons [7-8].

Research Methodology

The following salts were used to synthesize the complex compound: zinc (II) carbonate, m-cresoxyacetate acid, nickel (II) sulfate, and formiatic acid. Used organic solvents have also been purified and dried by certain methods.

The synthesis of the initial substances was carried out using the following methods: a concentrated solution of metal salt and M-cresoxyacetate acid was mixed in a ratio of 1: 2 moles between them [9].

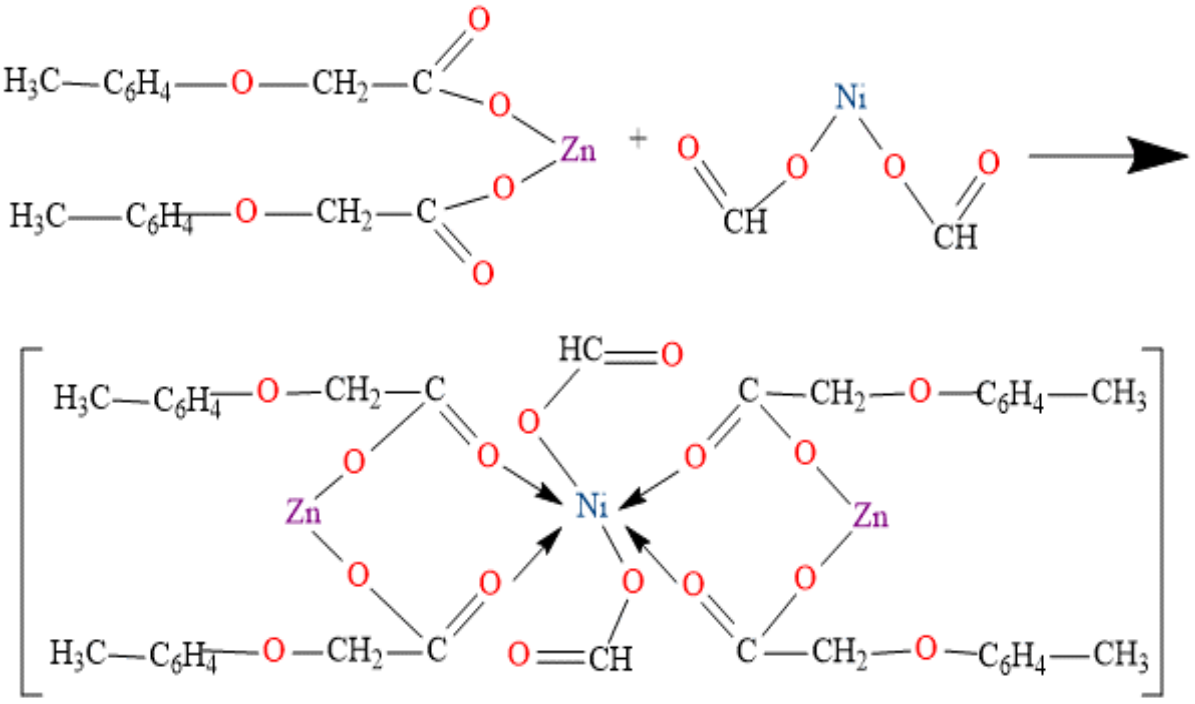
$$ZnCO_3+2CH_3\text{-}C_6H_4\text{-}O\text{-}CH_2\text{-}COOH=(CH_3\text{-}C_6H_4\text{-}O\text{-}CH_2COO)_2Zn+CO_2\uparrow+H_2O$$

Nickel (II) formate was obtained using the following method [10]:

$$NiSO_4 + 2NaOH = Ni(OH)_2\downarrow + Na_2SO_4$$

$$Ni(OH)_2\downarrow + 2HCOOH = 2(HCOO)_2Ni + H_2O$$

Zinc (II) metacreoxyacetate (0.79 g, 0.002 mol) was dissolved in acetonitrile (20 mL). After that, a solution of nickel (II) formate (0.149 g, 0.001 mol) in water was mixed and shaken in a closed container. The resulting dark green reaction mixture was intensively stirred in air at a temperature of 50 °C using a magnetic stirrer. Slow evaporation of the solvent gave a dark polycrystalline product. The resulting product was filtered, washed with acetonitrile and dried at room temperature. Product yield: 0.666 g (71%).



Analysis and Results

The elemental composition of the substances formed in all reaction processes was determined (Table 1).

Table 1. Elemental analysis and some physical properties of synthesized primary substances and complex compounds.

Compounds		$Ni(HCO_2)_2$	$Zn(C_9H_9O_3)_2$	$[Ni(HCO_2)_2{\cdot}2(C_9H_9O_3)_2Zn]$
Ni	Calculated	39,59	-	6,28
	Determined	39,51	-	6,31
Zn	Calculated	-	16,45	13,84
	Determined	-	16,48	13,82
C	Calculated	16,10	54,68	48,56
	Determined	16,16	54,63	48,55
O	Calculated	42,56	24,30	27,26
	Determined	42,53	24,39	27,29

A quantum-chemical analysis was carried out in order to determine the spatial structure of the central atom, energy parameters, upper bond and lower vacant molecular orbitals in the coordination compound obtained on the basis of nickel formate and zinc metacreoxyacetate (Figure 1). An input file was created in the MINIMAL STO-3G approximation in the non-empirical method of the HyperChem 8.07 software, and the optimization was performed in the non-empirical 3-21G B3LYP approximation in the Gaussian 9.0 software. Four variants of the possible coordination structure were considered: nickel formate and zinc methacreoxyacetate with coordination numbers 4 and 6 in a 1:1 ratio and coordination numbers 6 and 8 in a 1:2 ratio. The stability of complex compounds was determined based on the minimum heat of formation [11].

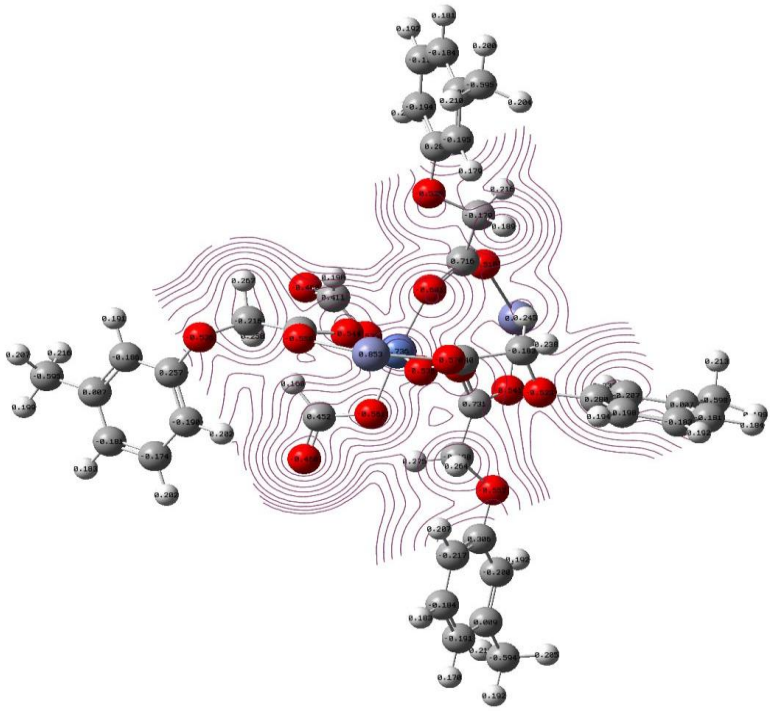


Figure 1. $[Ni(HCO_2)_2{\cdot}2(C_9H_9O_3)_2Zn]$ complex compound molecule charge distribution

As a result, the heat of formation of a complex compound with a coordination number of 4 in a ratio of 1:1 is -163.91 kcal/mol and that of a complex compound equal

to 6 is -55.23 kcal/mol, and the coordination number of the central atom obtained in a ratio of 1:2 is 6 the heat of formation of the complex compound was found to be –7702.25 kcal/mol, and the heat of formation of the compound with coordination number equal to 8 was –128.98 kcal/mol. Thus, we can see the stability of the compound with the coordination number of nickel equal to 6 in the complex compound, the salts of which are obtained in a ratio of 1:2.

In order to predict the reaction centers of electrophilic and nucleophilic processes, electrostatic surface potentials were obtained for optimization in B3LYP/3-21G geometry. Different values of the electrostatic potential on the surface are depicted in different colors, where the potential increases in the following order: red<yellow<yellow<green<blue. Negative, red molecular electrostatic potential (MEP) regions are associated with nucleophilic reactivity, and positive (blue) regions are associated with electrophilic reactivity.

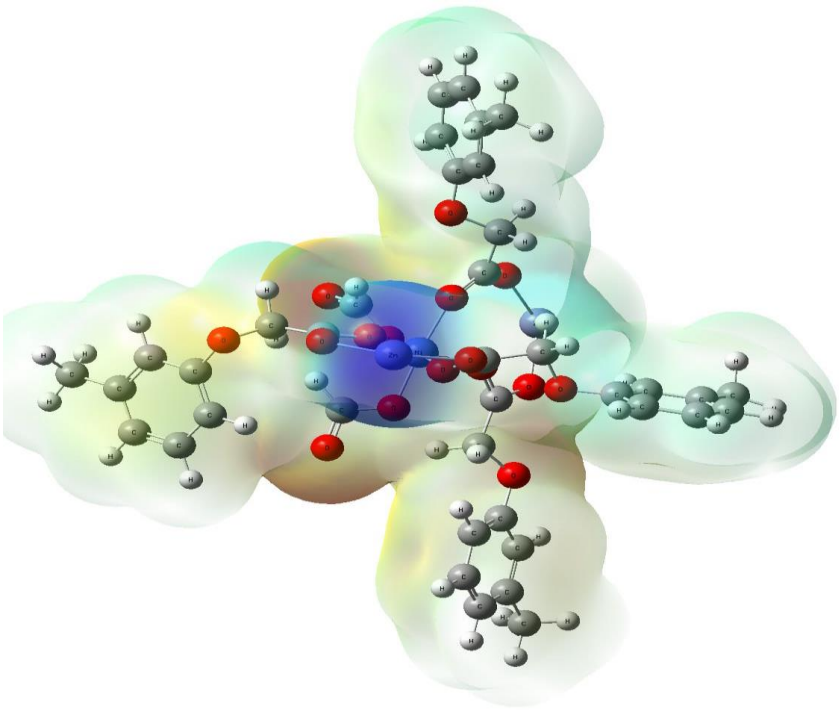


Figure 2. $[Ni(HCO_2)_2 \cdot 2(C_9H_9O_3)_2Zn]$ complex compound molecule electrostatic potential fields.

In the molecules, negative (red) areas were found on the oxygen atom, and positive (blue) areas were found around the hydrogen atoms. Thus, it can be predicted that the electrophilic ligand will be attacked more by oxygen. According to the calculation data (Figure 2), the MEP map shows that negative potentials are located around oxygen atoms, positive potentials are around hydrogen atoms, and in complexes, the potentials decrease, and this means that the electronic field of donor atoms is centered in the center of complex molecules.

Two molecules of methacreoxyacetate are arranged symmetrically to each other in the complex compound. The reason for this is that the size of the molecule is large and it tries to place the molecules as far as possible to eliminate the mutual steric effect. As a result of quantum-chemical calculations of possible complex compounds, their bond lengths were determined (Figure 3).

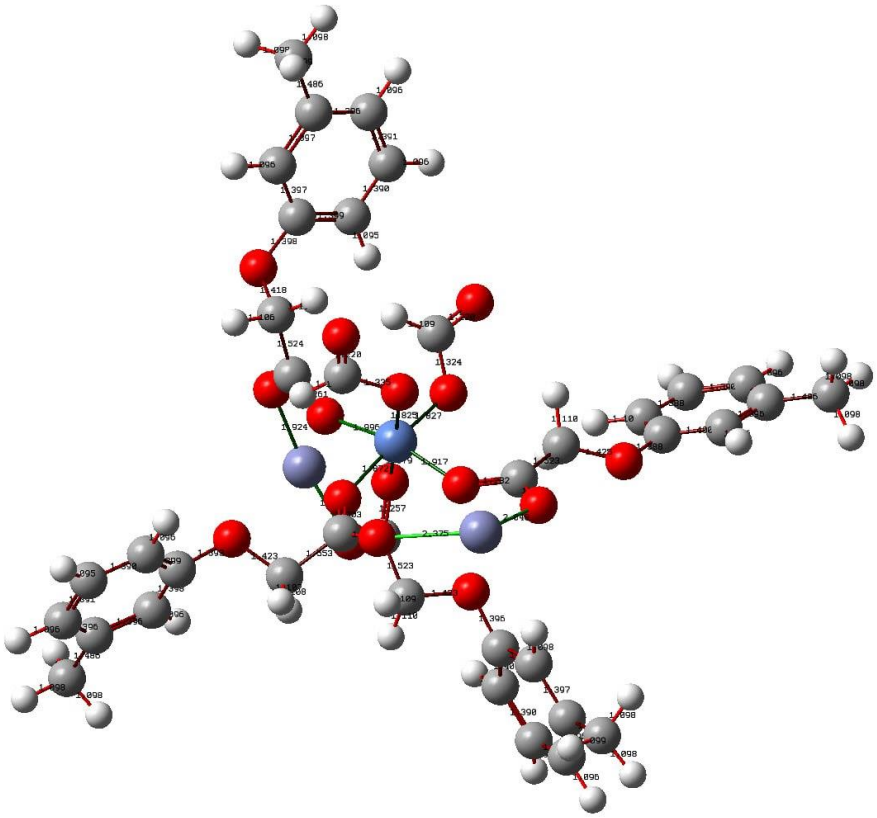


Figure 3. $[Ni(HCO_2)_2 \cdot 2(C_9H_9O_3)_2Zn]$ complex compound molecule bond lengths.

Due to the almost complete lack of localization of high-bond molecular orbitals in the benzene rings of the complex compound molecule, the carbon atoms in these groups do not facilitate coordination through these groups, even if they have the greatest negative value. If we consider the distribution of charges in the higher occupied and lower vacant molecular orbitals of the synthesized compound, we can see that the majority of the main charge distribution is located around the oxygens of the carbonyl group and increases around the coordination node (Figure 4).

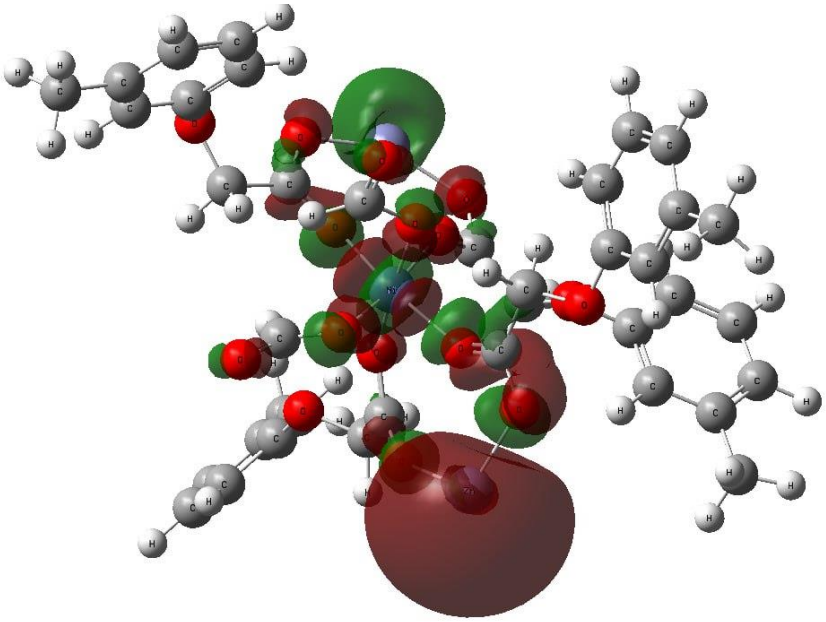


Figure 4. $[Ni(HCO_2)_2 \cdot 2(C_9H_9O_3)_2Zn]$ complex compound molecule HOMO-LUMO fields.

Conclusions

The possible structures of the complex compound synthesized on the basis of nickel (II) formate and zinc methacreoxyacetate were predicted by analysis using quantum-chemical methods. The minimum heats of formation of the complexes of nickel (II) formate and zinc methacreoxyacetate in 1:1 and 1:2 ratios with coordination number 4, 6, 8 were calculated in the possible structures. As a result, it was determined that the lowest energy is formed in the complex combination with a coordination number of 6 in the ratio of 1:2. When the composition of the synthesized complex compound was studied using the method of elemental analysis, it was proved that a compound with a coordination number of 6 in the ratio 1:2 was formed.

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TEMPLATE SYNTHESIS OF NANOCOMPOSITE FILMS BASED ON METAL OXIDES FOR SEMICONDUCTOR SENSORS

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Annotatsiya. Ishda tetroetoksisilan va metall oksidlari asosida templatsiz va templat ishtirokida tabiiy gazni keng konsentratsiya diapazonida selektiv aniqlovchi yupqa gazsezgir nanokompozit plyonkalar hosil qiluvchi komponentlarning tarkibi, optimal nisbatlari va tayyorlash texnologiyasi ishlab chiqilgan, Ushbu plyonkalar asosida tabiiy gazga yuqori sezgir va selektiv yarimo'tkazgichli sensorlari (YaO'S) tayyorlangan. Tayyorlangan sensorlarni signalizatorlar va gazanalizatorlar tarkibida ishlatilishi ularning tabiiy gazning uzluksiz avtomatik ravishda aniqlashdagi yuqori sezgirligi, selektivligi va signalini barqarorligi bilan izohlanadi.

***Kalit so'zlar**: tabiiy gaz, zol-gel texnologiya, gaz sezgir qatlam, yarimo'tkazgichli sensor, tetroetoksisilan, metall oksidlari, polietilenglikol, sezgirlik, selektivlik, titan, kobalt.*

Аннотация. В работе были разработаны состав, оптимальные пропорции и технология приготовления тонких газачувствиетильних нанокомпозитных пленок, для селективной обнаружении природного газа в широком диапазоне концентраций с участием темплата и безтемплата на основе тетроэтоксисилана и оксидов металлов. На основе этих пленок созданы высокочувствительные к природному газу селективные

полупроводниковые сенсоры (ППС). Предложено использование готовых датчиков в составе сигнализаторов и газоанализаторов для непрерывного автоматического обнаружения природного газа.

Ключевые слова: *природный газ, золь-гель технология, газачувствительный слой, полупроводниковый датчик, тетроэтоксисилан, оксиды металлов, полиэтиленгликоль, чувствительность, селективность, титан, кобальт.*

Abstract. The composition, optimal proportions and technology for the preparation of thin gaseous nanocomposite films were developed, which emit components with selective detection of natural gas in a wide range of concentrations with the participation of a template and a template based on tetroethoxysilane and metal oxides, highly sensitive to natural gas were created on the basis of these films and selective semiconductor sensors (SCS) were manufactured. The use of ready-made sensors as part of alarms and gas analyzers is desirable because of their high sensitivity, selectivity and signal stability with continuous automatic detection of natural gas.

Keywords: *natural gas, sol-gel technology, gas-sensitive layer, semiconductor sensor, tetroethoxysilane, metal oxides, polyethylene glycol, sensitivity, selectivity, titanium, cobalt.*

Introduction

With the rapid development of various sectors of the national economy, the demand for monitoring the composition of atmospheric air is increasing. Nowadays, it is important to create sensitive chemical sensors and methods developed on the basis of selective metal oxides for the control of various gases [1, 2]. Natural gas is one of the explosive components of atmospheric air. Therefore, the creation of a new generation of gas-sensitive semiconductor materials for natural gas control using sol-gel technology and the development of gas sensors that selectively detect natural gas from the composition of gas mixtures based on them are urgent issues [3]. Currently, large-scale research is being conducted in the field of creating highly efficient gas-inert materials for thermocatalytic and semiconductor sensors of toxic and explosive gases[4]. The parameters of the semiconductor sensor depend on the composition of the gas sensitive layer of the sensor. In this regard, one of the issues worthy of attention is the selection of the optimal composition of gas-sensitive material components of high-sensitivity sensors that selectively detect natural gas from gas mixtures [5]. Gas chromatographic, electrochemical and thermocatalytic methods and sensors for determining natural gas from gas mixtures have been proposed and developed by the world's leading universities and scientific research centers [6].

Nanocomposite films for sensors of natural gas consist of choosing the optimal conditions of the template synthesis process and developing highly effective gas-sensing materials.

Research Methodology

The development of a gas-inert layer with a controlled structure and properties should be carried out in the following order: selection of conditions for obtaining

composite materials; determine the morphological structure of the composite material; determination of indicators of sensors developed on the basis of composite material. In order to determine such laws, a complex study of the properties of composite materials, including the process of their formation, the morphological structure of films, and its electrical properties using modern analytical equipment is required [7-10].

Analysis and Results

Based on the data obtained from studies on the influence of various parameters on the sol-gel process, the control and management procedure for the synthesis of nanocomposite materials for natural gas sensors was determined.

Optimization of the synthesis process of gas-sensitive films was usually carried out empirically using an experimental design. The most important thing is to choose the initial values of the main factors of the experiment and determine the values of the range of variation. The molar ratio of the starting components TEOS:water:ethanol and hydrochloric acid was varied over a wide range.

Literature Review

Aliphatic alcohols were used as organic solvents. Ethanol, propanol-2 and iso-butanol were used as solvents in the experiments. These alcohols are good solvents for TEOS and most metal salts used as dopants. In the experiments to study the kinetics of the sol-gel process, the ratio of components in the TEOS:alcohol solution was changed from 1:1 to 1:45. Changing the ratio of TEOS and alcohol in the hydrolyzate was done by mixing the required amount of alcohol into the original solution. In the experiments, it was observed that the viscosity of the mixture decreased with the increase in the amount of solvent in all solutions studied. The change in viscosity of the hydrolyzate was 3.10-1.85 cPa when ethanol was used as a solvent for TEOS:alcohol ratio between 1:1 and 1:45, 3.20-1.90 cPa in propanol-2 and 3.30-1, in isobutanol. A change in the range of 95 cPa was observed. At values up to alcohol/TEOS=30, a significant change in viscosity is observed. Changing the alcohol/TEOS from 30 to 45 resulted in very little change in solution viscosity. It was found that the density (r) of the mixture decreased from 0.9783 to 0.8350 (1.172 times) with increasing TEOS:ethanol ratio in the range of 1:1 to 1:45. A significant decrease in the density value is observed when ethanol/TEOS=30 mol. As the alcohol/TEOS ratio increases from 1 to 45, the densities of isopropanol and isobutanol solutions decrease by a factor of 1.129 and 1.169, respectively.

By changing the amount of solvent (ethanol) in the hydrolyzate, the stability of the solution changed. In all investigated solutions (isopropanol and isobutanol solutions), a similar change to the above was observed with an increase in the amount of solvent, that is, an increase in the amount of solvent in the reaction solutions up to a certain value led to an increase in its stability and a slowing down of the hydrolysis process. An increase in the amount of alcohol in the solution leads to a decrease in its stability period. In ethanol solution, depending on the TEOS:ethanol ratio, the stability of the solution varies between 4-18.5 days. The maximum shelf life of the solution corresponds to a ratio of 30-35 tetroethoxysilane/ethanol. A partial decrease in solution stability (up to 17.5 days) was found with further increase in the TEOS:alcohol ratio to

1:45. For the isopropanol solution, this parameter varied from 5 to 20.5 days, and from 6 to 21.5 days for the isobutanol, corresponding to the TEOS:propanol-2 ratio (Table 1). The highest stability for propanol and butanol solutions corresponded to TEOS:alcohol ratios of 1:35 and 1:40, respectively.

Table 1. Effect of solvent composition and amount on stability of TEOS-H_2O-alcohol-HCl mixture.

№	Amount of components in the mixture, mol %				Stability of the solution, in days		
					Ethanol	i-propanol	i-butanol
	TEOS	Water	Alcohol	Catalyst			
1	1	20	1	0,05	4,0	5,0	6,0
2	1	20	10	0,05	6,0	9,0	9,5
3	1	20	20	0,05	12,0	16,0	16,5
4	1	20	30	0,05	18,5	19,5	20,5
5	1	20	40	0,05	18,0	20,5	21,5
6	1	20	45	0,05	17,5	20,0	21,5

Under these conditions, the solution can be used for sensor production for 450 hours. As the alcohol molecular weight increased from ethanol to butanol, the solution-to-gel transition time increased from 18.5 to 21.5 days. By changing the amount of water in the solution, its stability was increased from 5 to 18.5 days. The most optimal ratio was H_2O/TEOS=20, which provided high stability of the solution and complete dissolution of the dopant.

The inclusion of Zn, Fe, Co, Ni, In, Ag and other oxides in the composition of the silicate matrix makes it possible to obtain gas-inert nanocomposites with high sensitivity and selectivity for chemical sensors of combustible gases. Gas-resistant materials based on these metal oxides are promising but little explored.

In the course of the work, the formation of a thin film based on ZnO-containing dopant with the presence of TEOS was considered in detail. TEOS and ethyl alcohol purified by double distillation were used in the experiments. Zinc chloride ($ZnCl_2$) was used as a source of metal oxide. The synthesis of these films was carried out in three steps. Initially, the process of alternating tetraethoxysilane and ethanol was carried out for 30 minutes (solution 1). For this, a certain ratio of TEOS and ethyl alcohol was mixed in a specially prepared test tube. At this stage, 88.0 ml of 96% ethanol was added to 10.0 ml of purified TEOS at a ratio of ethanol/TEOS=30 and stirred for 30 min.

In the experiments conducted to determine the effect of dopant on the change of the properties of the thin layer, the amount of components in the SiO_2:ZnO mixture was changed from 1:0.1 to 1:2.0. The dynamic viscosity of solutions containing dopant (3.8 cPa) is greater than that of solution without dopant (2.1 cPa). The stability of solutions with dopants is less than the stability of solutions without dopants of the same composition. Thus, the addition of ZnO in the optimal ratio of TEOS:H_2O:C_2H_5OH:acid in the ratio of SiO_2/ZnO=2 increases its viscosity and reduces its stability. The change in viscosity of dopant-containing solutions over time is shown in Figure 1, from which we can see the stability range of mixtures containing ZnO.

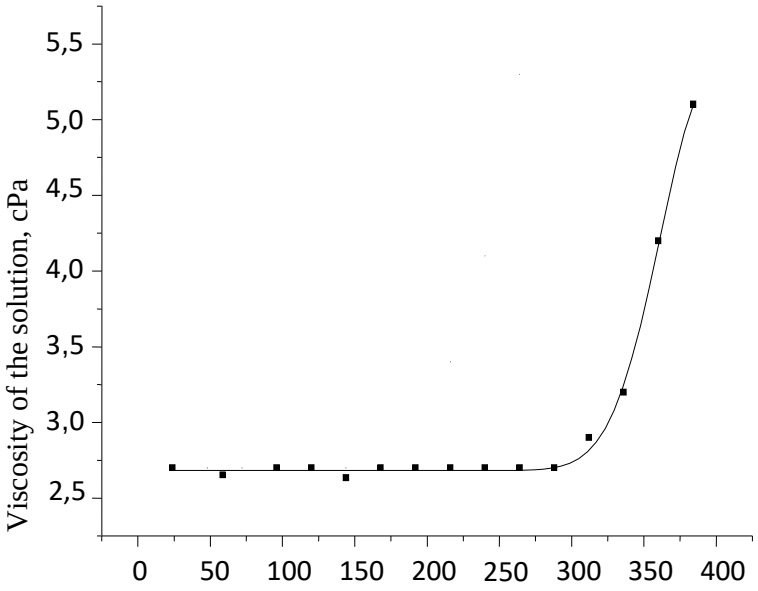

Figure 1. Changes in viscosity of dopant-containing solutions over time.

From further experiments, it was found that the stability is inversely proportional to the amount of dopant, and the stability of the solution decreases with the increase in the amount of the component added to the dopant. Therefore, with an increase in the amount of dopant in the mixture, the period of use of the mixture for making a film decreases.

In order to obtain a gas-sensitive material, the surface of the inert material was covered with a ready-made solution. The resulting film coating adheres tightly to the inert plate surface. Increasing the zinc oxide content above 10% resulted in more crystalline structure and film formation. For example, when a film obtained from a sol with this composition was thermally treated at 450 ℃, the film formed showed a clear crystal structure. When the burning time (thermal treatment time) of the film is extended to 60 minutes, it will have a good porous state.

Experiments have shown that it is important to keep the coating at a temperature not lower than 20-25 ℃ and a humidity level of 55-60% in order to obtain a porous nanocomposite.

The creation of high-sensitivity SODs requires the use of porous GSM with a large surface area. Porous gas-insensitive composite materials obtained by the template synthesis method were used for the development of highly efficient semiconductor sensors of natural gas. PEG was used as a template to obtain a nanocomposite material. From the experiments, during the sol-gel synthesis of GSM with the presence of a template, the amount of PEG added in the initial mixture to form a mesoporous film was determined.

Derivatogram of the obtained $SiO_2/TiO_2+Fe_2O_3$+PEG is given in the figure below and it can be seen 2 sharp changes (strong decomposition) in the range of 77-147 ℃ and 155-645 ℃.

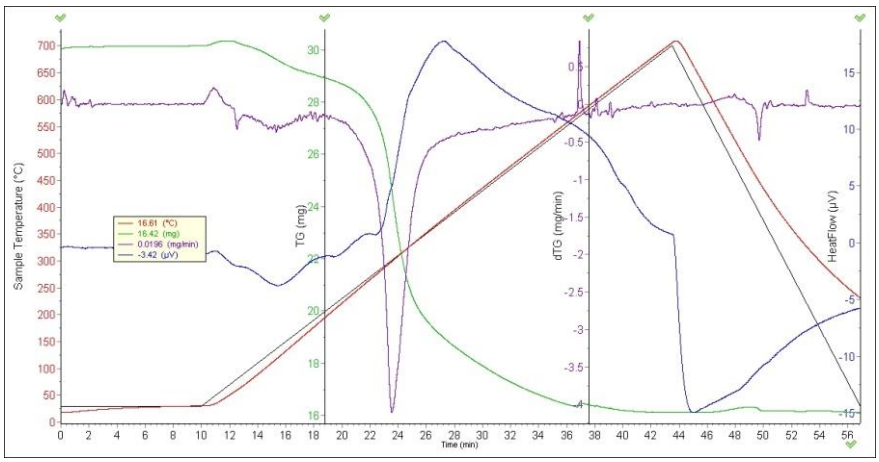

Figure 2. Derivatogram of $SiO_2/TiO_2+Fe_2O_3$+PEG.

Derivatogram of obtained $SiO_2/TiO_2+Fe_2O_3$+PEG analysis shows that intensive decomposition process takes place in 2 decomposable intervals. 40.3% of the decomposition takes place in the 2nd interval. Detailed analysis of the dynamic thermogravimetric analysis curve and DSK curve of the $SiO_2/TiO_2+Fe_2O_3$+PEG composition film, the mass loss in the range of 50-700 ℃ is in the range of 0.485-14.215 g, the decomposition rate of the sample is in the range of 0.137-2.499 mg/min, the energy consumed amount (µV*s/mg)) showed a change in the range of 1.45-1.59.

From the results of derivatographic studies, it is seen that the main mass cooling takes place in the range of 150-580 ℃, in which 46.2% of the main mass, i.e. the mass.

Conclusions

1. The optimal conditions for the synthesis of gas-inert nanocomposite materials for semiconductor sensors based on various metal oxides are suggested.
2. The optimal ratio of the components of the natural gas detecting sensor sensitive element has been determined.
3. Using the sol-gel technology, the possibilities of creating porous nanocomposite gas-insensitive films to flammable and explosive gases are shown.
4. It was determined that the sensitivity of the film containing $SiO_2/TiO_2+Fe_2O_3$+PEG with the presence of template component polyethyleneglycol to combustible components is higher than the sensitivity of the film without template.

Thus, using the sol-gel technology, the possibility of forming porous nanocomposite gas-tight films based on metal oxides against flammable and explosive gases (in particular, natural gas) was demonstrated. Such semiconductor sensor elements can be used in hazardous areas of industrial enterprises and private homes as part of devices that monitor the composition of atmospheric air.

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TYPES OF ANTHROPOGENIC EFFECTS AND THEIR DESCRIPTION IN UZUN DISTRICT

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Annatatsiya. Ushbu maqolada geotizimlar strukturasi, geoekologik vaziyatni shakllanishi, geoekologik vaziyatga ta'sir qiluvchi antropogen ta'sir turlari, tabiiy resurslardan foydalanish davomida tabiat qonunlari hisobga olish haqida so'z yuritilgan.

Kalit so'zlari: *Antropogen, geotizm,geoekologik muammo, geoekologik vaziyat, lalmi dehqonchilik, tabiiy resurs, eroziya.*

Аннотация. В данной статье говорится о строении геосистем, формировании геоэкологической ситуации, видах антропогенного воздействия, влияющих на геоэкологическую ситуацию, учете законов природы при использовании природных ресурсов.

Ключевые слова: *антропогенность, геотизм, геоэкологическая проблема, геоэкологическая ситуация, богарное земледелие, природный ресурс, эрозия.*

Abstract. This article talks about the structure of geosystems, the formation of the geoecological situation, the types of anthropogenic influence affecting the geoecological situation, and the consideration of the laws of nature during the use of natural resources.

Keywords: *Anthropogenic, geoticism, geoecological problem, geoecological situation, dry farming, natural resource, erosion.*

Introduction

Man eats various food products for his needs, wears clothes, builds various structures, all of which he takes from nature. During the use of natural resources, it is necessary to take into account the laws of nature (integrity, stability, dynamics of geosystems, exchange of matter and energy, etc.), natural geographical processes, and reduce the negative impact on nature as much as possible. If nature is used without a plan, without considering the consequences, it causes the origin and development of geoecological problems of various levels. The deepening of geoecological problems, in turn, leads to a violation of the ecological balance.

Research Methodology

The following methods were used in this research: field research methods, literature analysis method, cartographic and aerospace methods were used.

The method of summarizing the data obtained from this Google Earth site was also used in the research work.

Analysis and Results

Anthropogenic impact refers to the impact of human activity on the structure and special activity of geosystems. The anthropogenic impact of human activity on the geoecological situation depends on the natural geographical features and resource potential of the regions. Due to the natural conditions of Uzun district, natural resources, and some differences in the structure and characteristics of the earth's surface, the number and extent of anthropogenic impacts differ from one another in the district. Animal husbandry and harvesting of plants have a relatively greater role in the formation of the geoecological situation, while in densely populated river valleys and towns, the role of anthropogenic influences such as industry, transport, and construction is greater.

Kafirnihon is located in the east of the district, and Surkhondarya is in the west. Harvesting of plants (cutting trees) in forests on the banks of Surkhondarya and the first terrace above the river, irrigation farming, construction on the second and third terraces of Surkhondarya and Kafirenhan rivers. , transport, grazing livestock in the Bobotog mountains, dry farming, picking pistachios from pistachio trees, extracting sap from cruciferous plants are the main types of anthropogenic impact, which affect the performance of special activities, dynamics, and stability of geosystems. .

The types of anthropogenic impact are diverse, and most often, human activity is associated with a certain natural resource. It is related to land in dryland farming, pasture in animal husbandry, minerals in mining, and trees in forestry. These resources change to a certain extent in those areas during human labor activity. Based on their characteristics, the economic activity sectors create the types of natural resource use, various geoecological problems and geoecological situations corresponding to them, and the landscape that represents them. will have indicators[2].

The types of anthropogenic impact affecting the geoecological situation of Uzun district will be considered separately below.

Agriculture. Historically, it is an economic sector that started much earlier and is based on the use of bioresource potential of geosystems. Agricultural sectors rely on farming, animal husbandry, hunting, fishing, and local sources of natural resources.

Mineral fertilizers used in agriculture and pesticides used against pests, as well as various salts in the water used for irrigation, are absorbed into the soil cover and gradually accumulate, reduce the resource potential of the land, and destroy microorganisms that improve the mechanical structure of the soil. harms. These harmful substances used in agriculture seep through the soil and add to the groundwater, degrading its quality. Excess chemicals accumulated in the soil change the biological properties of cultivated plants in a negative way for human health.

The farming sector of agriculture affects the quality of the soil that is the product of the landscapes, the water used for irrigation dissolves mineral fertilizers, pesticides and deteriorates the quality of groundwater, as well as irrigation works on slopes. its introduction causes erosion. The impact of geosystems on the plant component is stronger in the livestock network. Continuous grazing of livestock in one area, use of

pastures without replacement causes a decrease in the species of plants consumed by livestock and an increase in other species.

Collecting plants. The use of plant resources such as making hay and cutting for firewood, extracting sap from deciduous plants also causes great damage to geosystems. Such activities lead to the disappearance of several species of plants. There are 22 plant species in the Bobotog National Nature Park itselfIncluded in the Red Book of the Republic of Uzbekistan. to these,Bobotog Kokboshi-Echinops babatagensis,Abbreviated bluegill -Echinops brevipenicillatus,False desert astragalus -Astragalus pseudoeremophysa,Bukhara astragali -Astragalus bucharicus,Tajik blanket -Ferula tadshicorum,Straight cut -Cousinia stricta,Leaking carrack -Cousinia candicans,Korolkov tulip -Tulipa korolkowii,Tubergen tulip -Tulipa tubergeniana,Holman's nettle -Fritillaria eduardii,Beautiful marak -Salvia insignis,Turned blueberry -Scutellaria colpodea,Rozanov Kovuli -Capparis rosanowiana,Lilac with purple flowers -Cercis griffithii,Bukhara pofanagi -Anemone bucharica, Kesselring’s sphincter -Colchicum kesselringii, Ferula tuberifera, Paulita ovczinnikovii, Hairy tulip - Tulipa lanata, Allium giganteum, Victor’s blackberry - ungernia victoris, Albert shirachi - Eremorus alberti, Scutellaria colpodea [4].

Plants absorb various pollutants. Compared to the forests in the western part of the district, thick forests have formed on the banks of the Kafirnihan river. Forests are of great practical importance, they absorb a lot of dust and clean the air from various impurities. According to data, a 1-hectare forest absorbs 220-280 kg of carbon dioxide and emits 180-220 kg of oxygen. Also, a forest on 1 hectare absorbs 32-63 kg of dust in a year. According to the calculations of many experts, the level of forest cover of irrigated land should be 6-7%, and 30% in the mountains. A. Rafikov believes that this indicator should be 40-50% in mountains and 30-40% in deserts [1].

We can see that the harvesting of plants is observed in the groves of the Surkhandarya river and in the foothills of Bobotog. Trees growing in the forests and foothills are being cut for firewood by local residents. This is causing increased erosion, leaving many animals and birds without shelter, and increasing dust. Algae does not develop in places where trees grow densely along the river. As a result of cutting down trees, algae increase, and the microorganisms contained in the wastewater discharged as a result of erosion kill many bacteria that live in the water.

Collection of medicinal plants, such as namatak, air almond, hawthorn, pistachio, frankincense, kavrak, aqqurai, has been started in Bobotog and foothill areas. If the collection of medicinal plants is not regulated by legislation, their number will decrease and they will be in need of protection.

Industrial objects - according to its distribution, it has a dotted character and cannot be compared with agriculture in terms of the occupied area. However, it is far ahead of agriculture in terms of the intensity of anthropogenic impact on landscapes and their geoecological impact. Due to the lack of large industrial enterprises in Uzun district, the impact of industrial enterprises in the district on the environment is not so great, but the Republic of Tajikistan is close to Uzun district, and the harmful gases emitted from the aluminum plant here, containing hydrogen fluoride, nitrogen and sulfur compounds, reach the territory of the district through wind and water. will come As a

result, orchards, vineyards and other agricultural crops are damaged by toxic chemicals [3].

Transport routes - although it has a linear nature and does not occupy large areas, the harmful gases emitted by cars harm the health of the people living along the road. Also, due to the rubbing of the car wheel on the asphalt, the substance benzopylene causes lung cancer.

Major highways (M-41, R-101 and R-106) pass through the territory of the district, and about 500 cars move in both directions every hour. Cars use a large amount of oxygen and emit carbon dioxide and soot. For example, one car uses as much oxygen in 1000 km as 1 person uses in 1 year. On average, one car uses the same amount of oxygen consumed by 20-30 people in 1 year. (Baratov A. and others, 1980)

Construction from the oldest branches of the economy, but since the second half of the 20th century, the construction of many engineering structures has accelerated. As a result, settlements consisting of anthropogenic elements that do not exist naturally in landscapes - various buildings, irrigation and reclamation networks, transport roads occupy large areas. The number of individual houses in the district is 32,997. Housing compacts rocks that are a component of geosystems, changes the soil cover, flora and fauna in the area they occupy. In general, it has a significant impact on the performance of special activities of geosystems.

Household waste also affects the deterioration of the geoecological situation. If we take into account that 0.7-1 kg of waste is generated per person per day in our country, in Uzun district with a population of more than 185 thousand people, an average of 130-185 tons of household waste is generated per day [5]. Their danger is that polymer products (polymer packages, bags, etc.) rot in at least 50 years, and the harmful consequences increase even more when burning them. A garbage dump has been established in the district, and household waste is collected by "Toza Havo" employees. However, the impact of the landfill on the environment and human health has not been carefully considered. For example, the issues of rainwater mixing with waste and seeping into the ground, the smell of landfills along the wind direction, and the spread of parasitic insects have hardly been studied. Another aspect of the problem is that waste is collected in a mixed manner, even construction and industrial wastes are mixed. That's why garbage cans burn when lit. When looking for a solution to these problems, the most effective way is to establish waste recycling.

Conclusions

If nature is used without a plan, without thinking about the consequences, it causes the origin and development of geo-ecological problems of various levels. The deepening of geoecological problems, in turn, leads to a violation of the ecological balance, therefore, if nature is used taking into account the laws of nature, the level of impact on nature will be less.

It is appropriate to develop the following proposals and recommendations aimed at reducing the level of anthropogenic influence in the rational use of natural resources of Uzun District:

1. Resting pastures from time to time;
2. Development of guidelines for collecting and hunting medicinal plants;

3. Prohibition of cutting down trees and bushes for firewood on riverbanks and meadows;

4. Processing household waste and laying 25 cm thick soil on top of the processed waste;

4. Use of pesticides and various chemical fertilizers at the REM level;

5. Construction of heavy metal dust and gas trapping devices at Tajikistan aluminum plant and control of continuous operation;

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PHILOSOPHICAL ANALYSIS OF ONTOLOGICAL AND EPISTEMOLOGICAL ISSUES IN ISLAMIC TEACHINGS

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Annotatsiya. Jahonda globallashuv davri va sivilizatsiyalar to‘qnashuvi avj olgan davrda islomiy ta’limotdagi ontologik va gnoseologik qarashlarning yuzaga kelishi, rivojlanishi va o‘zining yuksak darajasiga chiqishiga ta’sir ko‘rsatgan omillar, mezonlar va ularning tarixiy-falsafiy mohiyati, teologik qarashlarning epistemologik negizidagi insonvarvarlik, intellektual faoliyatning din va falsafa bag‘rida uyg‘unlashuvi sabablarini o‘rganish dolzarb vazifaga aylandi. Mazkur dolzarb masalalarga bag‘ishlangan maqolada Islom dinida borliqni vujudga kelishi va uning falsafiy mohiyati haqidagi ma’lumotlar bayon etilgan.

Kalit so‘zlar: *islom, din, ta‘limot, dunyoqarash, falsafa, gnoseologiya, diniy gnoseologiya, kreatsionizm, borliq va yo‘qlik, dunyoqarash atomistik tushuncha.*

Аннотация. Факторы, критерии и их историко-философская сущность, гносеологические основы богословских взглядов, повлиявшие на возникновение, развитие и достижение высшего уровня онтологических и теологических взглядов в исламском учении в эпоху глобализации и столкновения цивилизаций в мире. актуальной задачей стало изучение причин гармонии гуманизма, интеллектуальной деятельности в лоне религии и философии. В статье, посвященной этим актуальным вопросам, представлены сведения о сотворении бытия в исламе и его философской сути.

Ключевые слова: *ислам, религия, учение, мировоззрение, философия, эпистемология, религиозная эпистемология, ислам, креационизм, существование и небытие, мировоззренческая атомистическая концепция.*

Abstract. The factors, criteria and their historical-philosophical essence, the epistemological basis of theological views, which influenced the emergence, development and reaching the highest level of ontological and theological views in Islamic teaching in the era of globalization and the clash of civilizations in the world it has become an urgent task to study the reasons for the harmony of humanism, intellectual activity in the bosom of religion and philosophy. In the article dedicated to these current issues, information about the creation of existence in Islam and its philosophical essence is presented.

Keywords: *Islam, religion, doctrine, outlook, philosophy, epistemology, religious epistemology, Islam, creationism, being and non-being, worldviews atomistic concept.*

Introduction

Gnoseological concepts in various forms of worldviews have always existed and will always exist. After all, epistemology is a fundamental part of any picture of the world and any worldview. This expresses the inevitable human aspiration to a priori and integral constructions of the universe and to find out the place of man in them. In accordance with the historical types of worldviews we can distinguish several types of such epistemologies: mythological, religious, philosophical, which, in all their interrelation, represent independent models of comprehension of existence.

Therefore, the main epistemological categories, such as being and nothingness, matter and consciousness, real and ideal, motion, space and time, determinism and some others, began to form already in the mythological worldview. In religion, this process continued intensively, and finally the modern status of an independent sphere of knowledge gnoseology received in philosophy.

Literature Review

The Central Asian theologian Abu Mansur al-Maturidi (d. 332) was one of the first to formulate the basic epistemological approaches (asbab al'ilm) within the framework of cognition of doctrinal problems. Later they formed the basis of a new doctrinal school of Islam, the followers of which today are about half of Sunni Muslims.

The factors, criteria and their historical-philosophical essence, the epistemological basis of theological views, which influenced the emergence, development and reaching the highest level of ontological and theological views in Islamic teaching in the era of globalization and the clash of civilizations in the world it has become an urgent task to study the reasons for the harmony of humanism, intellectual activity in the bosom of religion and philosophy. The need for systematic, synthesis and comparative induction of social importance of ontological, epistemological and theological views of Islamic teachings in international scientific circles is growing.

The President of the Republic of Uzbekistan Sh. M. Mirziyoyev said at the 72nd session of the UN General Assembly, "We consider it the most important task to convey the true humanitarian nature of Islam to the entire world community. We cherish our sacred religion as the embodiment of our ancient values. We strongly condemn those who associate our sacred religion with violence and bloodshed, and we will never compromise with them. Islam calls us to be kind and peaceful, to preserve the original human qualities. I would like to note the invaluable contribution of many prominent figures of the Central Asian renaissance period to Islam and world civilization," he firmly concluded.

Research Methodology

Comparative analysis, expert evaluation, dynamic series, analytical comparison, logical reasoning and grouping methods are widely used in this research. Also, the researches of foreign and local scientists on this topic were analyzed. Official statistics were used in the analysis.

Analysis and Results

According to Islamic teachings, existence is the existence created by Allah. In this regard, the doctrines of unity of existence and unity of existence have been formed. Islamic thinkers developed the doctrine of existence in many ways. For example,

according to Farobiy, the first existence is the eternal God himself. According to Beruniy, the existence that begins with Allah is such a generality that it lies at the basis of everything, so existence is the basis of everything.

In Islam, the creation of existence is explained through the doctrine of "Wahdat-ul-Wujud." Wahdatul-wujud (Arab. - physical unity) is a pantheistic doctrine that believes that there is only one eternal God. According to this doctrine, the physical world, the world of objects, is not real, reality is embodied only in God, and the material world is the light of God. The representatives of the idea of unity of existence (IbnArabi, Mansur Hallaj, etc.) believed that God creates all existence.

Philosophers have long debated and written special works about existence and its manifestations. The interesting ideas of Farobiy, Beruniy, Ibn Sina, Abul Barakat, Fakhriddin Razi, Alisher Navoiy, Makhdumi A'zam and other scholars have been preserved from Eastern thinkers. Abu Nasr Farobi believed that "the only existence consists of 6 stages: 1. The first cause (cause first) - God; 2nd reason - (reason- second) - existence of heavenly bodies; 3rd reason - active mind (al-aql al-faol); 4th reason - soul (an-nafs); Reason 5 - shape (as-surat); The 6th reason is substance (al-modda). The great thinker, the founder of Islamic philosophy, Abu Nasr Farabi (872-950) was the first to use the terms "existence", "existence is obligatory" (wajib ul-wujud) and "existence is possible" (created existence) and was later widely used in the philosophy of Wahdat ul-wujud. elevated the terms to the level of philosophical categories. Farobiy's contribution to the formation of the philosophy of Wahdat ul-Wujud can be noted in the following two cases:

a) Farobiy was a supporter of the "Vujud" (existence) philosophical school, and was also the founder of this school. After all, in his works, the differences between "Vajib" (necessity, necessity), "Possible" (created), as well as issues related to the obligation of existence (Existence) are revealed for the first time.

b) Farobi was the first to speak about the issue of "active and potential (powerful) Mind," as well as the division of human mind into practical (experimental) and theoretical mind. As a result, Abu Ali ibn Sina developed the theory of "emanation of minds from the First Mind."

According to the doctrine of "Wahdat-ul-Wujud" and "Wahdat-ul-Wujud exists" in all beings in the universe, from small particles to huge creatures, the beauty and glory of the one and only God is embodied. Wahdat, "Wahdat-ul-Wujud" or pantheism is popular In the short words of the mystic scholar Reje Arnolds, lexically consists of substance (matter), but in the philosophy of mysticism, the purpose of this term is "kavnu amkon," that is, there is only one being in the entire universe, and that is the creator himself.

Ibn Arabi based the mystical experience characteristic of Sufis in the form of the philosophical system of "Unity and Oneness of Being" (wahdad al-wujud). According to this doctrine, the reason for the creation of the material world is to see its reflection in the things of the material world created by the Absolute, which is outside the universe, is independent (in its own will) and is called Zot, Haq, Ahad and lies in his drive (striving) for self-knowledge. This aspiration urges the infinite and abstract Absolute to manifest (tajalli) within the essences of the world (the world of essences between the Absolute and the material world - barzah) through self-limitation

(taqayyud) and concretization (ta'ayyun). The process of manifestation of the Absolute does not take place on its own, but in harmony with the images of things (manifest fixed) or possibilities (imkonat) that have always existed in this Absolute. The Absolute, realized (realized, fulfilled) in the things and events of the material world, loses its independence (free will) to a certain extent, because the material world has become a necessary manifestation of its existence. The Absolute with its logical proportion (ma'lux) becomes a god (iloh). He has external and concrete names and qualities. As a result, he became an object of worship (prayer) and judgment. At the same time, it remains the only reality, and the material world is its "reflection" (shabah), an illusion, which loses its meaning when there is no relation to its source.

The substance of existence is expressed in Islam as the concept of existence. In Islam, concepts such as wahdat ul-wujud, wahdat ul-majud and wahdat ul-majud were created in Islam.

In Islamic philosophy, ontology was created in the form of doctrines that reflect the essence of divine existence, the essence of God, and in Eastern pantheistic philosophy, it was created in the form of doctrines of unity of existence and existence of unity.

Conclusions

Islamic epistemology, on the one hand, corresponds to all the features of religious epistemology in general; on the other hand, it has distinctive features. Here are some of the common features of religious epistemology:

- All religious doctrines have an epistemological concept formed from worldview postulates that have primarily ethical meaning. Therefore, any epistemological construction, every event, thing, process is important not in itself, but as expressions, symbols of the interaction of the two universal forces of good and evil, which have a deep moral motive;

- religious epistemologies are the most influential compared to other, more tolerant epistemologies. Due to centuries of indoctrination, religious abstractions and symbols have become important components of surrounding reality. Religious narratives are organically embedded in the cultural, linguistic, and mental foundations of a people's existence;

- it is syncretic, since the epistemological maxim is the basis of any worldview construct. This means that all other forms of spiritual mastering of the world: mythology, morality, art, philosophy, science are constantly present in this epistemological scheme.

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ANALYSIS AND METHODS FOR IDENTIFYING TYPES OF VIOLENCE APPLIED TO ELDERLY PEOPLE

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Annotatsiya. Mamlakatimizda shaxsga nisbatan qo'llaniladigan zo'ravonlikni kamaytirish, zo'ravonlikka uchragan xotin-qizlar, erkaklar va keksalarni davlat tomonidan himoyaga olish mexanizmlarini takomillashtirish, ularni himoya orderlari bilan ta'minlash, ijtimoiy hayotda barcha fuqarolar singari xotin-qizlar, erkaklar va keksalarga teng va munosib ravishda jamiyatning teng huquqli a'zosi sifati tinch va farovon hayotda yashash ularning iqtidori, iste'dodini erkin namoyon qilishga keng imkoniyatlar yaratib berish borasidagi ishlarni yangi bosqichga olib chiqish muhim ilmiy va ahamiyat kasb etadi. O'zbekiston Respublikasi Prezidenti huzuridagi Statistika agentligi ma'lumotlariga ko'ra, 2024 yil 1 yanvar holatiga O'zbekistonning doimiy aholisi tarkibida 60 yoshdan yuqori yoshdagilar soni qariyb 3,5 mln kishini tashkil etgan. Bu O'zbekistonning jami doimiy aholisining 9,4 % ga yetgan. 65 yoshga to'lgan va unda katta yoshdagilar esa 2,7 mln ortiq kishini tashkil etadi. Umumiy aholi sonining deyarli o'n foizini tashkil qiluvchi bu aholi qatlamida ham bir qator ijtimoiy muammolar mavjud. Shunday muammolardan biri keksalarga nisbatan zo'ravonlikdir.

Kalit so'zlar: *keksalar, psixologik, jismoniy, jinsiy, iqtisodiy zo'ravonlik, beparvolik, mensimaslik, sovuqqonlik, e'tiborsizlikka asoslangan zo'ravonlik, depressiya, stress.*

Аннотация. Снижение насилия над личностью в нашей стране, совершенствование механизмов государственной защиты женщин, мужчин и пожилых людей, подвергшихся насилию, предоставление им защитных ордеров, качество равных прав женщин, мужчин и пожилых людей в общественной жизни как равные и достойные члены общества, как и все граждане. Жить в мирной и благополучной жизни, создать широкие возможности для свободного проявления своего таланта, выйти на новый уровень важно научно и важно.

По данным Агентства по статистике при Президенте Республики Узбекистан, по состоянию на 1 января 2024 года количество людей старше 60 лет в составе постоянного населения Узбекистана составило около 3,5 миллиона человек. Это достигло 9,4% от общей численности постоянного населения Узбекистана. Более 2,7 миллиона человек старше 65 лет. Эта группа людей, составляющая почти десять процентов от общей численности населения, также имеет ряд социальных проблем. Одной из таких проблем является жестокое обращение с пожилыми людьми.

Ключевые слова: *пожилые люди, психологическое, физическое, сексуальное, экономическое насилие, пренебрежение, пренебрежение, холодность, насилие на почве пренебрежения, депрессия, стресс.*

Abstract. Reducing violence against a person in our country, improving the mechanisms of state protection of women, men and the elderly who have been subjected to violence, providing them with protective orders, the quality of equal rights of women, men and the elderly in public life as equal and worthy members of society, like all citizens. Living in a peaceful and prosperous life, creating broad opportunities for the free expression of one's talent, reaching a new level is important scientifically and important.

According to the Agency on Statistics under the President of the Republic of Uzbekistan, as of January 1, 2024, the number of people over 60 years of age in the permanent population of Uzbekistan amounted to about 3.5 million people. This reached 9.4% of the total permanent population of Uzbekistan. More than 2.7 million people are over 65 years old. This group of people, making up almost ten percent of the total population, also has a number of social problems. One of these problems is abuse of the elderly.

Keywords: *elderly, psychological, physical, sexual, economic abuse, neglect, disdain, coldness, neglect-based violence, depression, stress.*

Introduction

According to the UN's Global Demographic Prospects report, the number of people aged 65 and over is growing faster than any other age group. This means that the proportion of the world's population aged 65 and over will increase from 10% in 2022 to 16% in 2050 [1-2]. By 2050, the number of people aged 65 and over worldwide is projected to be twice that of children under five and almost equal to the number of children under 12. Older people comprise a significant and growing part of the world's population. Today, more than 700 million people are over 60 years old. The reason why the full participation of the elderly in all aspects of social life is becoming an urgent issue in almost all countries of the world is that the elderly are weak, have low work capacity, are in poor health, and need the help of others. , their rights are being violated [3].

Many reforms and measures are being implemented in the new Uzbekistan to honor the elderly and protect them in every way. Several regulatory documents on the social protection of the elderly have been adopted, and the rights and legal interests of the elderly are under legal protection in our country. In particular, the President of the Republic of Uzbekistan № PF-5938 of February 18, 2020, "On measures to improve the social and spiritual environment in society, further support the neighborhood institution and bring the system of work with family and women to a new level," 2021 Decree № PF-6195, dated March 25, "On further development of the system of social support for the elderly and disabled, "Sakhovat" and "Muruvat" boarding houses" [4].

Literature Review

One of the great thinkers of the East, Ibn Khaldun (1332-1406). In his book "Kitab al-ibar" he describes the state policy; according to him, the state policy is not limited

only to the rulers but includes the participation of all subjects. Therefore, all changes in the state are related to the change in the position of not only the head of the state but also the entire society. The state has a specific time frame, determined by the age of three generations. During this period, it goes through five stages of development: the emergence of a new coercive force to replace the previous one; the concentration of supreme power in one hand after the ruler has dealt with all his accomplices who helped him come to power; the prosperity of the state, where order, calmness, and confidence prevail; resorting to violence and despotic governance to suppress opposition; It is a period of state decline and total burden [5].

In Turkic languages, the type of violence is determined according to whom it is used against. But in English, “Violence” is used with special terms, such as to whom it is applied. For example: There are several terms related to domestic violence. For example, “Elder abuse” refers to violence against the elderly, “Neglect” refers to neglect, neglect, coldness, neglectful violence, “Abuse” refers to strong emotional pressure, oppressing and depressing the victim (yelling, insulting, humiliating, mocking, etc.) overtly aggressive violence [6].

The concept of violence as a social phenomenon in conflicts was first scientifically studied in 1973 by the Norwegian sociologist J. Galtung. He considered any influence that limits the ability to perform physical or mental actions to be violent [7].

John Dollard in his “Frustration Theory” believes that the root cause of violent behavior is the obstruction of the purposeful activities of individuals and groups. J. Dollard emphasizes that the lack of resources, wealth, social status, power, security, equality, freedom, etc., leads to a struggle for these resources, and as a result, violence in one form or another appears [8].

S. Huntington pays special attention to the issue of violence in the “Concept of Modernization” and emphasizes the opinion that violence arises as a result of lagging behind the processes of social and economic change in the process of development of political institutions. Therefore, revolutions, coups, uprisings, and political assassinations are typical for transitional societies [9].

Research Methodology

In this article, a sociological analysis of approaches to the detection of violence against the elderly, using content analysis and comparative methods, allows us to determine the manifestations of violence and the specific characteristics of being a victim of violence against these persons.

Analysis and Results

Violence against the elderly is defined as a one-time or repeated action or inaction that causes physical, psychological, emotional, psychological, economic, financial, or social harm to an elderly person. Abuse and abuse of the elderly occurs primarily within a relationship of mutual trust. The elderly put a lot of trust in their loved ones, rely on them, and need their care. The difference between elder abuse and abuse against other persons is that if an elderly person has a pension, income, and assets, the abuse is done in matters related to the ownership or inheritance of these assets. If an elderly person does not have a pension, income, and assets, then violence is committed to hasten the death of such an elderly person.

Such abuse of the elderly has serious physical, psychological, financial, and social consequences, resulting in physical injury, depression, cognitive decline, financial ruin, homelessness, nursing home placement, and premature death. Another negative consequence of elder abuse is the lack of time for rehabilitation. Due to the slow regeneration and metabolism of organs and internal organs of the elderly, many elderly victims of violence die before they can go through the stages of rehabilitation [10].

The scientific literature on elderly physical abuse is called “Physical abuse of the elderly” and occurs when an elderly person is physically harmed by a person caring for an elderly person. In some cases, violence can lead to death, and it has been scientifically defined [11].

Since the respondents included elderly women, when asked questions about sexual violence, all respondents indicated that they had not experienced such violence. In Uzbekistan, based on the mental characteristics of the Uzbek people, it can be said that sexual violence against the elderly is zero among violence.

Sexual abuse is called “Sexual abuse of the elderly” in scientific literature on sociology, psychology, and social work, and it is forced sexual intercourse of an elderly person without consent. This violence occurs through the use of force and, in some cases, without the consent of the elderly due to cognitive impairment [12].

Another common type of abuse against the elderly is psychological abuse. “Psychological violence against the elderly” or emotional violence is a complex phenomenon in various forms. Often, the purpose of this abuse is to instill fear and anxiety in the elderly person. Some of the characteristic signs of psychological abuse of the elderly are depression, stress, talking without looking in the eyes and face when talking, and isolation from family and friends [13].

Another common type of elder abuse is physical neglect or deprivation of needs neglect, leaving an elderly person in a dangerous situation and, for example, starving an elderly person who is bedridden, refusing to give his medicine, neglecting his sanitation and hygiene, etc. Emotional neglect is neglecting the emotional needs of an elderly person. For example, family members do not communicate with an elderly relative and do not talk to them. Medical neglect (eng. medical neglect) is insufficient provision of medical care, prevention, and treatment of diseases to an elderly person under care. For example, children do not bring necessary medicines to their sick, elderly parents [14].

Conclusions

In conclusion, it can be said that violence against women, men, and the elderly is of global importance, and one or another form of violence occurs in all countries of the world. The United Nations, the European Union, the World Health Organization, and UNICEF have adopted international norms regarding the elimination of violence in all forms of violence, and many countries have signed and ratified the conventions, treaties, and agreements of these organizations.

In Uzbekistan, a number of normative legal documents have been adopted by the republican parliament and government regarding the fight against violence, the rehabilitation of victims of violence, and the prevention of violence. Types of violence

against women, men, and the elderly include physical, sexual, psychological, emotional, economic, social, neglect, and neglect.

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THE ROLE OF JADID TEACHING IN THE IDEOSPHERE OF NEW UZBEKISTAN DEVELOPMENT

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Annotatsiya. XX asr boshida Turkistonda yuzaga kelgan jadidchilik harakati tufayli o‘lkada yangi adabiyot, madaniyat, dunyoqarash va yangi siyosat paydo bo‘ldi. Mazkur maqolada ma’rifatparvar islohotchilar Abdulla Avloniy, Mahmudxo‘ja Behbudiy, Abdurauf Fitrat, Fayzulla Xo‘jayevlarlarning faoliyat va ijod yo‘llari tadqiq etilib, ularning bugun mamlakatimiz yangi taraqqiyotini barpo etishdagi roli ochib berilgan.

Kalit so‘zlar: *jadidchilik, taraqqiyot, ideosfera, erkinlik, jamiyat, ta’lim, ma’rifat, najot, axloq, erkinlik, bag‘rikenglik, hamjihatlik.*

Аннотация. В начале 20 века в Туркестане благодаря движению джадидизма возникла новая литература, культура, мировоззрение и новая политика. В данной статье исследуются пути деятельности и творчества просвещённых реформаторов Абдуллы Авлони, Махмудходжи Бехбуди, Абдурауфа Фитрата, Файзуллы Ходжаева, раскрывается их роль в становлении нового развития нашей страны сегодня.

Ключевые слова: *джадидизм, развитие, идеология, свобода, общество, образование, просвещение, спасение, мораль, свобода, толерантность, солидарность.*

Abstract. Due to the Jadid movement that emerged in Turkistan at the beginning of the 20th century, new literature, culture, worldview, and politics emerged in the region. This article examines the activities and creative paths of the enlightened reformers Abdulla Avloniy, Mahmudkhoja Behbudi, Abdurauf Fitrat, and Fayzulla Khojayev, and elucidates their role in shaping the new development of our country today.

Keywords: *jadidism, development, ideosphere, freedom, society, education, enlightenment, salvation, morality, liberty, tolerance, solidarity.*

Introduction

Jadidism is regarded as a movement rooted in both national and universal values. It emerged as an innovative and enduring aspiration that addressed the interests of the indigenous population of Turkestan while fully meeting the needs of social development. The foundation of Jadidism has undergone a complex developmental journey, transitioning from enlightenment to political ideology. This evolution encompasses two distinct stages in its history: the first stage is enlightenment, while the second is political. During these stages, their perspectives on national statehood were formed and refined.

The Jadids' activities, aimed at achieving independence for Turkestan and leading local nations towards social, political, and economic development, were primarily focused on developing the general cultural level of the people based on the demands and opportunities of the time. This included restoring national cultural heritage and advocating for the study of European cultures and experiences, all in pursuit of the goal of achieving independence. The essence of Jadidism was to advocate for the establishment of a national state, emphasizing that independence could only be achieved by lifting the nation out of the swamp of backwardness and superstition. In this regard, their guiding slogans were "Freedom is taken, not given" and "Salvation is in enlightenment".

Research Methodology

Conduct thorough research on the historical context of Turkestan in the late 19th and early 20th centuries, the emergence and evolution of Jadidism as an enlightenment movement and its transition into a political ideology. Gather information from reliable sources such as academic journals, historical documents, and expert opinions.

Analysis and Results

The Jadidist movement prioritized the idea of achieving national progress by revitalizing knowledge and enlightenment and radically reforming the education system under the extremely complex and difficult conditions in Turkestan. To achieve this goal, they established schools and theaters, publishing houses and libraries, as well as newspapers and journals in Turkestan, and sent talented youth abroad for further education. On this matter, President Shavkat Mirziyoyev has remarked: "Today, in the New Uzbekistan, our reforms aimed at creating a just, free, and prosperous society that honors human dignity, a people-oriented state, and a thriving life are fully consistent with and harmonious with the noble ideas and programs of our Jadid ancestors. For this reason, special attention is being given to immortalizing the memory of our ancestors who sacrificed their precious lives for the freedom of our people and the prosperity of our homeland, and to studying and promoting their activities and heritage from a fresh perspective" [1].

Today, thoroughly analyzing the scientific, methodological, and practical aspects of the Jadid philosophy within our national development path, as well as its contemporary impact and the possibilities for utilizing it, is of crucial importance. The increased attention to and need for such research are due to the following factors:

firstly, comprehensive and in-depth study of the philosophical legacy of our Jadid ancestors from both scientific-theoretical and practical perspectives, and on this basis, to elevate Uzbek philosophy to meet the demands of the new era;

secondly, on this basis, to shape our people's modern worldview and reformist thinking as envisioned by the Jadids in the process of building a new Uzbekistan;

thirdly, to educate a new generation of Jadids who respond affirmatively to innovations and to further expand the ranks of reformist intellectuals, thereby nurturing a new generation of reform-minded youth;

fourthly, the need to systematically develop and implement proposals and recommendations on the ways and possibilities of introducing the creative and socionic principles of this process into practice has become a demand of the times [2].

As we all know, the changes and innovations in the spirit of the Jadids greatly inspired the youth of that era. Recognizing the necessity of scientific and intellectual progress for advancement, the Jadids began to act fearlessly. They became advocates for approaching Europe, even if it meant putting their lives at risk.

In this regard, the life and work of the renowned enlightener *Abdulla Avloniy (1878-1934)* has taken a place among universal values as an exceptionally exemplary path for the advancement of independence and enlightenment. The scholar's belief that societal progress must be achieved through enlightenment and education, and that education is a means to cultivate knowledge, moral virtues, and creativity in the youth, is confirmed by his words: "Education for us is a matter of life or death, salvation or ruin, happiness or disaster" [3]. Abdulla Avloniy's perspective on societal renewal, educational advancement, and the development of a well-rounded generation through national and moral education still retains its significance and value in today's period.

One of the major political figures of the 20th century is *Mahmudkhoja Behbudi (1875-1919)*. He saw the development of society on the basis of cultural innovations in society and said: "...our schools, shops, factories, madrasas, and similar institutions are in need of modern reforms. Otherwise, everything will fall apart, and we will be left with nothing but manual labor. To operate a machine, a shop, or a palace, it is essential to understand modern science and contemporary advancements. Otherwise, our property and tools will pass into the hands of those who are better acquainted with worldly knowledge than we are, and this is how things are progressing" [4].

Behbudi anticipated that the society's need for cultural renewal would pave the way for large-scale reforms in the country. For this purpose, the scholar supported the necessity of the press and theater, which serve as a mirror for keeping individuals informed about their time and culture. Behbudi's first Uzbek drama, "Padarkush", was created with this very purpose in mind, revealing how ignorance and folly lead to the disintegration of a family [5]. At the same time, the spiritual and educational views in the enlightened scholar's intellectual legacy have served the cause of our national spiritual and cultural advancement.

Studying the life and creative activities of *Abdurauf Fitrat (1886-1938),* one of the theoretical founders of the Jadid movement, helps illuminate the untapped chapters of our nation's history. Because Fitrat's works continue to hold scientific-theoretical, practical, and educational significance today, contributing to the further development of our country and the elevation of our culture. The progressive ideas promoted by the author, along with his exemplary political activities and civic courage, are not only significant for the period in which the scholar lived and worked but also serve as a unique school of expertise and inspiration for today's seekers of knowledge and enlightenment. Fitrat's entire life was dedicated to promoting knowledge and enlightenment for the freedom and independence of Turkestan, as confirmed by his following words: "...Our nation and people remain at such a low level, and they fall into such dire conditions due to their ignorance. We must cling to education, knowledge, and enlightenment. May our homeland, country, and nation be illuminated by the light of knowledge, and may religion be equipped with both worldly and scientific knowledge" [6]. From these words of the enlightened scholar, it is clear that,

in all of them, valuing the homeland, loving and protecting it, and elevating enlightenment are of primary importance.

In examining Fitrat's thoughts on the freedom of the homeland and the nation, as well as independence, his articles published in the "Hurriyat" newspaper during 1917-1918, particularly the series "Yurt Qayg'usi" (Concerns of the Homeland), hold special value: "My homeland, my Turan! To be separated from you is my death. To die for you is my life... I was born for you, I live for you, and I will die for you. O, sacred hearth of Turkism! Death befalls those who wish for your demise, and hatred is for those who wish to see you fall!" [7]. In today's era of information, Fitrat's views on knowledge, enlightenment, and independence are of crucial importance due to their alignment with the great goal and idea of "From National Revival to National Advancement" in our country.

The ideas and reforms proposed by the statesman and public figure Fayzulla Khodjaev play a significant role in the ideosphere of our contemporary society. They contribute greatly to transmitting the legacy of great scholars, revered saints, prominent statesmen, and undefeated leaders to the younger generation, as well as in strengthening feelings of loyalty to the homeland, national pride, and honor in their hearts. In 1913, F. Khodjaev joined the Jadid movement and recognized that democratic progress in Bukhara could not be achieved without cultural development. He made efforts to spread knowledge, enlightenment, and culture among the population. In particular, based on the five-year plan developed by him, he put forward the following tasks that should be performed in the field of public education:

- to observe the transition to general primary education in cities and the preparations for this transition in rural areas;
- to eradicate illiteracy among as many adults as possible;
- to meet the needs of the national economy for skilled labor as much as possible through the republic's public education system [8].

The idea and philosophy of the Jadids, as well as the Jadid movement and its practices, have become not only one of the fundamental sources for such courageous intellectuals but also an essential guide for the process of intellectual renewal today. For each of us, it has become a model of inspiration and a factor in reinforcing our sense of responsibility, which has become a demand of the times.

The conceptual ideas of the Jadids serve as a fundamental source for contemporary change practices and act as the genetic basis for today's strategies and comprehensive reforms. Because in their political programs, they promoted universal human values, advocating ideas of freedom and liberty, free thinking and a new worldview, justice and independence. This is evidence of the initiatives of the Jadids, which can be the ideological basis for our independence. In the Jadid philosophy, the Eastern values that have been refined over centuries, including our people's spiritual identity, thought processes, way of life, mentality, customs and traditions, principles of tolerance, and aspirations for stability and creativity, are reflected.

During their activities, the Jadids succeeded in bringing about a distinctive change in people's consciousness. In particular, the new-style schools, theaters, libraries, and museums established by them, as well as the newspapers, magazines, and charitable societies formed with the aim of sending the children of Turkistan abroad, awakened

our people from centuries of ignorance and provided immense strength for the national liberation movement. Unfortunately, the establishment of Bolshevik policy in our country and the continuation of colonialist policies in a new form prevented the Jadids from fully realizing the goals and objectives outlined in their programs. However, their noble aspirations have been preserved in the hearts and historical memory of our people and continue to live on. Although they were small in number, they were able to shape a completely new cultural and societal ideosphere. In this sense, the idea of "New Uzbekistan," which is gaining prominence in the ideological sphere of our entire nation and becoming a nationwide movement, embodies the aspirations and longings of our great ancestors. More broadly, it reflects the dreams and desires of our thinkers who laid the foundations for the First and Second Renaissance periods in our national history.

Conclusions

In summary, the ideological-political, social-educational, and legal-moral views advanced by the great-enlightened Jadids continue to serve in establishing principles of tolerance and solidarity among different nations and ethnic groups. Their actions have become a true example for the current generation growing up in the global world. Their lives and courage remind us that the prosperity and well-being we enjoy today were not easily achieved, and they continually call us to safeguard our national independence.

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AUTOMATION OF DIMENSIONAL CUTTING OF A CONTINUOUS PLASTIC BAR OF SOAP

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Annotatsiya. Maqolada uzluksiz sovun plastik brusni avtomatik kesish jarayonlarini yangi takomillashtirilgan konstruksiya orqali amalga oshirish haqida ma’lumotlar keltirilgan. Uzluksiz plastik brusdan bo‘laklangan mahsulotni olishda brusning uzluksiz harakati davomida kesish jarayonini amalga oshirish va kesilayotgan bo‘lak o‘lchamini ta’minlash muammolari kelib chiqadi. Bunda kesuvchi organ bilan plastik brusni sinxron harakatlanishini ta’minlash yoki bu jarayonlarni diskretlash talab qilinadi. Olib borilgan tadqiqotlar natijasida yuqoridagi kesish usullarining bir qator kamchiliklarini inobatga olgan holda kesish o‘lchamlarini va aniqligi, kesish yuzasining perpendikulyariligini yuqori darajada ta’minlaydigan prinsipial jihatdan yangi konstuksiyasi ishlab chiqildi. Yangi konstruksiya tajriba sinov natijalari mavjud qurilmalarga nisbatan kesilayotgan brusning ulchamlarini aniqligini va kesish yuzasining perpendikuryarligi ta’minlandi.

Kalit so‘zlar: *kesuvchi element element, richag, baraban, shnekpress, sovun, sinxronizatsiya, kesish aniqligi, kesish perpendikulyarligi.*

Аннотация. В статье представлена информация о внедрении процессов автоматической резки непрерывной пластичного бруса мыла новой с усовершенствованной конструкцией. При получении штучного продукта из непрерывного пластичного бруса возникают проблемы с реализацией процесса резки при непрерывном перемещении бруса и обеспечением размера отрезаемого куска. В этом случае требуется обеспечить синхронное движение пластичного бруса с режущим органом или дискредитировать эти процессы. В результате проведенных исследований была разработана принципиально новая конструкция, обеспечивающая высокий уровень размеров и точности резания, перпендикулярность режущей поверхности с учетом ряда недостатков вышеуказанных способов резания. Результаты экспериментальных испытаний новой конструкции обеспечили точность размеров режущей кромки и перпендикулярность режущей поверхности по сравнению с существующими устройствами.

Ключевые слова: *режущий элемент, рычаг, барабан, шнекпресс, мыло, синхронизация, точность резки, перпендикулярность реза.*

Abstract. The article provides information on the introduction of automatic cutting processes for a continuous plastic bar of soap with a new and improved design. When obtaining a piece product from a continuous plastic beam, problems arise with the implementation of the cutting process with continuous movement

of the beam and ensuring the size of the cut piece. In this case, it is necessary to ensure the synchronous movement of the plastic beam with the cutting body or to discretize these processes. As a result of the conducted research, a fundamentally new design was developed that provides a high level of cutting dimensions and accuracy, perpendicular to the cutting surface, taking into account a number of disadvantages of the above cutting methods. The results of experimental tests of the new design ensured the accuracy of the cutting-edge dimensions and the perpendicularity of the cutting surface in comparison with existing devices.

Keywords: *cutting element, lever, drum, screw press, soap, synchronization, cutting accuracy, cutting perpendicularity.*

Introduction

One of the most pressing issues at the moment is to improve the technical level of enterprises in the manufacturing process, accelerate the mechanization and automation of production processes, increase the productivity and reliability of technological equipment and devices, and reduce material and energy consumption. Also, one of the important tasks is to increase the production of consumer goods, improve their quality and increase their assortment [1].

The difficulties mentioned above are especially important in the food business. The product-cutting department is one of the departments that reduces productivity and product quality on soap production lines in the food sector. Existing cutting machines' poor dependability and cutting quality result in line stoppages and an increase in the percentage of faulty items.

Literature Review

Raw materials in the form of a continuous plastic brush with a rectangular cross-section are used for the production of soap in enterprises. During the cutting process, a continuous plastic soap bar is formed using a screw press and transferred to the cutting zone.

When obtaining a pieced product from a continuous plastic soap brush, the problems of performing the cutting process and ensuring the size of the piece being cut arise during the continuous movement of the brush. In this case, it is required to ensure the synchronous movement of the plastic brush with the cutting body or to discretize these processes [1-4].

Cases of using both of the above principles are known in cutting devices. In some devices, a discretization method is used, in which a brush of a certain length is taken from the movement zone, and then it is cut into pieces of the required size while at rest. But due to discretization of the work process, there is a need for a large number of processes or complex transmission systems (given in Figure 1). This leads to the increase in the dimensions of the machine and the complexity of the construction.

In other devices, the method of synchronizing the movements of a continuous plastic brush with the cutting element is used. In this case, the synchronization signal is transmitted through the surface of the plastic brush. In these devices, the signal about the speed of movement from the plastic brush is transmitted to the cutting working body through a kinematic chain consisting of chain, friction, gear and other transmissions (Figure 1). As a result, an error in each feed leads to errors in the length

of the piece being cut, the perpendicularity and flatness of the cutting surface.

The fact that the known devices have a number of shortcomings and none of these devices are being developed in our Republic today shows that the issue of creating fundamentally new cutting devices with high cutting accuracy and reliability without the above shortcomings and developing their design principles is one of the important and urgent tasks of today.

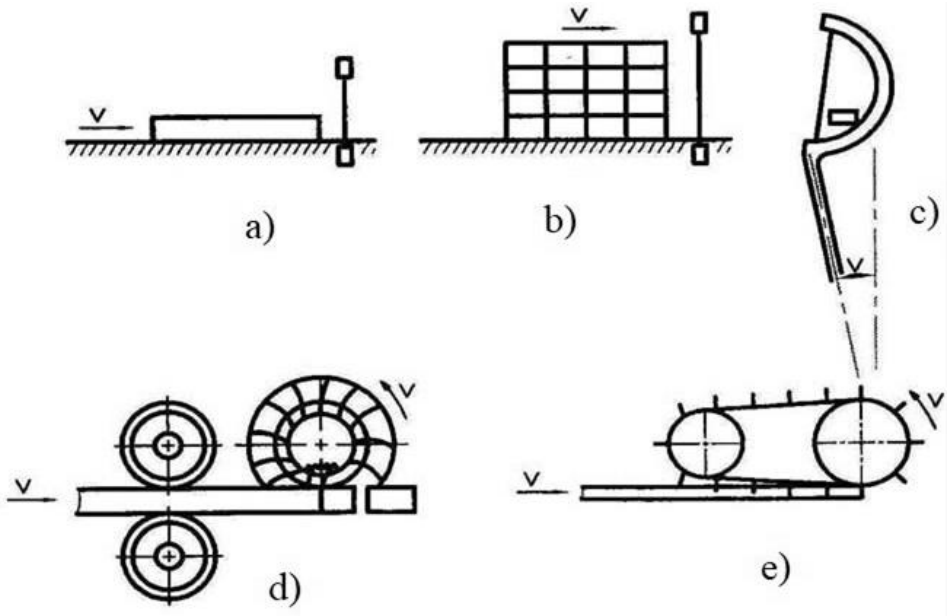

Figure 1. Available cutting methods according to the nature of movement**.**

Research Methodology

As a result of theoretical studies, the main kinematic parameters of the proposed device were determined [5, 6].

Including, the value of the drum radius r, which affects all operating conditions of the device, is as follows:

$$r = -\left[\frac{f}{2} + \frac{\cos\alpha_H (l\cos\varphi_k - A)}{2(1-\sin\alpha_H)}\right] + \sqrt{\left[\frac{f}{2} + \frac{\cos\alpha_H (l\cos\varphi_k - A)}{2(1-\sin\alpha_H)}\right]^2 + \frac{l^2 - f^2 - (l\cos\varphi_k - A)^2}{2(1-\sin\alpha_H)}} \quad (1)$$

Similarly, it was determined that the value of the cutting angle, which is involved in determining other main parameters, is as follows:

$$\varphi = \arccos\frac{1}{l}\left(r\cos\alpha + l\cos\varphi_k - k\cdot r\left(\alpha - \frac{\pi}{2}\right)\right) \quad (2)$$

Due to the determination of the values of the main parameters, it was possible to calculate the coordinates of the profile of the device copier, which ensures the synchronization of the movements of the cutting element with the material being cut.

Currently, together with scientists and talented students of Urganch State University, a new design of a new cutting device has been developed as given in Figure 2 [7] .

One of the main tasks in the design of such devices is to determine the profile of the device copier (Figure 3).

In order to ensure the synchronism of the blade and brush movements during the operation of the cutting device, the levers must be in a position that is constantly resting on the copier of the device through their rollers. The copier profile of the cutting device

was determined analytically and graphoanalytically, in which the algorithms for calculating the coordinates of the base points of the copier and the methods of designing the main parameters of the proposed continuous plastic brush cutting rotor devices were developed.

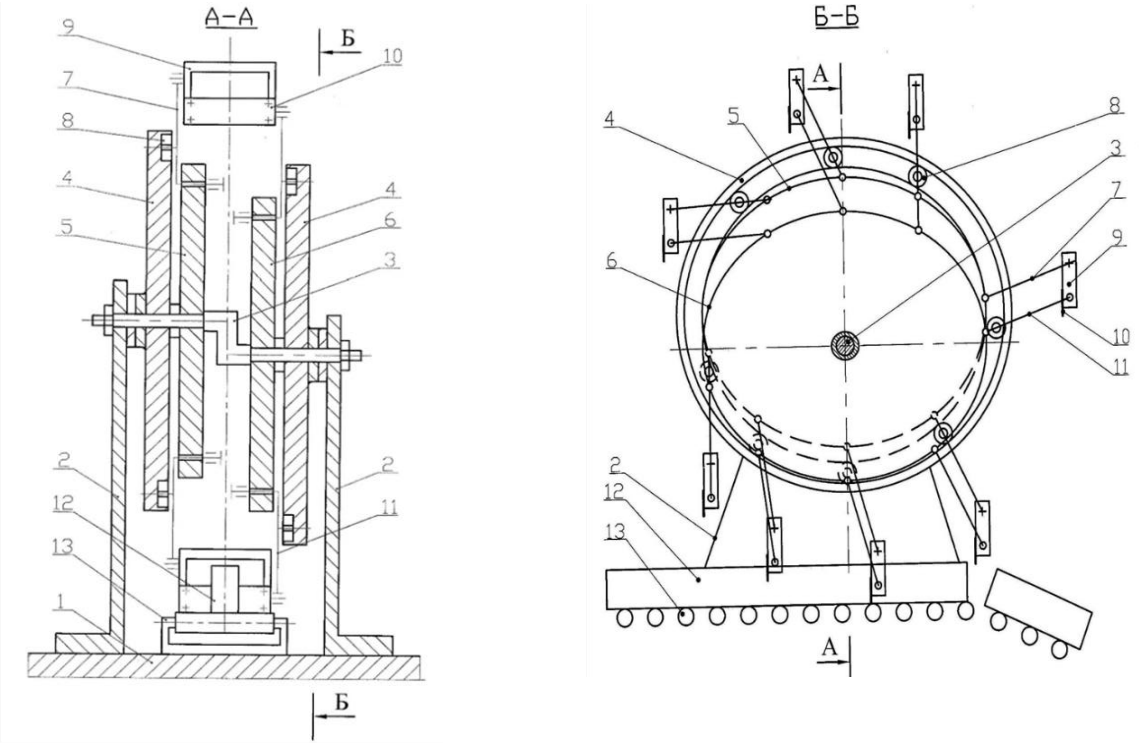

Figure 2. New universal continuous plastic soap bar cutting machine. *1- base, 2- machine column, 3- crankshaft, 4- drum, 5, 6- machine copy, 7, 11- one-shoulder levers, 8- roller, 9- cutting element, 10- cutting blade, 12- plastic bruce, 13-rolgang.*

It is possible to process the copier profile on BB (numerical control) machines, as well as on universal metal cutting machines, which are often used in mechanical workshops of enterprises.

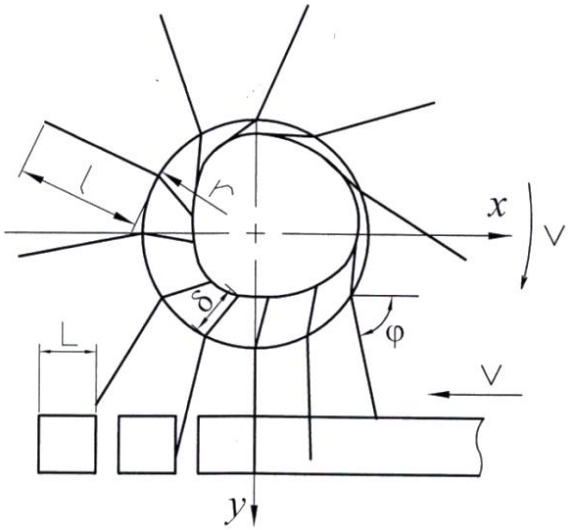

Figure 3. Calculation scheme of the cutting device copier. *L- the length of the cut blade, l- the length of the lever, d- the shoulder of the lever, φ - the angle between the X-axis and the lever, r- the radius of the rotor.*

Analytical and graphoanalytical method of constructing the profile of the device

copier designed for processing on universal metal cutting machines, which are often used in mechanical workshops of oil and oil enterprises, was developed [8].

Sharp variations in the movement of the levers with cutting elements are not possible since the rollers of the levers enter and exit the copier's working profile, as well as move along all of the copier's nonworking sections. That example, the drums and levers must rotate smoothly during the operating cycle. Rapid movement of the copier's levers can result in considerable variations in acceleration signals and values. This has a negative impact on accuracy since it adds more dynamic effects to the gadget [9].

To prevent the detrimental impact of the copier profile on the device's dynamic properties, a way of construction of its non-working portions was created, ensuring smooth movement of the device elements and simplifying copier management. As a consequence, the radii of the circles linking the copier's entry and departure points to the working profile and non-working portions, as well as the locations of their centers, were determined.

As a result of the research, a test model of a new universal rotor cutting device was created from a theoretical standpoint, and it was installed on the production line at JSC "Urgench-oil" soap workshop, where test-experimental work was carried out. Because of its universality, the machine may rapidly be altered to the cutting length required in the creation of home or toilet soap by simply changing the machine's copier [10].

Analysis and Results

The inaccuracy of cutting length, perpendicularity of the cutting surface, and form errors were investigated to compare the accuracy indicators of the novel device with the features of the cutting devices currently used in soap cutting.

According to the test results, the innovative design of the presented soap cutting machine has the following benefits:

a) Eliminating intermediary mechanisms improves device dependability and reduces bulk by 20%.

b) Cutting blade accuracy increases to 1.3 mm or more than double that of the previous device.

c) Cutting surface perpendicularity increased up to 60 minutes or more than twice that of the current device.

d) Cutting surface flatness raised to 0.2 mm or 12 times that of the current device.

Conclusions

The proposed device's kinematic parameters, including drum radius r and cutting angle, were determined through theoretical studies. Copier profile coordinates were calculated to ensure the cutting element's movements are synchronized with the material being cut.

To cut a continuous plastic soap brush, the device's drum must meet the following conditions:

- The torque value must be greater than zero during the cutting process.
- The cutting angle must be less than the critical value.
- Based on the parameters for assuring blade uniformity and cutting plane quality, the blade height should not be less than the value.

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TO CARRY OUT ENGINEERING-GEOLOGICAL PROSPECTING WORKS IN THE MINING OF MINES IN THE TERRITORY OF OUR COUNTRY AND ASSESSMENT OF THE QUALITY OF WORKS

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Annotatsiya. Bugungi kunda mamlakatimiz sanoatini rivojlantirishda foydali qazilma konlarini qazib olish, ulardan foydalanish uchun keng imkoniyatlar yaratilmoqda. Ushbu maqolada konlarni qazib olishda kon inshootida muhandis -geologik jarayonlar o‘rganilib, bu jarayonlarning rivojlanishida asosiy omillarning ta’siri tahlil qilingan. Tog‘ jinslarining fizik-mexanik xususiyatlari o‘rganilgan. Muhandis-geologik qidiruv ishlari olib borilgan va ishlar sifati baholangan.

Kalit so‘zlar: *muhandis-geologik qidiruv ishlari, foydali qazilma konlari, kon inshooti, tog‘ jinslari, fizik-mexanik xossalar, texnologik jarayonlar.*

Аннотация. Сегодня в развитии промышленности нашей страны создаются широкие возможности для добычи и использования месторождений полезных ископаемых. В данной статье изучены инженерно-геологические процессы на горном объекте при разработке рудников, а также проанализировано влияние основных факторов на развитие этих процессов. Изучены физико-механические свойства горных пород. Проведены инженерно-геологоразведочные работы и оценена качество работ.

Ключевые слова: *инженерно-геологическая разведка, месторождения полезных ископаемых, шахтное строение, горные породы, физико-механические свойства, технологические процессы.*

Abstract. Today, in the development of our country's industry, wide opportunities are being created for the extraction and use of mineral deposits. In this article, the engineering-geological processes in the mining facility during the mining of mines are studied, and the influence of the main factors in the development of these processes is analyzed. Physical and mechanical properties of rocks were studied. Engineering-geological exploration works were carried out and the quality of works was assessed.

Keywords: *engineering-geological prospecting, mineral deposits, mine structure, rocks, physical-mechanical properties, technological processes.*

Introduction

Finding, extracting and effectively using underground resources is one of the main tasks in the development of the economy of every country. In the conditions of the market economy, the rational use of any underground resources and replenishment of underground resources is the basis of industrial development.

Exploration and development of mineral deposits are being carried out at a rapid pace throughout our country. In this regard, engineering-geological and hydrogeological studies are being carried out in the North mine together with geological prospecting studies [1, 2].

Literature Review

Many scientists have worked on engineering-geological research and their use. Including, M.D. Braja, G.P. David, W. Kuhn, B.G. Neal, A.R. Harutyunyan, I.L. Bartholomey, V.M. Bezruk, P.B. Babakhanov, A.A. Glaz, A.I. Grot, R.S.Ziangirov, N.P.Zatenatskaya, M.F.Yerusalimskaya, M.O.Karpushko, A.K.Kiyalbaev, A.A.Kirillov, N.A.Klapatovskaya, Yu.V.Kuznetsov, A.D. Kayumov, T.Kh. Qalandarov, S.S. Mordovich and many scientists. The North mine is geographically located at an altitude of 1,400-2,000 meters above sea level in the Surkhan elevation of the South-Western Hisar mountain range. The mine is located in the north-eastern part of the Surkhontau intrusion in the Khandiza mining area and in the area you can find a lot of sedimentary rocks such as Quaternary, Silurian, Devonian, Carboniferous limestones, limestone coal, shale, gypsum anhydrite, sandstone. As ore and ore-bearing rocks in the mine, mainly metamorphic rocks (gneisses) of the Proterozoic period and intrusive rocks of the Paleozoic period (porphyry rheolite and syenite, shale) are found [3].

The Surkhontau uplift has a tectonically complex structure, and the Baikal, Caledonian, Hertsinian, Kimmerian mountain folding periods play a key role in its formation. Due to the fact that the amplitude of tectonic stress during the folding cycles and the direction of plate movement are different from each other, cracks in rocks differ in their propagation characteristics. The fact that the distribution characteristics of cracks are different complicates the area from an engineering-geological point of view.

One of the main tasks is to study the engineering-geological conditions for the safe passage of underground mining operations. Collapse of shaft walls during underground mining is one of the most common and dangerous engineering-geological processes. The occurrence of such events occurs as a result of the different lying conditions of rock cracks and their intersection [3, 4].

Research Methodology

The processes in the mining area largely depend on the amount of precipitation, and due to the arrival of water in the streams in the spring months and as a result of the increase in the amount of atmospheric precipitation, processes such as crushing of rocks and cracking of rocks can be found on the surface of the earth. In the area of the mine, landslides can be found with a surface area of 20 m^2 to 150 m^2, and a thickness of 0,2 m to 1,0 m.

Cracking of rocks in the walls of the mining facility is mainly developed along the angle of 30°-70°. Cracks are mainly formed in the direction of bedding of layers. The

width of the cracks is 1-2 mm, the distance between them is 10-20 cm, and the length is from 70 cm to the one where the tectonic cracks cross the tunnel (6-7 m long). As a result of underground water movements in the cracks of some rocks, the cracks are filled with Quaternary deposits.

Rocks around major tectonic faults are fragmented. Fracture surfaces with irregularly densely distributed fractures are clearly distinguished. Man-made cracks are rare in solid rocks. Around large tectonic faults, strongly deformed 0,3-1,0 meter thick crushed rocks are found.

When monolithic samples are taken from the mining facility and studies are carried out, we can observe the changes in the following indicators [2, 5].

Table 1. Water level and physical-mechanical characteristics of rocks.

Location of sampling	Comparative weight (g/sm^3)	Total weight (g/sm^3)	Water saturation of rocks, (%)	Porosity of rocks, (%)	Nomenclature and composition of rocks
№19 adit 40-45 m	2,72	2,68	0,49	1,29	Crimnic carbonate rocks
№ 19 adit № 113 cut	2,70	2,68	0,39	0,78	Rheolite porphyry
№19 adit № 1drift	2,74	2,70	0,31	0,83	Fractured rhyolite porphyry
№ 114 cut	2,71	2,70	0,20	0,36	Rheolite porphyry

Table 2. Physical and mechanical properties and characteristics of rocks

Location of sampling	Determining the strength of rocks by gravity, MPa	Determination of rock strength, MPa		Looseness coefficient of rocks	The degree of hardness of rocks according to Protodiakonov (%)	Nomenclature of rocks
		Strength in natural state	Strength in water-saturated state			
№1 drift 100 m	2,1	22,8	18,5	0,92	2,7	Fissured shale
№ 2 drift 100 m	4,6	53,2	49,2	0,85	5,3	Carbonate rocks
№ 110 cut	9,8	94,4	85,9	0,91	9,4	Rheolite porphyry
The 13th borehole is 57-60 m	6,5	66,3	59,7	0,88	6,6	Sient Porphyry

The physical and mechanical parameters of the samples taken from the mining facility of the North section are as follows: according to the lithological composition, the carbonate rocks are shale, the rhyolite porphyry structure is medium-grained, the color is light dark gray, and everywhere a small amount of iron oxide has been encountered [5]. The texture is rough, these rocks are chloritized and fractured, quartz and sulphide fibers are found between the cracks. Their specific gravity is from 2,70

g/cm^3 to 2,74 g/cm^3; the total weight is from 2,68 g/cm^3 to 2,70 g/cm^3, the water saturation of these rocks is 0.20-0.49%; the porosity of these rocks is up to 0,36-1,29 %; the strength of rocks in their natural state is up to 51,8-94,4 MPa; It can be observed that the hardness coefficient according to Protodyakonov varies from 5,3 to 9,4 (Table 1-2).

In Khandiza mining area North section 19, mainly carbonate rocks, syenite, rheolite and in some places quartz rocks can be found. When studying cracks in these rocks at a distance of 1x1 m^2, the width is from 1 mm to 15 mm, the length is from 48 cm to 180 cm, and the number of cracks is 1-30. The void ratio of the crack varies from 0,5 % to 7,2 %, the specific crack varies from 1,4 to 7,4 m^2/m, the porosity of the rocks varies from 0,8 to 5,0 % (Table 3). Cracks in this area can be divided into 4 directions (system) in azimuth direction [8].

Table 3. Estimation of the degree of voidness (porosity) of rock cracks in the walls of the mining facility

Learned place	The average distance between cracks per 1m^2 area, ai, sm	Average width of cracks per 1m^2 area, Bi, sm	The hollowness of the slit,(%).	According to M.V. Ratsu, the separation of cracks into classification	Nomenclature of rocks
№ 19 adit	29,6	0,3	1,0	Average	Shale, porphyry rheolite
	23,5	0,2	0,8	Average	
	19,1	0,21	1,0	Average	
	11,5	0,6	5,0	very large	
	18,7	0,2	1,0	Average	
	21,7	0,3	1,3	Huge	
	24,0	0,2	0,8	Average	
	23,0	0,3	1,2	Huge	

In the process of mining mineral deposits, the change in the state of rocks and the increase in the mined depths, as well as the increase in the role of man-made factors lead to the formation of engineering-geological processes. In connection with the change of the mining schemes of drilling and blasting, the tendencies of the emergence of man-made processes complicating the development of deposits are increasing, as a result, it causes the development of various engineering-geological processes. Currently, the reserves of underground resources that can be mined quickly and easily are decreasing at a very fast pace, in order to further expand promising mining areas, it is necessary to carry out mining mainly in difficult geological conditions, by exploring the depths of the lower horizons.

Such processes are formed in places where small deep cracks appear around the crushing zones in the upper part of the zones where ore bodies are formed. Deep cone-shaped deposits are formed inside the developed cracks.

Since 2016, as a result of the underground mining operations carried out during the development of the Khandiza mine, there have been explosions on the surface of the mine. Currently, 6 eruptions have occurred until September 2023. Fractured limestones ranging from light reddish to gray have been exposed as a result of the eruption. Due

to the fact that the relief of the place where the landslides occurred is at a slope of 35º-40º, the landslides are mainly in the south-west and in a small amount in other directions [9].

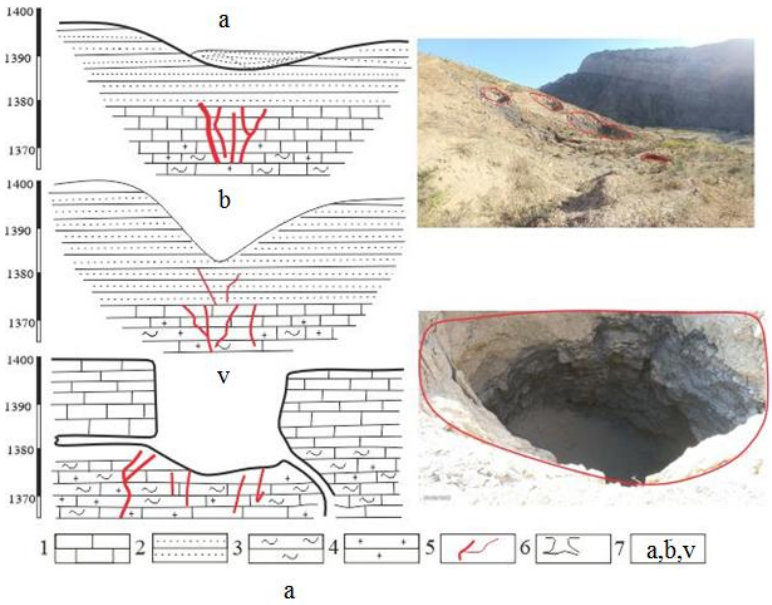

Figure 1. Schematic view of the lungs. 1-limestone and siltstone rocks; 2- quaternary deposits (sandy soils); 3-shales; 4-polymetallic ore body with colchedon; 5-cracks; 6-lungs of suffocation; 7-the development of the lungs, a- the beginning of the earth's surface, b- the initial appearance of the lungs, v- the formation and general appearance of the lungs

In September 2022, in the areas adjacent to the territory of the site, the Neogen, Quaternary sediments were formed on the surface of the earth, this process first created cracks on the earth's surface and underground, and then, over time, earthquakes occurred. In the formation of erosion lungs, first of all, the cracking of clay-like sand deposits occurred, and then it was slowly brought to the process of erosion. The diameter of the pit is 2-10 meters, and the process of pitting has developed slowly..

The depth of the lungs reached 2-4 meters in the initial collapse. When the development of this process was observed, it was found that the diameter of the lungs expanded to 2-5 meters when measuring the lungs (Figure 1).

Analysis and Results

Based on the above information, the coefficient of the crack void is weakly cracked. As a result of man-made works, the crack coefficient has changed in the mining facility of the North section. The width of the crack is thin crack.

A-less fractured area rocks are monoliths with minor fractures and are moderately fractured and fissured. When studies of rock cracks are carried out on $1m^2$ areas, the void ratio of cracks DBK−0,5-2,0 %, the number of cracks is up to 1-3, the porosity level of cracks is up to 1,0 %, changes in engineering-geological conditions are not observed in such places.

B-medium cracked area is found around medium cracked tectonic faults, near large faults and in places where there is no crushing zone, up to 4-5 cracks can be found in $1m^2$ area. DBK−up to 2,5-5,0 %, the porosity of seams is higher than 1,1 %. Cracking and physical-mechanical properties and characteristics of rocks change, new cracks appear, moisture level increases during mining operations.

V-strongly fractured area is strongly fractured, the rocks in this area are strongly fractured, the rocks are mainly found in small block tectonic faults. DBK−above 5,0 %, up to 6-30 cracks can be found in 1m^2, the porosity of the cracks is up to 5.0%. Underground water moves along the formed cracks, as a result of which the strength of mine walls and the slopes of mining facilities decreases, shifts occur along the cracks. This makes it difficult to extract minerals from underground.

In the course of observations, it became known that over time the cracks widened, underground water began to seep through the cracks, and the edges of the place where the earthquake occurred began to collapse.

When analyzing the formation of these processes in the mine, it can be concluded that the impact of the mining technology on the development of this process took place due to the reduction of the intermediate distance to the Quaternary deposit as a result of the mining of ore bodies between solid rocks. The tectonic cracks here developed at an angle of 70º to 80º towards the top. As a result of drilling and blasting, the tectonic cracks widened. Finally, small cracks appeared on the surface of the earth, which widened with the passage of time. Up to now, the depth of the lungs is up to 30-40 m, the diameter is 25-35 m.

Conclusions

In the mine, engineering-geological processes such as the collapse, overturning, and crushing of rocks are widely developed. Collapses and spills in Shtolnya are mainly developed along tectonic faults, the azimuth direction of tectonic faults is mainly 250-360° and the lying angle is 60-80°. Tectonic faults are formed along parallel and diagonal directions, in crush zones and strongly fractured areas.

In the mining process, man-made cracks appear, and later, as a result of blasting, engineering-geological processes lead to the development of overturning, collapse and collapse of rocks.

As a result of the conducted research, the following conclusions were made.

1. The physical and mechanical properties of rocks were classified according to the strength level:

a) to unstable rocks (σ>20-25 MPa) - strongly fractured and broken areas, strongly variable, fragmentary excavations require strengthening.

b) Rocks of average strength (σ=30-65 MPa) - moderately cracked areas, the cracks are filled with other rock. Relatively moderately strong, it is associated with rock fracturing, where the strength of the rock changes through changes in the texture and structure of the rock.

v) strong rocks (σ>66-100 MPa) - places with few cracks, rocks are highly fragmented. In mining operations, they are mostly stable, in some places around the cracks there may be processes such as the collapse and overturning of rocks.

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PERSPECTIVES ON THE ANALYSIS AND DEVELOPMENT OF COMPUTER-ASSISTED DESIGN SYSTEMS IN THE AUTOMOTIVE AND CONSTRUCTION INDUSTRIES

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Annotatsiya. Maqolada turli jarayonlarni loyihalash tizimlarining sabablari, avtomobilsozlik va qurilish sanoatida qo‘llanilishi, ularning imkoniyatlari va zudlik bilan modernizatsiya qilish uchun potentsial yo‘nalishlar muhokama qilinadi. Boshqaruv tizimlarini loyihalashda muhandislar ishini avtomatlashtirishning zamonaviy usullari, tizim ishonchliligini tahlil qilish va optimallashtirish metodologiyalari yoritilgan.

Kalit so‘zlar: *CAD, SaaS, BIM texnologiyasi, 3D skanerlash, ovozli interfeys, 3D navigatsiya, fotosuratlarni skanerlash, axborot tadqiqot texnologiyasining afzalliklari.*

Аннотация. В статье описываются различные системы автоматизированного проектирования, используемые в автомобильной и строительной промышленности, их возможности и потенциальные области для непосредственного улучшения. Охвачены современные способы

автоматизации работы инженеров при проектировании систем управления, анализе надежности систем и методологиях оптимизации.

Ключевые слова: *САПР, SaaS, технология BIM, 3D-сканирование, голосовой интерфейс, 3D-навигация, фотосканирование, преимущества технологии информационного моделирования.*

Abstract. The article describes the various computer-aided design systems used in the automobile and construction industries, their capabilities, and potential areas for direct improvement. Modern ways to automating engineers' work in control system design, system reliability analysis, and optimization methodologies are all covered.

Keywords: *CAD, SaaS, BIM technology, 3D scanning, voice interface, 3D navigation, photo scanning, advantages of information modeling technology.*

Introduction

The automation of design work in the automotive and construction sectors has altered dramatically in the twenty-first century due to the advancement of information technology. Modern programs are emerging in Russia and many other nations to generate high-quality design solutions, shorten the time it takes to develop new projects, boost the productivity of specialists and improve their working circumstances, and reduce resource consumption [1].

Currently, in the automotive and construction industries, there is a need to stress the usage of a significant number of computer design systems. The most common are: AutoCAD, Autodesk Architectural Desktop, ArchiCAD, nanoCAD, KOMPAS, K3-Cottage, Project Smeta CS, and others.

Literature Review

It should be highlighted that these advancements are aimed at both mass and individual production, which significantly expands the scope of their application.

Let’s analyze the most popular foreign programs in the field of automotive engineering and construction:

- *ArchiCAD* - Graphisoft provides a graphic ALT software suite for architects. Designed for developing architectural and construction buildings, solutions, landscape components, furniture, and others.;
- *APM CivilEngineering* - CAD/CAE is designed for civil and industrial construction projects. This system fully takes into account the requirements of state standards, construction norms and regulations related to the preparation of project documents and calculation algorithms.;
- *NanoCAD* - It is a mainframe design system intended for the creation and manufacturing of operational documentation;
- *KOMPAS* - these are computer-aided design systems capable of preparing project and construction documents in accordance with SPDSE and YeSKD series standards;
- *K3-Cottage* - this is a collection of computer programs for designing profiled timber and wooden houses;

- *Project Smeta CS* - designed for the development of project-estimate documents and the determination of the cost of engineering studies for construction;
- *Bocad-3D* - is a powerful CAD system for designing steel and wooden structures;
- *Google Sketch Up* - is an easy-to-use application that makes it easy to create and process 3D model presentations. Almost any kind of presentation construction at different levels may be created quickly and effectively with it. Minutes can be spent creating interiors, furnishings, structures, buildings, and much more. Furthermore, you may generate multi-page papers and presentations using Google Sketch UP. Additional options include the ability to arrange and label multiple scale models on a single page;
- *NormaCS* - This is a technical and regulatory document information-reference system that is valid throughout the Russian Federation;
- *AutoCAD* - is a two- and three-dimensional computer-aided design and drafting system developed by Autodesk [2]. Despite all the powerful design and visualization tools, the main point of a computer-aided design system is to obtain accurate production documents and adhere to accepted standards that are an integral part of the design process. compliance. The Russian industrial company developed the auto. SPDS software to automate routine tasks in the application of various project elements [3];
- *Solid Works* - this is a system of computer-aided design, engineering analysis and production preparation of products of any complexity and purpose, developed by SolidWorks Corporation (USA);
- *MathCAD* - it is an integrated system for solving mathematical, engineering and scientific problems;
- *BCAD* - this is a software project focused on new 3D graphics and CAD technologies, as well as 3D modeling and photo realization, visualization of 3D models. BCAD - for the execution of technical documents, meets the requirements of the standards. Manufacturer - Russia, "Pro pro Group" [6].
- *Monomakh* - the software package is designed for calculation and design of building structures made of monolithic reinforced concrete, as well as buildings with brick walls;
- *IronCAD* - is considered an automated design system for mechanical engineering and provides two- and three-dimensional design. Manufacturer - Visionary Design Systems, Inc., USA [6].
- *SpIn* - it is an electronic reference calculator for designers and construction engineers [2].

Enterprises cannot withstand market competition if they do not prepare new products of the best, quality, and cost in a short period of time. Therefore, they strive to use the great potential of the graphical interface in the automation and interconnection of design and production processes [6].

Analysis and Results

The analysis of the programs presented above shows that the existing design systems in the automotive industry and construction are developing day by day. Although this list does not include construction, production organization, planning

work, transport task optimization programs, calculation of network diagrams and calendar plans, geodetic calculations and many other programs, they can solve a wide range of tasks in construction.

The fact is that the development of ALT in construction is being carried out in the form of cloud-based, so-called SaaS technologies, that is, web services, smart capabilities, mobile devices that allow access anytime and anywhere.

In addition, nanoCADplus 7 version appeared on the Russian market in May 2015, and it has a number of advantages, such as automation of the construction of a number of objects, 3D navigation that allows full access to the created models.

When it comes to the construction of 3D models, it is necessary to clarify on the issues related to the information modeling technology used in the design, direct construction and operation of buildings, structures and other objects. Here are some of the advantages, that we should underpin:

- First of all, it works with a three-dimensional model of the object. In parentheses, we emphasize that software based on BIM technology should not be confused with tools for creating ordinary 3D models. A model built using BIM technologies, more precisely, a set of data related to the size, area or volume of each of its structural elements, as well as any information component (serial number, element location symbol) includes;

- this feature of information modeling allows automation of many stages of the design process. Thus, considerable time can be saved when creating statements and specifications when preparing documents, and all reports are automatically generated based on the availability of elements in the model;

- BIM technology significantly saves time when making changes, any change (for example, moving an element in a plan view) is immediately reflected in all other views that contain this element. At the same time, the area, volume or mass of this element, as well as the values of other elements related to the first one in the compiled statements or specifications, are recalculated.

Reduction of the design time in one specialty is also due to the versatile project function, which is convenient in the first stages of project creation [4].

It should be noted that in construction, ALT is currently widely used not only in the construction of new facilities, but also in the reconstruction of existing ones. In particular, 3D laser scanning technologies allow obtaining a cloud of points (it can be one or several). A prototype is created to create a complete three-dimensional model with all the necessary technical documents and technological documents. This means the emergence of prospects for the use of modern construction materials and technologies for the reconstruction of outdated objects.

From an economic point of view, such technologies fully justify themselves, because their use in ALT can significantly reduce the time spent on preparing documents and technological calculations.

The availability of photo scanning technology makes it possible to obtain three-dimensional models in a cheaper way. This is, for example, the same amount of time to scan an entire city.

Thus, despite the existence of many ALT systems in the automotive industry and construction, this field is rapidly developing and has wide prospects for becoming

systems with artificial intelligence, compatible with other geoinformation resources, and capable of creating innovative construction projects with minimal human intervention [5].

Conclusions

The advancements in computer-aided design systems for the automotive and construction industries have revolutionized the way design work is carried out. The introduction of SaaS technologies, BIM technology, 3D scanning, and photo scanning has significantly improved efficiency and productivity while also reducing resource consumption. These technologies not only save time in design processes but also offer economic benefits. Furthermore, ALT systems are rapidly evolving and hold promising prospects for becoming more advanced with artificial intelligence capabilities and compatibility with other geoinformation resources.

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BASING THE SPECIFIC CHARACTERISTICS OF SALINE SOILS ON THE BASIS OF BUILDINGS AND STRUCTURES IN THE CONDITIONS OF UZBEKISTAN

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Annotatsiya. Bugungi kunda O‘zbekistonning bir qator sho‘rlangan gruntlar tarqalgan hududlarida grunt suvlarining ko‘tarilishi va hududning suv bosishi kuzatilmoqda. Natijada asos gruntlarning mustahkamlik tavsiflari kamayishi sababli ko‘plab bino va inshootlarda avriyalik holati qayd etilmoqda. Mustaxkamlik tavsiflarini kamayishiga asosiy sabab sho‘rlangan gruntlar takibidagi yengil va qiyin eriydigan tuzlarni uzoq vaqt suv tasirida yuvilishi natijasi bo‘lmoqda. Mazkur maqolada bino va inshootlar asosidagi sho‘rlangan gruntlarni filtratsiyali yuvilishida ularning mustahkamligini o‘zgarish qonuniyatlarini o‘rganish bo‘yicha tajribalarni natijalari keltirilgan.

Kalit so‘zlar: *mustahkamlik tavsiflari, bino va inshootlar, sho‘rlangan gruntlar, boshlang‘ich gipslashish miqdori, sho‘rlanish darajasi, tuzlarni ishqorlanish darajasi, mustaxkamlik ko‘rsatkichlari.*

Аннотация. Сегодничная дня наблюдается подъем грунтовых вод и подтопление территории в ряде районов Узбекистана, где разбросаны ряды засоленных грунтов. В результате из за снижения характеристик прочности грунта основания многие здания и сооружения находятся в состоянии обрушения. Основная причина снижения характеристик долговечности - результат длительного вымывания легких и труднорастворимых солей в засоленных почвах. В статье представлены результаты экспериментов по изучению закономерностей изменения прочности засоленных грунтов на базе зданий и сооружений при фильтрационной промывке.

Ключевые слова: *характеристики прочности, здания и сооружения, засоленные грунты, степень засоления, степень щелочности солей, показатели прочности.*

Abstract. Today, there is a rise in ground water and flooding of the area in a number of areas of Uzbekistan, where a number of saline soils are scattered. As a result, due to the decrease in the characteristics of the strength of the base soil, many buildings and structures are in a state of collapse. The main reason for the decrease in the characteristics of durability is the result of long-term washing of light and difficult-to-dissolve salts in saline soils. This article presents the results

of experiments on the study of the laws of change in strength of saline soils based on buildings and structures during filtration washing.

Keywords: *characteristics of strength, buildings and structures, saline soils, amount of initial plastering, degree of salinity, degree of alkalinity of salts, indicators of strength.*

Introduction

Nowadays, large-scale construction work is underway in our country. The projecting and construction of buildings and structures in complex climatic conditions require specific researches. Engineering-geological surveys on soil-based sections with high humidity are carried out according to a special program specified in the terms of reference. The software and terms of reference are developed jointly by the project and exploration organizations. The materials obtained as a result of the search should, in general, allow you to:

1. Quantitative assessment of the stability of the foundation;
2. Predict the value and duration of the subsidence of the base in the consolidation process.

In general, these materials should be evaluated to ensure that the high-moisture layer can be used as the lifting base material.

The program can be edited after receiving the current information by the project organization during the search.

In the projecting and construction of buildings and structures in complex climatic conditions, engineering-geological surveys can include the following types of work:

1. Collection, analysis and summarization of search and previous years materials;
2. Obtaining and decoding aerospace survey materials;
3. Recognition inspection in conjunction with aerial and route observations;
4. Crossing mountain carvings;
5. Geophysical study of the area;
6. Field inspection of soils;
7. Hydrogeological research;
8. Stationary observations;
9. Study of soil and water in the laboratory;
10. Predicting possible changes in engineering-geological conditions;
11. Processing of materials in the room;
12. Preparation of technical report (conclusions).

Literature Review

When compacting soils to ensure the stability and strength of the foundation of buildings and structures, their moisture is restrengthened if their humidity is less than the optimal humidity, if the humidity is less than the allowable, then the soil is additionally moistened.

Soils with more than the allowable level of moisture should be dried: artificially sanded, dry sprinkled soils burnt, adding inactive sediments, laying a water-absorbing or permeable layer. as well as active additives (lime, gypsum, volatile ash, etc.) are used to dry the muddy soils at the base and top of the pavement.

It is necessary to regular monitor the management of water and heat in the area of buildings and structures.

Research Methodology

In collecting, analyzing and summarizing the research materials of previous years, it is necessary to pay attention to the history of development of geology of the region in the Quaternary period and data on the analogy of the district. Special attention should be paid to the generalization of data on anthropogenic impacts leading to groundwater level rise and swamping in the construction area, as well as the development of swampy, lake, lagoon, alluvial and mixed genesis deposits during route monitoring.

It is necessary using different methods of geophysical research in the study of the strength of soils in the maximum volume to study the distribution and thickness of soils in high humidity, as well as in the upper part of the surface.

Processing of search materials in the room should be carried out during the field work for timely editing of the survey, as well as in the process of drawing conclusions to obtain information about the high-moisture soil layer at the base of the projected lift.

The lightest high-altitude technique should be used when crossing mountain ridges. Drilling wells should be operated on a low-volume, lightweight mobile drilling rig, using a pipe if necessary. Sampling is performed manually to determine the physical properties of highly moist soils in the laboratory. Monoliths are obtained with special soil receivers to determine the deformation and strength characteristics of high-moisture soil in the laboratory. To preserve the natural structure of the monoliths, they are obtained in a metal-walled virgin wall device.

The main tests for the study of highly moist soils in the field are carried out with conical-tipped probes and a rotary cutter, in addition to which a stamp and a pressiometer.

Data on the presence of high-moisture soils, their properties, distribution and properties are collected taking into account the data of previous years and the construction experience in the given area. It is necessary to use aerial photography and space survey data. In the absence of sufficient information on the distribution, genesis, thickness, composition, condition and properties of soils, as well as hydrogeological and geomorphological conditions of the study area, a reconnaissance search is established.

Analysis and Results

The composition and scope of exploration work in the plan and depth according to RST Uz 20522-95 to distinguish engineering-geological elements, normative and calculated values of soil properties, including strength and deformation characteristics; hydrogeological measurements, measurements of the intensity of development of geological processes, as well as the aggressiveness of groundwater should be sufficient to determine. It is recommended that the scale of engineering-geological surveys be 1: 10000-1: 2000. A scale of 1: 1000 and smaller can be obtained based on the search program, respectively.

The results of geophysical studies of soil thickness at high humidity first supplement the data obtained during the reconnaissance study on the inhomogeneity of its structure, the direction and velocity of groundwater, the variability of physical and mechanical characteristics of soils at high humidity.

The main types of work to be carried out at this stage of the project are: engineering-geological survey, route monitoring, geophysical surveys, sampling of wells and drilling of wells on the ground with high humidity. It is proposed to carry out engineering-geological survey on a scale of 1: 10000-1:5000. Electro - intelligence and seismoacoustic profiling, georadiolocation are proposed as the main method of geophysical research. Drilling wells will be drilled in the form of a 50x50 m net, depending on the size of the study area, based on aerial photography, at a distance of 150 m on both sides of the route axis. Samples are taken from high-moisture soils every 0.5-1.0 m in depth when passing sounding drilling wells.

Materials on the hydrogeological order of the stratum are collected. Salinity often accumulates salts of sulfuric, hydrochloric, and carbonic acids, and in some cases, sodium and potassium salts of nitric acid in the desert. This is very harmful for most species.

The main cause of salinization is the rising and evaporation of mineralized groundwater near the surface. In this case, the salts gradually accumulate in the upper layers and surface of the soil. The groundwater level at which these processes take place and strong evaporation begins is called the critical depth. To stop salinization, the groundwater level should be constantly lowered from this point, i.e. by draining from the critical depth.

Depending on the chemical composition of the salts, there are soda, sodasulfate, sulfate, sulfate chloride, chloride sulfate, chloride and other salinities.

Conclusions

The chemical composition of salts in soils depends on the chemical composition of the groundwater and surface water moving in them. Natural waters (groundwater and surface water) form solutions enriched with various chemical elements. Their chemical composition is formed under the influence of atmospheric precipitation and the "alkaline melting" of rocks, evaporation, ion exchange, ion absorption, gases, organic compounds and organisms, and other physicochemical processes.

The chemical composition of groundwater is formed mainly due to the slightly soluble salts in the soils dispersed in the aeration zone. The amount and composition of the components in water depends on many factors, mainly the distribution of some elements in the earth's crust, their solubility in water under this temperature and pressure.

Most chemically formed rocks are well soluble in groundwater. Among them, chloride, sulfate and carbonate, alkaline compounds are common. The solubility of salts depends on the initial chemical composition of the solvent water, the temperature of the medium, the speed of movement of the water [2].

The degree of salinity of the soil is determined by the total amount of harmful salts (gypsum, minus the amount). According to this sign, saline soils are weak (harmful salts 0.1-0.2%), moderate (0.2-0.4%), strong (0.4-0.8%), very strongly saline (saline

soils), More than 0.8%). Natural saline soils are divided into chloride, sulfate chloride, chloride sulfate, sulfate, sodasulfate, sulfate, chloride soda, soda, sulfate or chloride hydrocarbonate (alkaline earth elements) saline soils according to their chemical composition (salinity type).

Saline soils of different quantities and compositions are found in different natural regions of Uzbekistan. The most common salts involved in salinization are: NaCL, $Na_2SO_4 \cdot 10H_2O$, $MgSO_4 \cdot 7H_2O$, $MgCL_2 \cdot 6H_2O$, $CaCL_2 \cdot 6H_2O$, $NaHCO_3$, $Na_2CO_3 \cdot 10H_2O$, $CaCO_3$ and $CaSO_4 \cdot 2H_2O$.

The content of lightly soluble salts in soils varies widely. The amount and type of lightly soluble salts in the soil determine its physical and mechanical properties. To assess correctly the salinity of soils, it is necessary to count a complex of key natural factors affecting salt metabolism (amount of precipitation, climatic regime, etc.). In addition slight/ soluble salts, saline soils contain large amounts of gypsum and carbonates, as mentioned before.

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OPTIMIZING PROJECT TIME WITH AUTOMATED DESIGN SYSTEMS IN MODERN MECHANICAL ENGINEERING

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Annotatsiya. Axborot texnologiyalari sohasidagi yaqin kelajakdagi eng dolzarb muammo bu mahsulotlarni loyihalash, ishlab chiqarishni texnologik tayyorlash va ishlab chiqarish bosqichida mahsulotlarni elektron tavsiflashdir. Sanoat korxonalari mahsulotlarni loyihalash, ishlab chiqarish va ulardan foydalanish uchun mutlaqo qog'ozsiz texnologiyaga o'tishlari kerak.

Kalit so'zlar: *avtomatlashtirish, dizayn, tizimni boshqarish, dasturiy ta'minot xavfsizligi, modellashtirish, muhandislik echimlari, texnik echimlar, ishlab chiqish, badiiy intellekt, matematik usullar, optimallashtirish, funksionallik, iqtisodiy foyda.*

Аннотация. Наиболее актуальной проблемой в области информационных технологий в ближайшем будущем является электронное описание продукции на этапе проектирования, технологической подготовки производства и изготовления продукции. Промышленные предприятия должны перейти на полностью безбумажную технологию проектирования, производства и использования продукции.

Ключевые слова: *автоматизация, проектирование, системное управление, безопасность программного обеспечения, моделирование, инженерные решения, технические решения, разработка, художественный интеллект, математические методы, оптимизация, функциональность, экономические выгоды.*

Abstract. The most pressing issue in the field of information technology in the near future is the electronic description of products during the design phase, technological preparation for production, and product manufacturing. Industrial firms must move to completely paperless technology for product design, manufacturing, and use.

Keywords: *automation, design, system management, software security, modeling, engineering solutions, technical solutions, development, artistic intelligence, mathematical methods, optimization, functionality, economic benefits.*

Introduction

Recently, the most advanced approach of computer-aided design is the creation and enhancement of an object project utilizing sophisticated three-dimensional computer modeling technologies. Using modern design technologies, it is feasible to develop multidimensional parametric and dynamic models and test their features and behavior on a computer before manufacturing, considerably reducing project errors and speeding up the design process [1-6].

The design stage is one of the most critical steps in engineering product design. Its importance plays a vital role not only in the formulation of the mental image of the future product at this stage, but also in the creation of mathematically accurate geometric models of specific parts during the design stage and in the subsequent phases of the product life.

Literature Review

At present time, all available automated design applications are typically classed based on their functional completeness. On this basis, it is conditionally classified into three stages. The lowest level contains programs that use 2D models in the form of drawings and sketches. Mid-level software solutions enable you to generate a three-dimensional geometric model of a relatively simple product, primarily by modeling a solid body. Surface modeling is a feature of the most capable design and manufacturing software. They are designed to construct products with complex shapes (planes, cars, household appliances, etc.) [1-3].

Research Methodology

Mid-level engineering CAD systems are geometric modeling tools that allow you to manipulate shapes in three dimensions. The most popular graphic editors include AutoCAD, KOMPAS, SolidWorks, and others (Table 1).

Table 1. *Medium-level mechanical engineering CAD systems.*

Manufacturer country and company	**Autodesk, USA**	**Siemens PLM Software, USA**	**Dassault Systems, USA**	**АО «АСКОН», RUSSIA**	**АО «Топ Системы», RUSSIA**
Programs	Inventor Series, Inventor Professional	Solid Edge	Solid Works	КОМПАС-3D	T-Flex CAD 3D

Analysis and Results

The technologies were developed to address issues connected with the usage of physical models throughout the design process. These systems simulate the process of creating and modifying real models. A visual model built with a geometric modeling system may appear physical, but it is intangible.

Each of the middle-level project systems contains unique features and modeling functions, as well as shared capabilities that tie them together [3].

An ideal project includes the development of a technical object that not only fulfills the stated functions but also meets certain quality criteria.

The lowest level of optimal design comprises identifying the best project choice based on the selection of multiple, which is carried out without the use of computer technologies or mathematical models.

On a high level, optimal design issues expressed in the form of mathematical models are solved using appropriate mathematical optimization methods and a computer. The highest level comprises optimal design issues resolved inside ALT. ALT can handle optimization challenges at any point in the design process. During the preliminary design stage, optimal design involves determining the appropriate values for basic design characteristics that impact the eventual appearance of the technological product. At the design stages, optimization problems can have a deeper nature, covering the issues of determining the optimal values of the main parameters of the object as a whole, as well as individual components and parts.

During the development of ALT, the problem of optimal design consists in solving the following main issues:

 to determine the stages of the computer-aided design process along with solving certain optimization issues;

 construction of mathematical optimization models and development of machine algorithms;

 creating software to solve optimization problems;

 development of a system for interactive formation and viewing of project object options by determining the values of certain quality indicators, as well as the formation of mathematical models and managing the process of solving relevant problems;

 optimization of development time.

The model is improved during the project by optimizing it based on one or more criteria. The project efficiency criteria for various mechanisms can be adopted as follows. When only one criterion is used to optimize, the problem is solved in the simplest possible method. For example, a solution can be discovered by exploring many project possibilities and selecting the best one. Solving multi-criteria problems is more challenging. Multi-criteria optimization is employed when a single criterion is insufficient to assess quality.

In the context of the development of ALT, formalizing the process of automated search for technical solutions and optimizing the parameters of mechanical engineering units creates significant difficulties and requires the use of special heuristic decision-making methods and digital optimization methods.

Thus, we can conclude that design is multifaceted. In general, the optimal option should be the option that provides the required performance at the minimum cost. The number of users of such packages is very large, and this creates the problem of overloading programs with functions that most users may not need. At the same time, some groups of users have specific requirements that were not taken into account in time by the developers of the main software package or that are not of interest to the majority of other users.

The simplest example of a tool for extending a software package is macros, tools that allow you to remember a sequence of frequently repeated commands in a package and then repeat it with just one new command.

Another common way to increase the functionality of a package is to develop additional modules (Plugins) in compiled general-purpose programming languages such as Pascal, C or C++.

Thus, we can distinguish three main ways to expand the functionality of software packages:

- Visual Basic for Applications language;
- special programming language;
- additional modules [4].

No matter how vast a graphics system's library set is, it cannot cover all of the various regions and suit the needs of all types of customers. It's not limited to engineering graphics, simulation, or factory automation. Today, when information technology is widely employed, its field of application might be far broader than its capabilities. The scope of project difficulties has grown so large that tackling some of them with standard and practical tools given by a software development business has become time-consuming [5-6].

Conclusions

The advantage of current engineering design systems is that they may be developed by anyone, including skilled programmers and average engineers. In addition to the basic products and libraries, they offer tools and apps for creating customized library sets. All of these extra tools enable you to automate repetitive activities, decrease user errors, and improve project timeframes.

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APPLICATIONS OF NANOTECHNOLOGY IN THE SMART TEXTILE INDUSTRY AND IN SPECIAL CLOTHING AND FABRICS

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Annotatsiya. Maqolada nanotexnologiya va nanomateriallarning barqaror tarzda joriy etish uchun ishlatilgan, antimikrobiyal, ultrabinafsha to‘qimachilikka chidamli, elektr o‘tkazuvchan, optik, hidrofobik va olovga chidamli xususiyatlar va kiyimlar bo‘yicha ma’lumotlar mavjudligi bilan asoslidir.

Kalit so‘zlar: *iqtisod, samaradorlik, kiyinish, energiya, konvertatsiya, ekologiya, nanogeneratorlar, superkondensator, fotoelektron, to‘qimachilik nanotoksiklik, integratsiyalashuv.*

Аннотация. Статья основана на наличии информации об использовании нанотехнологий и наноматериалов для устойчивой реализации антимикробных, устойчивых к ультрафиолетовому излучению, электропроводящих, оптических, гидрофобных и огнезащитных свойств текстиля и одежды.

Ключевые слова: *экономика, эффективность, износ, энергия, преобразование, экология, наногенераторы, суперконденсаторы, фотоэлектрические, текстильные нанотоксичность, интеграция.*

Annotation. The article is based on the availability of information on the use of nanotechnology and nanomaterials for sustainable implementation of antimicrobial, UV resistant, electrically conductive, optical, hydrophobic and flame retardant properties of textiles and clothing.

Keywords: *economics, efficiency, wear, energy, transformation, ecology, nanogenerators, supercapacitors, photovoltaic, textile nanotoxicity, integration.*

Introduction

The work underlines the various methods and techniques for the functionalization of nanomaterials and their integration into textiles with an emphasis on cost-effectiveness, comfort, wearability, energy conversion efficiency and eco-sustainability. The most recent trends of developing various nanogenerators, supercapacitors and photoelectronic devices on the fabric are highlighted, with special emphasis on the efficiency and wearability of the textile. The potential nanotoxicity associated with the processed textiles due to the tendency of these nanomaterials to leach into the environment along with possible remediation measures are also discussed. Finally, the future outlook regarding progress in the integration of smart nano-devices on textile fabrics is provided.

Literature Review

Introduction of sensors and actuators in the textile industry is mainly pivoted on the conductive properties of the textile material. Conducting polymers find a vast application in this regard in textile industry. The tuning of resistivity in these materials produces electric response on textile surface when it is exposed to an external stimulus. These polymers can be modified to a desired property by incorporating a variety of nanomaterials into its matrix. For example, nanostructured polyaniline (PANI), polypyrrole (PPy) and polythiophene (PT) are the widely used conducting polymers which can impart enhanced mechanical strength, optical and conducting characteristics. These polymers have many advantageous features for integration with the textile industry viz; lower production costs, flexibility and light weight. Many conductive nanomaterials have been introduced to modify the surface structure of the fibers so that various smart functionalities can be achieved. Surface processing of fibers by conductive polymers enhances their conductivity by magnitude of one order [1].

The modern textile industry faces incessant consumer demand for innovative applications of new technology and a constant stream of new and ever more innovative products. The “conventional” textile industries have seen huge improvements in their products in terms of their mechanical strength and durability, the surface texture and “feel” of the fabric and the ability to dye in a wide range of colours and printing patterns. Other developments include personal care factors such as anti-perspirant and deodorants properties along with flame-retardancy, self-cleaning and anti-microbial characteristics. However, recent years have seen the emergence of so-called “smart textiles” which are derived from the combination of more conventional materials with smart nanomaterials. A smart textile is one which can sense changes in the environment and respond by modifying one or more of its parameters to perform a function. [2]

Research Methodology

Connection to the ‘internet of things’ offers yet further potential for advanced uses. Fabrication of microelectronic devices is now at a level where they can be combined into textiles and allow the unique capabilities of nanomaterials to be exploited to add high added-value functionality to fabrics and garments while retaining other desirable properties such comfort, flexibility, lightness and aesthetic appearance [3, 4].

Various approaches have been developed to incorporate nanomaterials into textiles. The ‘bottom-up’ approach is used during the production of fibers from which the

fabrics are manufactured. By contrast, the 'top-down' approach is applied at the finishing stages, for example by printing technologies, spray coating, or impregnation. Electrospinning is a relatively new method for producing fibers and fabrics from processed raw materials and has been shown to be ideal for fabricating nanofibers [1-4].

Analysis and Results

These nanowhiskers can be introduced in the textile fiber so as to achieve kind of peach fuzz effect. The distance among the individual nanowhiskers is less than the size of a water drops but more than the molecular size of H_2O. As a result, significant surface tension can be realized which doesn't allow water to spread on its surface.

However, the breathability can be maintained owing to the permeability of nanowhiskers. Hence, water repellent coatings can be developed by nanoparticulate films on the textiles. Fluorinated mixtures are being regularly used for this application on textile polymers [5].

Using proper processing method for tuning the texture of fibers, super hydrophobicity can be attained without deteriorating the comfort, softness and durability of the fabrics. Tuning of contact angle is instrumental in attaining the hydrophobicity or oleophobic [5]

In terms of "conventional" textiles, modern fabrics have been developed that show high levels of performance with respect to hydrophobicity (wearer comfort), UV-resistance, antimicrobial, antistatic, anti-wrinkle, stain-free or shrink-resistance properties. However, these are "passive properties" and researchers are interested in incorporating new fabrication and surface finishing methods to employ nanotechnology to inculcate smart and innovative applications. Their main motive is to introduce new applications with high efficiency without compromising on comfort, flexibility and light weight of the fabric [6].

Possibilities include the incorporation of piezoelectric generators, solar cells or biofuel cell modules. In this regard, various kinds of nanogenerators and supercapacitors have been designed and integrated with the textile. Researchers have also developed devices which can sense external stimuli and generate electronic signals for various monitoring systems [7].

Researchers focus on exploring nanomaterial-based photonics over the textile so that highly aesthetic, colourful and smart clothes, which can change the colour of the clothe as per various stimuli, can be developed. Although there have been a number of advances in this field, there remain limitations and challenges which hold back the smooth progress of this industry.[8]

The main challenges lie in the integration process as the fabricated devices and on-body electronics often spoil the smoothness, appearance, comfort and wearability of the clothes. Moreover, the efficiency and durability of the on-body devices and electronics needs significant improvement so that completely self-reliant clothes can be realized. As well as loss of performance, leaching and loss of the nanomaterials raises environmental issues as concerns persist regarding potential nanotoxicity. A number of categories of smart textiles will now be discussed in detail.

Conclusions

The work described in this article shows that the production of smart textile materials has seen tremendous advances in recent years but that there is the potential for even more useful products to be developed. The advances in fabrication methods for nanomaterial-based textiles, the potential market demand and subsequent scope for research has attracted many new workers to the area. The last two decades or so has seen the integration into textiles of various nanomaterial-based structures such as metallic or metal oxide-based nanoparticles, carbon nanotubes, nanoelectronics and optical components including Bragg diffraction gratings. These materials were prepared using various fabrication methods such as spray coating, impregnation, lithography, spray coating, fiber drawing or weaving. To produce effective electronic or optical functionalities, the surfaces of textile fabrics have been modified with nanomaterials in order to produce flexible and wearable garments with high aesthetic appearance so as to be attractive to the consumer. Along with the bloom of the smart textile industry, environmental concerns are also magnifying. So, life-cycle assessments and the potential toxicity of leached nanomaterials from textiles needs to be critically evaluated.

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THEORETICAL IMPORTANCE OF VERBAL AND NON-VERBAL COMMUNICATION

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Annotatsiya. Ushbu maqolada og'zaki bo'lmagan muloqotning odamlar o'rtasidagi ijtimoiy munosabatlarga ijobiy ta'sirining ilmiy-nazariy jihatlari va ahamiyati yoritilgan. Og'zaki bo'lmagan muloqot haqida ham batafsil ma'lumot berilgan.

Kalit so'zlar: *og'zaki bo'lmagan muloqot, ijtimoiy munosabatlar, tana tili, mimika, imo-ishoralar*

Аннотация. В данной статье освещаются научно-теоретические аспекты и значение положительного влияния невербальной коммуникации на социальные отношения между людьми. Также приводится подробная информация о невербальной коммуникации.

Ключевые слова: *невербальное общение, социальные отношения, язык тела, мимика, жесты*

Abstract. In this article, the scientific-theoretical aspects and importance of the positive effect of non-verbal communication on social relations between people are highlighted. Also, detailed information about non-verbal communication is provided.

Keywords: *non-verbal communication, social relations, body language, facial expressions, gestures*

Introduction

The article explores the significance and impact of non-verbal communication in human interactions. It delves into the multifaceted nature of communication, encompassing various aspects such as interaction, information exchange, relationships, influence, and mutual understanding. Highlighting the importance of non-verbal cues, it discusses their role in shaping perceptions and influencing communication dynamics. Additionally, the article emphasizes the cultural nuances of non-verbal communication and its relevance in fostering meaningful connections across diverse societies. Moreover, it offers insights into interactive teaching methods aimed at enhancing students; proficiency in non-verbal communication. Overall, this comprehensive examination provides valuable perspectives on the complexities and implications of non-verbal communication within social contexts.

Literature Review

A few academic articles and literature sources related to non-verbal communication and its impact on social relations. Mark L. Knapp and Judith A. Hall wrote a

comprehensive overview of non-verbal communication in various contexts, including personal, professional, and cultural settings [1]. The Power of Nonverbal Communication: How You Act, Feel, Think Is More Important Than What You Say - by Henry Calero [2]. He explores the significance of non-verbal cues in shaping interactions and relationships. Ronald B. Adler et al. published delves into the role of non-verbal communication in everyday interactions and its impact on social relationships [3]. Nancy J. Adler wrote article about examines how cultural differences influence non-verbal communication and offers insights for effective cross-cultural interactions in business settings [4]. Robert Rosenthal et al. research paper provides a functional analysis of non-verbal behavior and its implications for understanding human interaction [5].

Research Methodology

Non-verbal communication has a significant impact on the impressions we create in our interactions with others. Studies have shown that a large percentage of the meaning we convey in conversation comes from non-verbal cues such as body language, tone of voice, and facial expressions. These cues can affect how others perceive us and can influence the success of our interactions.

Understanding non-verbal communication is also crucial for navigating cultural differences. Different cultures have varying norms and expectations when it comes to non-verbal behavior, so being aware of these differences can help prevent misunderstandings and improve cross-cultural communication.

In educational settings, interactive teaching methods are used to teach students about non-verbal communication. By engaging students in activities that involve analyzing body language, tone of voice, and other non-verbal cues, educators can help students develop their awareness and understanding of these important forms of communication.

Overall, recognizing the importance of non-verbal communication in social relations is essential for effective interpersonal interactions. By being mindful of our own non-verbal behavior and understanding the signals given off by others, we can improve our ability to connect with others and build strong relationships.

Analysis and Results

Communication takes the leading place among the activities performed by people, it satisfies the most important need of a person - the needs related to living in society and considering oneself as an individual. Communication is the process of interacting with each other during various activities arising from the needs of joint activities. That is, the work of each person in the society includes forms of interaction and interaction.

The concept of communication is a process that simultaneously includes the following:

a) the process of interaction of individuals;
b) the process of information exchange between individuals;
c) the process of one person's relationship with another person;
g) the process of one person influencing others;
d) opportunity to express sympathy to each other;
e) the process of mutual understanding of individuals;

1. Among the special pedagogical abilities, there are those that cannot be distinguished as belonging to specific teaching or educational activities. Because they are equally necessary for both. This aspect is pedagogical communication, treatment.

In the process of communication, the meaning of non-verbal influence is "without speech". This includes the positions of the interlocutors in relation to each other in space, situations (close, distant, intimate), gestures, facial expressions, pantomimes, looks, direct feelings of each other, appearance, various signals (noise, smells) coming out of it. All of them increase the transaction process and help interlocutors to get to know each other better. According to the American scientist Migranyan's formula, 7% of spoken words, 38% of paralinguistic factors, and 58% of non-verbal actions affect positive impressions of interlocutors who are meeting for the first time.

How we pronounce words also shapes non-verbal communication. Intonation and tone, tone of voice, fluency of speech are meant. It is known from experience that depending on how we express our thoughts, the meaning of the sentence can change dramatically. Based on experiments, a certain part of speech information is received according to the state of the language, the situation and the loudness of the voice when exchanging ideas. 55% of information is received through facial expressions and gestures, and 38% through intonation. Only 7% make up words while we are talking. In other words, how we speak is often more important than what we say. In other words, what we say is often more important than what we mean.

If our interlocutor says, "Okay... I'll look into it," then the pause after the word "good" means that the manager or boss has other work (concerns) and now has no time to consider it at all. no, or does not know how to conclude. Imagine a scenario where non-verbal cues can create noise in the process of information exchange. You go into your boss's office to get the information you need for your project. You come in, and he looks at the papers on his desk for a few seconds. Then, looking at his watch, he says in an expressionless voice: "How can I be of use to you?" While his words do not in themselves convey a negative meaning, the meaningful expression of the language makes it clear that you are an unwanted distraction from his work. How do you ask him questions now? What thoughts come to mind the next time you ask your boss a question? As you can imagine, nothing positive happens. Now imagine it differently: you walk into the room and your boss looks up at you and says, "How's the project going?" How can I benefit you? The same words are used in both cases. But in this case, the non-verbal signs that are often found in conversations between people completely overwhelm the verbal signs. An important conclusion can be drawn from this: the non-verbal signs used must match the information you intend to convey, and your ideas. Otherwise, non-verbal signs cause such misunderstanding that the patient or subordinates may misunderstand and accept the information. Cultural differences in non-verbal information exchange can create great barriers between concepts. For example, if you receive a business card from a Japanese person, you should read it quickly. If you suddenly put it in your pocket, you will be treated as an insignificant person. Thus, through non-verbal communication, the interlocutor shows his true attitude to the event. In this case, your task is to correctly understand what is hidden behind such events.

In addition, by managing and understanding personal non-verbal behavior, you can enter the interlocutor's trust and restore contact (communication) with him.

Interactive methods of teaching non-verbal communication between the teacher and the student. The task of educating the growing generation to be independent thinkers is set in the “National Personnel Training Program.” The solution to this problem depends to a large extent on the use of interactive teaching methods. First of all, let's clarify the concept of “interactive.” The word “interactive” comes from the English word “interact.” “Inter” means mutual, “act” means to work. So, interactive means interacting, performing activities or being in a state of dialogue (communication) with someone (with a person) through conversation or order. Thus, interactive teaching is, first of all, communicative teaching, in the course of which there is interaction between the teacher and the student. The essence of interactive teaching is to organize the educational process in such a way that all students are involved in the learning process and have the opportunity to think freely, analyze and think logically. The joint activity of students in the process of learning is understood as the individual contribution of each of them in their own communication, exchange of mutual knowledge, ideas and methods of activity. At the same time, all this is done in an atmosphere of mutual goodwill and support. This, in turn, not only gives an opportunity to acquire new knowledge, but also develops the activity of knowledge itself, taking it to higher levels of cooperation and cooperation.

2. Non-verbal communication is the oldest form of human communication. Non-verbal means of communication developed before language, and their initial function was distinguished by its stability and efficiency. Gradually, their advantage over verbal means was revealed: they were received directly, and therefore had a strong impact on the addressee. They express the most sensitive feelings and relationships, which for some reason cannot be expressed through words. Nonverbal communication refers to the exchange of nonverbal messages between people and their interpretation. Non-verbal communication occurs because each culture reflects existence with the help of its own signs and symbols. People communicate with each other through words. But there are other means of communication that also play an important role in communication. These are non-verbal tools. Due to the strengthening of interlinguistic and inter-cultural relations in recent years, the attention of linguists and social psychologists is focused on the study of the culture of communication, signs used in it, customs and norms of etiquette.

Because the national and cultural identity is reflected in the behavior, culture, and speech process of that nation.

3. Non-verbal means are understood as gestures (body, hand movements), gestures (mimicry), touching (touching hands, hugging, caressing, kissing, etc.), body position, distance between people.

Non-verbal means are the simplest and most economical means of expressing ideas. Such tools help verbal tools in conveying a certain message, and in some places even act as verbal tools. It is important to correctly interpret non-verbal means of communication and study their specific features. Knowing the non-verbal means specific to Uzbeks, not allowing them to be broken in some places, and fully observing the rules of behavior of the people who speak this language will increase the success

and expressiveness of communication. At the same time, non-verbal means also help to save time. Through the non-verbal means of the Uzbek national dialogue, we can understand without exaggeration the chanting of immortal feelings such as sincerity, openness, kindness, mutual respect and respect, which are worthy of the Uzbek people. Non-verbal means of a national nature are listed as signs used in the communication of a certain nation, nation or people, and are characterized by the limited scope of their use. Such non-verbal means embody national characteristics, are associated with traditions, rituals and manners. Among Uzbeks, the following can be added to the forms of communication that have been formed and used since ancient times:

- Rituals (customs) are actions related to tradition and their sum.
- Forms of etiquette (forms of manners) - rules of etiquette in the process of dealing.
- Gestures are certain information-transmitting actions in communication.

Conclusions

In conclusion, it can be said that non-verbal means are almost similar in all countries and are manifested in a certain way under the influence of the culture, national character, customs and values of each nation.

Knowledge of them, equal interest in the culture of all nations, helps to eliminate various misunderstandings in the process of communication with representatives of other nations.

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PEDAGOGICAL TECHNOLOGIES OF COMMUNICATIVE SKILLS DEVELOPMENT IN FUTURE MUSIC TEACHERS

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Annotatsiya. Maqolada bo‘lajak musiqa ta’limi o‘qituvchilarining muloqot qobiliyatlarini rivojlantirishga qaratilgan pedagogik texnologiyalar tahlil qilinadi. Zamonaviy o‘quv jarayonida o‘qituvchilarning samarali aloqa o‘rnatish qobiliyati ularning pedagogik faoliyatining muhim tarkibiy qismidir. Maqolada muloqot qobiliyatlarini rivojlantirish uchun innovatsion pedagogik usullar va texnologiyalardan foydalanish imkoniyatlari muhokama qilinadi. Musiqa o‘qituvchilarining malakasini oshirish, talabalar bilan muvaffaqiyatli muloqot qilishda ushbu texnologiyalarning o‘rni ham alohida ta’kidlangan.

Kalit so‘zlar: *Muloqot ko‘nikmalari, musiqa ta’limi, pedagogik texnologiyalar, o‘qituvchilarning malakasini oshirish, kommunikativ texnologiyalar, innovatsion ta’lim usullari.*

Аннотация. В статье анализируются педагогические технологии, направленные на развитие коммуникативных навыков будущих учителей музыкального образования. В современном образовательном процессе умение педагогов устанавливать эффективную коммуникацию является важной составляющей их педагогической деятельности. В статье рассматриваются возможности использования инновационных педагогических методов и технологий для формирования коммуникативных навыков. Также освещается роль этих технологий в профессиональном развитии учителей музыки и успешной коммуникации с учащимися.

Ключевые слова: *Коммуникативные навыки, музыкальное образование, педагогические технологии, профессиональное развитие педагогов, коммуникативные технологии, инновационные образовательные методы.*

Abstract. Pedagogical technologies aimed at developing communicative skills in future music education teachers are analyzed in this article. In the modern educational process, the ability of teachers to establish effective communication is an important component of their pedagogical activity. The article considers the possibilities of using innovative pedagogical methods and technologies for the formation of communicative skills. It also highlights the role of these technologies in the professional development of music teachers and successful communication with students.

Keywords: *Communicative skills, music education, pedagogical technologies, teacher professional development, communication techniques, innovative educational methods.*

Introduction

In today's rapidly developing society, the education system is of great importance in the process of training quality personnel. In particular, one of the important aspects of training professional teachers in the field of music education is the development of their communication skills. A music teacher should not only have mastered musical knowledge and skills, but should also have the ability to clearly express their thoughts, establish effective communication with students, and make them interested in music.

Communicative skills are one of the most important tools of the teacher in the educational process, they serve to strengthen interactions with students, increase the effectiveness of the lesson, and fully reveal the creative potential of students. In this process, it is of particular importance for music teachers to be able to use communication tools correctly and appropriately, to deal with students of different ages [1-7].

This article analyzes the theoretical foundations and practical methods of developing communicative skills in future music education teachers. At the same time, it provides detailed information about the role of communication in the teacher's pedagogical activity, its impact on the educational process, and effective ways of developing these skills.

Literature Review

The problem of developing communicative skills in future music education teachers is one of the topics widely studied in scientific and pedagogical literature. In modern pedagogical approaches, communicative skills are considered as the main tool not only for increasing the knowledge base of teachers, but also for improving the quality and effectiveness of communication in the educational process. From this point of view, various pedagogical technologies and methods that help to form these skills have been thoroughly studied in the literature.

J. Dewey [3], L.S. The theories of developing interactive communication with students developed by Vygotsky [8] and other classical pedagogues are of great importance. In particular, Vygotsky's ideas about communicative processes affecting the social development of students are considered as one of the main factors in the professional development of music teachers [8]. At the same time, educational approaches such as constructivism and cognitivism also play a key role in the development of communicative skills. Their main principles are aimed at encouraging students to be active, strengthening knowledge through interaction and ensuring the leadership role of the teacher.

In the literature based on new generation pedagogical technologies, various methods aimed at forming communicative competence are studied in detail. In particular, the cooperative teaching methodology developed by T. Kagan envisages the development of communicative skills through teamwork and mutual exchange of ideas [5]. This technology is successfully used in music education to establish communication between students and support creative activity.

Also, many studies have been conducted on the use of ICT (information and communication technologies) in the development of communicative skills of music education teachers. For example, the technology of enriching educational processes

with digital tools, developed by D. J. Hargreaves, is recognized as an important tool for teachers to perform their pedagogical tasks more effectively [4].

Within the framework of the educational system of Uzbekistan, there are also studies aimed at developing the communicative skills of teachers. In particular, N.M. Dadajonova [2] and other scientists have widely covered the importance of using information technologies and modern pedagogical approaches in the development of communication skills of teachers in the national music education system.

The analysis of this literature shows that modern pedagogical technologies, cooperative teaching methods, information and communication technologies and innovative approaches are of great importance in the development of communication skills of music education teachers. These methods play an important role in improving the professional skills of the teacher and ensuring successful communication of students in the educational process.

Research Methodology

In the process of studying pedagogical technologies for the development of communicative skills in future music education teachers, the main goal of the research is to identify the most successful pedagogical approaches and methods for the effective formation of these skills. Research methodology is based on the following stages and methods.

Research design. This study used mixed methods, that is, qualitative and quantitative data were collected. In terms of quality, the experience of teachers in the practical application of pedagogical technologies aimed at forming the communicative skills of music education teachers was analyzed. On the quantitative side, the data collected through questionnaires and experiments were statistically analyzed.

Research participants. Sample groups consisting of music education students (future teachers), active teachers and heads of pedagogical institutions were selected as research participants. The number of participants was approximately 100-150 people, they were selected from different regions and educational institutions.

Data collection methods.

- Questionnaires and interviews: Questionnaires were conducted to assess the communication skills of teachers and students participating in the study and to determine their opinions on the use of pedagogical technologies in the teaching process. In-depth interviews with teachers and students were also conducted.

- Observation: The pedagogical technologies used by the teachers for the formation of communicative skills during music lessons were observed. During this process, active participation of students and methods used by teachers were evaluated.

- Experiments: small experiments were organized in order to test the effectiveness of pedagogical technologies. In these experiments, new methods aimed at studying students' communicative skills were used and their results were analyzed.

Data analysis methods.

- Statistical analysis: Quantitative data (survey results, experimental data) were analyzed using statistical methods. The obtained results were visualized using diagrams and graphs.

- Qualitative analysis: Qualitative analysis of the results of interviews and observations was carried out, and it was studied which methods are more effective in forming the communicative skills of teachers. The attitude of students and teachers to this process was also analyzed.

Research tools. The main tools used in the research are as follows:

- Questionnaire forms: Questionnaires specially designed to assess the communication skills of teachers and students and collect their opinions about pedagogical technologies.

- Observation cards: Observation cards for evaluating teachers' communicative methods during the learning process.

- Experimental tools: necessary tools and methods for testing the effectiveness of pedagogical technologies [6].

Analysis and Results

This study was focused on identifying and evaluating pedagogical technologies for the development of communicative skills in future music education teachers. Based on the data collected during the research, a number of pedagogical methods and technologies aimed at increasing the ability of teachers to establish effective communication were analyzed. In this section, the results of experiments, questionnaires and observations are analyzed and their main conclusions are presented.

1. Effectiveness of pedagogical technologies used in the development of communicative skills.

According to the results of the research, it was found that the following pedagogical technologies are the most effective in developing communicative skills of music education teachers:

- Cooperative teaching methodology: The teaching method based on teamwork and mutual cooperation in music lessons has had a great effect on the development of students' communicative skills. With the help of this technology, teachers developed the skills of mutual communication and joint problem solving.

- Interactive lessons and training: When the teachers involved in the study used interactive methods (such as discussions, role-plays and debates), the active participation of students increased significantly. These methods taught students to clearly express their thoughts and listen to the opinions of others.

- Information and communication technologies (ICT): The use of online platforms and multimedia tools by teachers has helped to speed up communicative processes and make educational materials livelier and more interesting. It was observed that the quality of communication between students and teachers increased with the help of ICT opportunities.

2. Results of evaluation of teachers’ communicative skills.

Based on the results of questionnaires and interviews, the level of development of communication skills between teachers and students was evaluated. The results of the survey showed the following:

- Level of student satisfaction: During the study, the overall level of student satisfaction with lessons was higher in the groups that used cooperative teaching and

interactive methods. Students were able to express their thoughts more freely when communication opportunities were expanded.

- Teachers' self-evaluation: It was noted that the use of information and communication technologies and the effective use of cooperative methods had a great positive effect on the development of their communication skills by teachers. Teachers noted that students' communication skills improved during lessons based on mutual cooperation.

3. Results of the experiment.

In the study, new pedagogical technologies were tested for the formation of communicative skills among the experimental groups. According to the results of the experiment:

- Effects of group work and discussions: In groups where group discussions and role-playing were used, students became more confident and active in their interactions. With the help of this method, the ability of students to listen to each other and logically justify their opinions has increased significantly.

- The role of technological tools: The use of digital tools (for example, video lessons, online tests and virtual music programs) in the lessons helped students to be more actively involved in the educational process and to increase the opportunities to communicate with the teacher.

Conclusions on the results of the analysis

The results of the analysis show that the use of innovative pedagogical technologies in the development of communicative skills of future music education teachers makes the educational process more effective and interactive. Pedagogical approaches based on teamwork and the use of information and communication technologies significantly improve the quality of communication between teachers and students.

The results showed that successful strategies for the development of communicative skills help future music teachers in their professional activities and enable the development of creative and communication skills of students.

Conclusions

Development of communicative skills in future music education teachers is one of the important aspects of the modern educational process. The results of this study show that teachers' effective communication skills are crucial in imparting knowledge and skills to students, supporting creative growth, and encouraging active participation in the learning process.

Analyzing the main approaches to the development of communicative skills through the use of pedagogical technologies, team teaching, interactive teaching methods and the effective use of information and communication technologies were particularly effective. These technologies allow teachers to support the creative and intellectual development of students, which plays an important role in improving the quality of musical education [1].

It was also noted that the teachers who participated in the research were interested in using new pedagogical technologies to improve their communication skills, and the indicators of students' satisfaction with such teaching methods were high. These

indicators confirm that teachers are ready to update the pedagogical process and that the development of communicative skills plays an important role in this process.

Offers:

1. Organization of special courses for the development of communicative skills: Special trainings and seminars aimed at the development of communicative skills should be organized for future music education teachers. Such programs should teach teachers how to effectively communicate and show how to use these skills in the classroom.

2. Wider introduction of teaching methods based on interactive and teamwork: In pedagogical practice, the wider introduction of methods such as interactive lessons, discussions, role-playing games and group projects will help improve students' communication skills. This process increases the active participation of students in classes and enables teachers to provide more effective education.

3. Expanding the possibilities of using information and communication technologies: To improve the communication skills of music education teachers, it is necessary to further improve the process of using modern technologies. Also, the use of digital platforms and online educational tools helps students to be more active in the learning process and to increase the level of communication with the teacher.

4. Orienting teachers to continuous professional development: Involving future music teachers in continuous professional development programs and giving them the opportunity to familiarize themselves with new pedagogical technologies can be an important step for them. This supports the professional development of pedagogues and contributes to the improvement of the quality of education.

These proposals have a positive effect on the successful formation of communication skills of future music education teachers and their professional development.

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TEACHING STUDENTS THROUGH MICROTEACHING IN ENGLISH METHODOLOGY LESSONS

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Annotatsiya. Ushbu maqolada o‘qituvchilarni tayyorlashda mahorat darslarining rivojlanishi va ahamiyati haqida keng miqyosda so‘z yuritiladi. Unda ushbu metodning kelib chiqishi va prinsiplari ko’rib chiqilib, nazorat qilinadigan muhitda o‘qituvchilik ko‘nikmalarini takomillashtirishning roli va ahamiyati yoritilgan. Maqolada ayniqsa, ingliz tili mutaxassisligi bo‘yicha talabalar uchun mahorat darslarining ahamiyati va ta’siri haqida so‘z boradi, bu darslar talabalarga haqiqiy hayotda amaliyot o‘tash, obyektiv fikr-mulohaza olish va o‘ziga ishonch hosil qilish imkoniyatini taqdim etadi.

Kalit so‘zlar: *Mahorat darslari, tengdosh kuzatuvi, fikr-mulohaza, tahlil, takroriy jarayon.*

Аннотация. В этой статье обсуждается эволюция и значимость микропреподавания в подготовке учителей по всему миру. Подчеркиваются истоки и принципы этого метода, а также его роль и важность в совершенствовании преподавательских навыков в контролируемой среде. Основное внимание уделяется его влиянию на студентов, специализирующихся на преподавании английского языка, предоставляя им структурированную платформу для практики в реальных условиях, получения объективной обратной связи и укрепления уверенности в себе.

Ключевые слова: *Мастер-класс, наблюдение сверстников, обратная связь, рефлексия, итеративный процесс.*

Abstract. This article discusses the evolution and significance of microteaching in teacher education globally. It emphasizes the method’s roots and principles, highlighting its role and importance in refining teaching skills within a controlled environment. The focus is on its impact on English language specialization students, providing them a structured platform to practice in real life, receive objective feedback, and build confidence.

Keywords: *Microteaching, peer observing, feedback, reflection, iterative Process.*

Introduction

This study aims to examine the role of microteaching as a critical tool in enhancing the teaching skills and readiness of English language specialization students. It highlights the effectiveness of microteaching in providing a controlled, supportive environment where aspiring educators can practice, receive feedback, and refine their teaching strategies. The study aims to demonstrate how microteaching bridges the gap between theoretical knowledge and real-world classroom experience, ultimately

contributing to future English language teachers' professional development and confidence.

Microteaching has transcended its origins to become an indispensable and widely embraced facet of teacher education and training programs worldwide. It stands as a cornerstone in pursuing pedagogical excellence and preparing educators for their vital roles in the classroom. The core of this discussion revolves around the invaluable impact of microteaching on English language specialization students. It elucidates how this method allows these students to explore and perfect their teaching skills, experiment with diverse strategies, and gain confidence before they enter real classrooms.

This structured technique, microteaching, is crucial for teacher training and professional development. It is characterized by systematically deconstructing the teaching process into manageable units, fostering focused practice, and facilitating the acquisition of valuable feedback for continuous improvement. With its primary goal of enhancing teaching skills and effectiveness, microteaching is a bridge between future teachers and the real-world classroom environment.

Literature Review

Microteaching is a teacher training technique that was developed in the 1960s. It was invented by Dr. Dwight W. Allen, a professor at Stanford University, and his colleagues. Microteaching was initially created to improve teacher education and help aspiring teachers develop their teaching skills in a controlled and supportive environment. The sessions are recorded and reviewed, allowing the aspiring teachers to receive feedback and improve in a controlled setting. This technique is designed to help educators refine their teaching techniques, experiment with different strategies, and gain confidence in their abilities before they enter a real classroom [1, 2].

Microteaching has since become widely adopted and essential to teacher education and training programs around the world. It remains a valuable tool for developing and improving teaching skills, ensuring that educators are well-prepared for their roles in the classroom.

George Brown (1975) explained that micro-teaching sessions are as follows: “Microteaching format satisfies the requirement of the teacher training model. Rules of planning are given in lectures and seminars; performance is split into its component skills, the skills are demonstrated, and opportunities for practice are given in controlled conditions. Feedback in the form of video recordings is given in supervisory sessions, and students are taught what cues to look for in their interaction with pupils” [3].

Implementing microteaching. Microteaching is a structured technique used for teacher training and professional development, involving the breakdown of teaching into manageable units for focused practice, feedback, and improvement. Its goal is to enhance teaching skills and effectiveness, preparing teacher candidates for real classroom experiences. (Brent & Thomson, 1996) [4].

We found that after graduating from university, students need more experience, teaching skills, and methods in their teaching careers. Therefore, we conducted various experiments and determined that implementing microteaching with our students would achieve good results.

"The core of their social perception of a good teacher includes such qualities as an excellent knowledge of the subject, authority and high demandingness. That is, these are the qualities that a teacher must possess. It is good, of course, if he/she is patient, wise, kind, fair and attentive, and it is not necessary that he/she loves children. A love for children is on the periphery of parents' social perception of a teacher and is considered, in my opinion, as a stereotypical attribute of a teacher rather than a professionally valuable quality" [1].

Wilkinson (1996) highlights that microteaching enables teacher candidates to gain practical teaching experience and a grasp of teaching principles. It provides a platform for teachers to explore and reflect upon their teaching styles and learn about innovative teaching methods (Wahba, 1999).

Pre-service teachers can derive significant benefits from microteaching applications. Initially, they uncover fundamental aspects of teaching and the teacher's role, such as an instructor, a facilitator, an assessor, or a mentor (Amobi, 2005; Hawkey, 1995; Kpanja, 2001; Wilkinson, 1996). It also emphasizes the importance of planning and decision-making and helps them enhance their teaching skills (Benton-Kupper, 2001) [5].

Research Methodology

Here are the critical components of microteaching:

- *Micro Lesson:* In microteaching, a teacher delivers a short, focused lesson to a small group of students. The lesson usually lasts 5-20 minutes and covers a specific topic or skill.
- *Video Recording*: Microteaching sessions are often recorded on video, letting the teacher and observers review and analyze the teaching performance later. Video recordings allow pre-service teachers to evaluate themselves by engaging them in more experiences and configurations (Jensen et al., 1994). Sherin (2000) indicates that video recordings affect the perspectives of teachers in the education process. Cunningham and Benedetto (2002) emphasize that video tools support reflective learning, and Spurgeon and Bowen (2002) stress that with the help of these tools, the problems that may occur in education can be observed and defined.
- *Peer Observers:* In the microteaching session, the role of other teachers or peers as observers is crucial. They provide constructive feedback and critique the teacher's teaching methods, communication, and classroom management, fostering collaboration and shared learning.
- *Feedback and Reflection:* After the micro lesson, there is a feedback session where the teacher and observers discuss what went well and what could be improved. This feedback is based on specific teaching criteria, such as lesson planning, classroom management, communication, and engagement. Feedback in microteaching is critical for teacher-trainee improvement. It is information that students receive concerning their attempts to imitate certain patterns of teaching. The built-in feedback mechanism in microteaching acquaints the trainee with the success of their performance and enables them to evaluate and improve teaching.

- *Repetition or Iterative Process:* Microteaching often involves multiple sessions. The teacher may adjust based on feedback and then deliver another micro lesson to continue refining their teaching skills.

Preparation steps: Preparing English language specialization students for teaching through microteaching involves several steps. Here is a breakdown of the process:

1. Designing Teaching Objectives: Define the specific teaching objectives and content areas the students will be teaching. Ensure that the objectives align with the goals of the English language specialization program.
2. Developing Short Teaching Modules: Based on the defined objectives, create short teaching modules or lessons (approximately 5-10 minutes each) covering different language skills, such as listening, speaking, reading, and writing.
3. External Observation: The involvement of experienced teachers or mentors in observing and providing feedback on the teaching modules is invaluable. Their input can guide and support the students in refining their teaching methods and materials.
4. Practicing Teaching: Encourage students to practice teaching the modules before presenting them to their peers. It can be done individually or in small groups. It allows them to gain confidence and refine their presentation.
5. Conducting Microteaching Sessions: Organize microteaching sessions in which students take turns teaching their short modules to a small group of their peers. The sessions should be recorded for later review.
6. Feedback and Self-Reflection: After each microteaching session, facilitate a feedback session where both the students who taught and their peers provide constructive feedback. Encourage self-reflection on their teaching performance.
7. Peer Review and Evaluation: Have students review and evaluate their peers' microteaching sessions. It provides a valuable opportunity to learn from each other and identify effective teaching techniques.
8. Incorporate Feedback: Encourage students to use the feedback they receive to improve their teaching skills, whether related to lesson content, instructional techniques, or classroom management.
9. Progressive Complexity: As students become more confident and proficient in their teaching, the complexity of the teaching modules and the expectations for lesson planning gradually increase.
10. Real Classroom Experience: Eventually, students should have opportunities to apply what they have learned in actual classroom settings. These real-world teaching experiences can further enhance their skills.
11. Continuous Improvement: Emphasize the importance of ongoing professional development and the need for continuous improvement in their teaching skills.

Microteaching is crucial for philology students to enhance their teaching skills and effectiveness. Through this method, they can learn to teach independently and effectively and improve their teaching practice as they go along.

Analysis and Results

In the experiment, the microteaching method was applied to three distinct groups. (The experiment participants are students of groups №213, №214, and №215 English philology faculty, Mamun University, Uzbekistan.) Notably, all three groups displayed

active participation and engaged effectively in the microteaching process. This approach facilitated their understanding of pedagogical concepts and techniques, equipping them with the skills required to convey knowledge effectively. Furthermore, the participants gained proficiency in employing a variety of teaching activities, contributing to a comprehensive understanding of teaching methodology.

A pivotal aspect of this experiment was the development of the participant's capacity to observe teachers during microteaching sessions and subsequently provide constructive feedback. It proved instrumental in fostering a culture of peer-driven learning and continuous improvement. The ability to critically assess teaching methodologies and offer constructive insights emerged as a significant outcome of the experiment.

In the Micro Lesson, I assigned a task where they had to conduct the lesson in pairs to make themselves feel more comfortable. They conducted the lesson, each taking on the role of the teacher, for a duration ranging from 10 to 30 minutes.

During the Video Recording step, they recorded their lessons to analyze their successes and mistakes in detail.

In the Peer Observers and Feedback step, peers observed the lessons. They provided positive and negative feedback, suggestions concerning the teacher's behavior, interaction with students, voice modulation, classroom management, organization, lesson planning, and student engagement. During the Repetition step, they eagerly conducted the lesson a second time. Having taught once already, they felt more self-confident and better organized their lessons, thus minimizing mistakes.

Conclusions

In conclusion, implementing the microteaching method in these three groups resulted in active participation and comprehensive learning experiences. Participants learned how to teach effectively and employ diverse teaching activities and acquired the valuable skills of observation and feedback provision. This experiment underscores the importance of microteaching in equipping future educators with the competencies necessary for effective teaching and collaborative learning environments.

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ACTUAL PROBLEMS OF MATHEMATICS, PHYSICS AND MECHANICS

UDC: 535.3.04

PLASMA PARAMETERS IN NANOSECOND-LASER-PRODUCED SILICON AND INDIUM

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Annotatsiya. Lazerli spektroskopiya usullaridan foydalangan holda, kremniy va indiy yuzasida 1064 nm to‘lqin uzunligi va 10 ns impuls davomiyligi bo‘lgan Nd:YAG lazer nuri ta’sirida hosil bo‘lgan lazer plazmasining normal atmosfera bosimidagi xossalari o‘rganildi. Plazmadagi elektron zichligi lazer plazmasining spektral chiziqlari uchun Stark kengaytirish usuli bilan aniqlandi. Elektron harorati Boltsman tenglamasi yordamida hisoblangan.

Kalit so‘zlar: *LIBS, lazer plazmasi, elektron zichligi, elektron harorati, Stark kengaytirish usuli.*

Аннотация. С использованием методики лазерной спектроскопии исследованы свойства лазерной плазмы при нормальном атмосферном давлении, формирующейся на поверхности кремния и индия под действием лазерного пучка Nd:YAG с длиной волны 1064 нм и длительностью импульса 10 нс. Плотность электронов в плазме на определяли методом расширения Штарка для спектральных линий лазерной плазмы. Электронная температура рассчитывалась по уравнению Больцмана.

Ключевые слова: *LIBS, лазерная плазма, электронная плотность, электронная температура, метод расширения Штарка.*

Abstract. We study the properties of laser plasma at normal atmospheric pressure, which is induced on the surface of silicon and indium under the action of an Nd: YAG laser beam with a wavelength of 1064 nm and a pulse duration of 10 ns using the method of laser spectroscopy. The electron density in the plasma was determined by the Stark expansion method for spectral lines of laser plasma. The electron temperature was calculated using the Boltzmann equation.

Keywords: *LIBS, laser plasma, electron density, electron temperature, Stark expansion method.*

Introduction

Due to the simplicity and possibility of the express analysis of the material composition by using LIBS (Laser-induced breakdown spectroscopy) attracts attention of the leading scientists around the world. This technique allows to qualitatively and quantitatively composition of unknown elements (like, metals, polymers, semiconductor etc.) by their plasma emission excited in the field of ultrashort laser pulses [1-4]. Usually the process of the analysis of the composition of elements consists from three steps. First of all the plasma emission should be produced on the surface of the material by using ultrashort laser pulses, the second step is recording plasma

spectrum in the spectrophotometer and last step is analyzing collected plasma spectrum by using certain mathematical procedures. In this work, we studied laser-induced plasma (LIP) parameters of the silicon and indium targets in normal conditions. Nowadays, the silicon and indium elements is one of the semiconductor and unique materials, and it forms a major part of high-tech electronic, photocell and display devices. There is a great need to recycle and restore this element [5-8].

Research Methodology

The study of the structure of plasma formed from the element silicon by the LIBS method. The LIP on the surface of the Si target was excited with an Nd: YAG laser at the wavelength of 1064 nm and a pulse duration of 10 ns under normal conditions. The fibre spectrophotometer (HR4000, Ocean Optics) was used as a detector of the plasma emission (Figure 1). The spectrophotometer is a high-precision optical fibre spectrometer that provides optical accuracy up to 0.025 nm full width of the half maximum (FWHM) and allows to analyze plasma spectra in the wavelength range of 200 nm to 1100 nm.

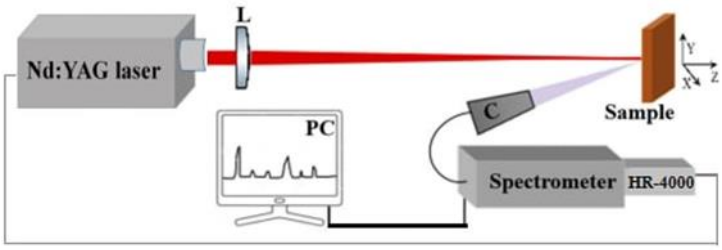

Figure 1. Optical scheme of the experimental device.

The obtained plasma spectrum showed the presence of ionic transitions in which the element Si and In is formed from one (I) and two (II) charged ions (Fig. 2).

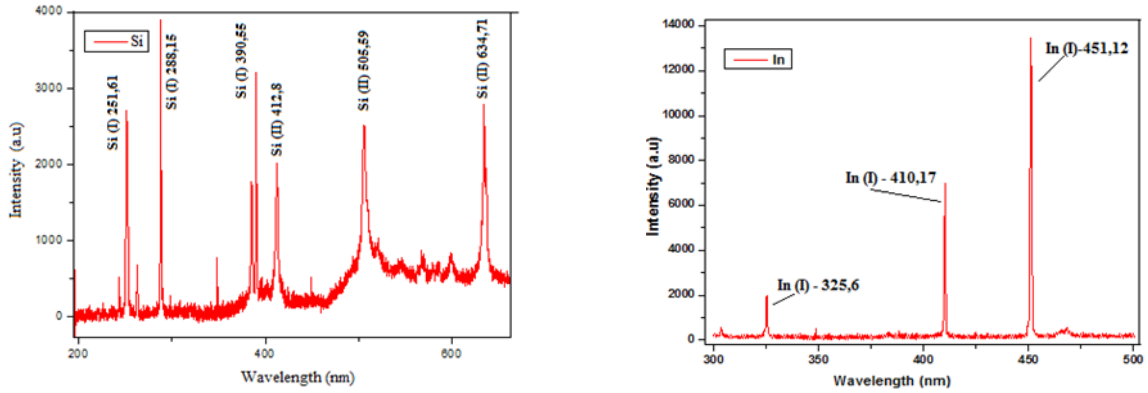

Figure 2. Plasma emission spectrum induced on the Si and In surface by 1064 nm laser pulse.

Analysis and Results

The wavelengths for silicon and indium ions corresponding to the plasma spectra and the widths of these transition lines were determined, which made it possible to determine the concentrations of free electrons in the plasma using the Stark expansion method. The Stark effect is the displacement and division of the spectral lines of atoms and molecules due to the presence of this external field. The stark effect can also be observed for emission and absorption lines. The abrupt expansion of the spectrum results from the collision of charged particles by lines in the plasma spectrum. As

shown by the difference between the electron density and the FWHM (full widths at half maximum) spectral half-width, the Stark extended line is as follows:

$$\Delta\lambda_{\frac{1}{2}} = \left[2W\left(\frac{n_e}{10^{16}}\right) + 3{,}5A\left(\frac{n_e}{10^{16}}\right)^{\frac{1}{4}} \cdot \left(1 - \frac{3}{4}N_D^{-\frac{1}{3}}\right) W\left(\frac{n_e}{10^{16}}\right) \right] \overset{0}{\text{A}} \quad (1)$$

Where ND is the number of particles in the Debye sphere, A is the interaction parameter of ions, and W is the electron interaction parameter. On the right side of the equation is the coefficient of the expansion parameter from the interaction of the first term electrons and the parameter of the interaction of the second term electrons and ions. For non-hydrogen ions, Stark expansion is dominated by electron interaction and thus ion interaction, and the coefficient of ion interaction is negligible [9]. The resulting Stark expansion is as follows.

$$\Delta\lambda_{\frac{1}{2}} = 2W\left(\frac{n_e}{10^{16}}\right) \overset{0}{\text{A}} \quad (2)$$

$\Delta\lambda_{1/2}$= FWHM half of the spectral width, n_e- electron density. Using the Stark expansion method, the electron densities were determined on a scale corresponding to the wavelength values of the spectrum formed by the charged ion transitions of the Si element (I) and (II) (see in Table 1). In this case, half of the spectral bandwidth (FWHM) was determined by matching Gauss with a high detection coefficient R^2 for the silicon spectrum line. From the adaptation, ionic transitions with very close scales were separated and calculated separately. Electron interaction parameter W. The numerical value of Ni was used from different temperature-dependent variable values corresponding to the scales [10].

Table 1. The calculated parameters of Si II and In I spectral lines.

Element	***Si (I)***	***Si (I)***	***Si (II)***	***Si (II)***	***Si (II)***	***In (I)***	***In (I)***
λ (nm)	251.61	288.15	412.8	505.59	634.71	410.17	451.12
FWHM (nm)	2.33	0.85	1.9	3.51	1.28	0.51	0.82
W (Å)	0.70	0.54	1.29	1.8	1.2	0.0084	0.0084
n (10^{17} cm^{-3})	1.66	0.78	0.73	0.97	0.54	30	48

We have determined the plasma temperature using the well-known Boltzmann plot method via the relative line intensities of the emission spectrum of the laser produced silicon plasma plume. Considering the plasma in the Local thermodynamic equilibrium (LTE), the populations of different excited levels at a specific temperature obey the Boltzmann distribution law [11, 12].

$$N_i = g_i \frac{N_0}{U(T)} \exp\left(-\frac{E_i}{kT_e}\right) \quad (3)$$

Here g_i is the statistical weight of the upper level, N_0 (cm^{-3}) is the total number density, U(T) is the partition function, E_i (J) is the energy of the excited level, k (J/K) is the Boltzmann constant and Te (K) is the excitation temperature. The line intensity of a transition from an upper level to a lower level is expressed as:

$$I_{ik} = h\nu_{ik} A_{ik} N_i = \frac{hc}{\lambda_{ik}} A_{ik} g_i \frac{N_0}{U(T)} \exp\left(-\frac{E_i}{kT_e}\right) \quad (4)$$

Where, the subscripts i and k represent the upper and lower atomic levels, λ_{ik} (nm) is the wavelength of the spectral line, A_{ik} (s^{-1}) is the transition probability for the spontaneous emission.

Having confirmed that the plasma is optically thin, now we use the simplest method of intensity ratio of two spectral lines of the same ionization stage to deduce the excitation temperature using the reformulated.

$$T_e = \frac{(E_2 - E_1)}{k \ln\left(\frac{I_1}{I_2}\frac{\lambda_1}{\lambda_2}\frac{A_2}{A_1}\frac{g_2}{g_1}\right)} \quad (5)$$

Taking the two lead lines at 251.61 nm (g_1 = 5, A_1= 1.68x10^8 s^{-1}) and 288.15 nm (g_2 = 3, A_2= 2.17×10^8 s^{-1}), and substituting the observed line intensities and the other constants in this equation we calculated the excitation temperature as 6.01 eV.

A more accurate value of the excitation temperature can be calculated using the Boltzmann Plot method in which several spectral lines and their relative line intensities are considered :

$$\ln\left(\frac{I_{ik}\lambda_{ik}}{hcA_{ik}g_i}\right) = -\frac{E_i}{kT_e} + \ln\left(\frac{N_0}{U(T)}\right) \quad (6)$$

A plot of the left-hand side of this equation versus the energies of the upper levels yields a straight line and its slope is equal to 1/T . In Table 2 the transition wavelengths (nm), upper-level energies, statistical weights (g) and transition probabilities (s^{-1}) of the six lines used to construct the Boltzmann plot are listed. The Boltzmann plot is shown in Figure 3. The plot's linearity is evident, reflecting that the plasma may be considered optically thin.

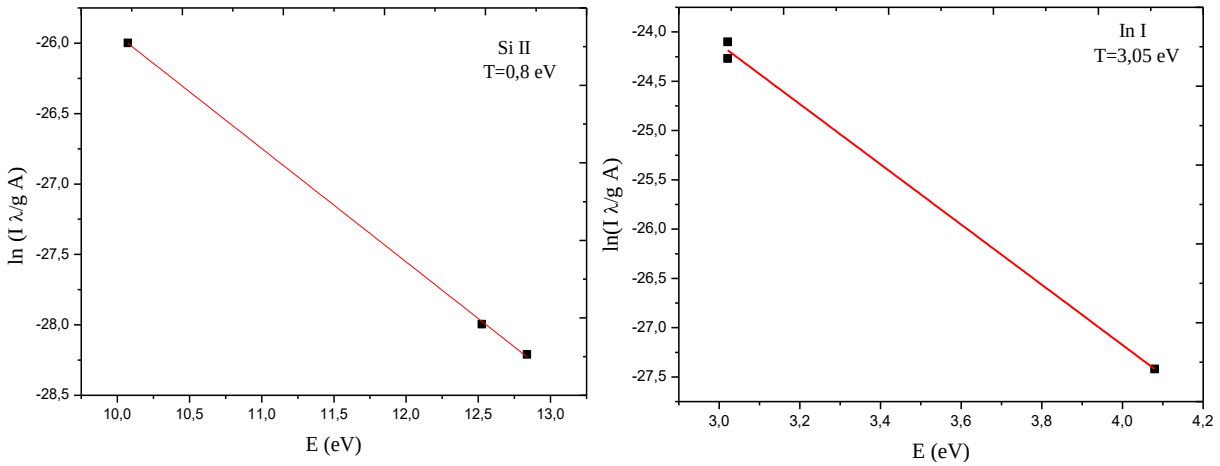

Figure 3. Boltzmann plot based on three Si II and In I spectral lines.

Table 2. The calculated parameters of Si II and In I spectral lines.

Atom/ion	*Wavelength λ_{ki}, (nm)*	*Upper level Energy E_k,(sm^{-1})*	*Statistical weight g_k*	*Transition probabilities A_{ki}, (s^{-1})*
Si II	412.57	103556.16	6	1.49× 10^8
Si II	505.59	101024.35	6	1.45× 10^8
Si II	634.37	81251.32	2	0.68× 10^8

In I	325.6	32915.539	4	1.3×10^{8}
In I	410.17	24372.957	2	4.96×10^{7}
In I	451.12	24372.957	2	8.93×10^{7}

It was found that the value of Si (II) double -chargedion transitions is T=0.8 eV and In (I) forsingle-chargedion transitions is T=3.05 eV, where the graph's slope indicates the plasma temperature. As the laser energy increases, the electron temperature and electron density increase. With the increase of laser radiation, the increase of these parameters in the plasma depends on the frequency of the plasma and is related to the absorption or return of the laser radiation by the plasma [12]. The frequency corresponding to the Nd:YAG laser (1064 nm) we used in the experiment is 2.8×10^{14} Hz.

The plasma frequency is given by [13–16]:

$$\nu_p = 8.9\times 10^{3}\, n_e^{1/2}$$

where ne is the electron density. For our case, the plasma frequency is estimated as 3.44×10^{12} Hz, less than the laser frequency. Hence, energy loss due to laser reflection from the plasma is insignificant.

The comparative results of the optical study of dependence of Si plasma temperature on the distance from the sample surface demonstrated the variation of the electron temperature in the range from 7500 to 4000 K. The electron density which changes from 3.2×10^{17} to 1.8×10^{17} cm^{-3} seems to be in local thermodynamic equilibrium (LTE) condition [1].

Conclusions

We studied the laser-induced plasma on the Si and In surfaces by using 10 ns pulse duration and wavelength of 1064 nm laser pulses. The parameters of the laser-induced plasma plumes were estimated. The electron density in the plasma was determined by the Stark expansion method for spectral lines of laser plasma. The electron temperature was calculated using the Boltzmann equation.The electron concentration and plasma temperatures were estimated and for Si their values were equal to $n_e \approx 10^{17}$ cm^{-3} and Te ≈0.8 eV, for In their values were equal to $n_e \approx 10^{18}$ cm^{-3} and Te ≈3.05 eV. Using obtained results for Si and In, it is possible to conduct qualitative and quantitative analysis of Si and In-mixed substances in the solid state.

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EVALUATION OF SENTIMENT ANALYSIS DATASET USING MACHINE LEARNING AND DEEP LEARNING MODELS

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Annotatsiya. Ushbu maqolada o‘tkazilgan tajribalardan so‘ng olingan natijalar taqdim etilgan. O‘zbek tilidagi matnlarning sentimental tahlili uchun bazaviy sun’iy inyellekt modellarni yaratish maqsadida turli xil oilalarga mansub tasniflash algoritmlatri tanlangan. Bular orasida Support Vector Machines (SVM)ning turli usullari, shuningdek, Rekurrent neyron tarmoqlari (RNN) va Konvolyutsion neyron tarmoqlari (CNN) kabi zamonaviy chuqur o‘rganish usullari mavjud. Tasniflashning haqqoniylik koeffitsiyenti uchun matematik hisob kitoblar amalga oshirilgan. Tajriba ikki xil berilganlar to‘plamida amalga oshirildi.

Kalit so‘zlar: *Sentiment tahlili, SVM, RNN, CNN, Aspektga asoslangan sentiment tahlili, o‘zbek tili.*

Аннотация. В данной статье представлены результаты, полученные после проведенных экспериментов. Для создания базовых моделей сентиментального анализа текстов на узбекском языке были выбраны классификаторы, относящиеся к различным семействам искусственного интеллекта. Среди них различные методы машин опорных векторов (Support Vector Machines, SVM), а также современные методы глубокого обучения, такие как рекуррентные нейронные сети (RNN) и сверхточные нейронные сети (CNN). Проведены математические расчеты для коэффициента достоверности классификации. Эксперимент проводился на двух различных наборах данных.

Ключевые слова: *Анализ тональности, SVM, RNN, CNN, Аспектно-ориентированный анализ тональности, узбекский язык.*

Abstract. This paper introduces the results that were obtained after conducting the experiments. To create the baseline models for Uzbek sentiment analysis, it has been chosen various classifiers from different families, including different methods of Support Vector Machines (SVM), and recent Deep Learning methods, such as Recurrent Neural Networks (RNN) and Convolutional Neural Networks (CNN). Mathematical calculations were performed for the accuracy coefficient of the classification. The experiment is performed on two different datasets.

Keywords: *Sentiment analysis, SVM, RNN, CNN, Aspect-based sentiment analysis, Uzbek language.*

Introduction

The rapid advancements in Natural Language Processing (NLP) technologies in recent years have led to highly accurate results, enabling the development of valuable

applications that now play a crucial role in various fields. Notably, the adoption of deep learning models has significantly improved accuracy across many NLP tasks. Sentiment classification, a key application within NLP, has particularly benefited from deep learning methods, showing notable performance improvements over earlier techniques [1]. However, these advancements have yet to reach low-resource languages. Neural network models, which have become highly popular in recent years, are widely regarded as the most effective supervised sentiment classification technique for languages with abundant resources [1-3,7]. Nonetheless, they require large volumes of annotated training data to perform well.

Literature Review

In the study by [4], sentiment analysis of Turkish political news in online media was explored using four different classifiers: Naive Bayes, Maximum Entropy, SVM, and character-based n-gram language models. The analysis employed various text features, such as the frequency of polar word unigrams, bigrams, root words, adjectives, and effective polar words. The results indicated that Maximum Entropy and n-gram models outperformed SVM and Naive Bayes, achieving an accuracy of 76% for binary classification.

Research Methodology

In order to assess the accuracy of these configurations, we utilized 5-fold cross-validation, which is a reliable method for evaluating model performance. This method involves partitioning the dataset into five equal segments, utilizing four segments for training the model and the fifth segment for testing purposes. The method is iterated five times, with each part utilized precisely once as the test set. Cross-validation enhances the accuracy of model evaluation by minimizing the fluctuations caused by the random division of the data. The box plots were used to display the accuracies achieved from the 5-fold cross-validation for each configuration of the Support Vector Machine (SVM). Box plots are a concise and effective visual representation used to depict the distribution of numerical data by showcasing the quartiles, median, interquartile range, and any possible outliers.

F1-Score: The effectiveness of the classification algorithms is usually estimated based on such metrics as precision, recall, $F1$ score, and accuracy. Moreover, it is very important to take into account computational cost resources that algorithm needs for building the classifier and using it. Consider the metrics that were used for calculation of the precision, recall, $F1$ score, accuracy (see the Table 1). Confusion matrix contains the estimated and actual distribution of labels. Each column corresponds to the actual label and each row corresponds to the estimated label of the sentence.

Table 1. Confusion matrix for a binary classifier.

		Actual	
		Positive	Negative
Estimated	Positive	TP	FP
	Negative	FN	TN

TP is the number of true positives: the sentence that is actually positive and was estimated as positive;

TN is the number of true negatives: the sentence that is actually negative and was estimated as negative;

FP is the number of false positives: the sentence that is actually negative but estimated as positive;

FN is the number of false negatives: the sentence that is actually positive but estimated as negative.

Accuracy presents the proportion of the correct answers that are given by the classifier hence it can be estimated as:

$$accuracy = \frac{TP + TN}{TP + TN + FP + FN}$$

Precision can be estimated using following formula: $precision = \frac{TP}{TP+FP}$

Recall shows the ability of the classifier to "guess" as many positive answers as possible out of the expected. The more precision and recall the better. However, simultaneous achievement of the high precision and recall is almost impossible in real life that is why the balance between two metrics has to be found. $F1$ score is a harmonic mean of precision and recall

$$F_1 = \frac{2 \cdot precision \cdot recall}{precision + recall}$$

The Krippendorff's alpha coefficient, which is named after the esteemed academic Klaus Krippendorff, is a statistical metric used to assess the level of agreement attained during the process of coding a collection of units of study.

Reliability data are generated in a situation in which $m \geq 2$ jointly instructed but independently working coders assign any one of a set of values $1, \ldots, V$ to a common set of N units of analysis. In their canonical form, reliability data are tabulated in an $m - by - N$ matrix containing N values $v_{i,j}$ that coder c_i has assigned to unit u_j. Define m_j as the number of values assigned to unit j across all coders c. When data are incomplete, m_j may be less than m. Reliability data require that values be pairable, i.e., $m_j \geq 2$. The total number of pairable values is $\sum_{j=1}^{N} m_j = n \leq mN$

The set of all potential answers an observer may offer is denoted by R. The collection of replies from all observers in a given case is sometimes referred to as a unit, which may be conceptualized as a multiset. The collection of units denoted as the items, U, is representative of a multiset. Alpha is given by:

$$alpha = 1 - \frac{D_o}{D_e}$$

where D_o is the disagreement observed and D_e is the disagreement expected by chance.

Analysis and Results

This subsection describes the conducted experiments and provides the results of the classification.

Our objective was to examine the impact of various kernel functions and optimization settings on the accuracy of sentiment classification tasks in Support

Vector Machine (SVM) models. More precisely, we examined three different setups of Support Vector Machines (SVM):

- Support Vector Machine (SVM) using the Radial Basis Function (RBF) Kernel, without employing dual optimization: This model utilizes the Radial Basis Function (RBF) kernel, which is widely used for handling non-linear data. It maps the data onto a space with more dimensions, making it simpler to identify a linear division. The phrase "without dual optimization" signifies that the problem was resolved in its primal form, which can be more effective for specific data types.

- The SVM with RBF Kernel (with dual optimization) employs the RBF kernel and solves the SVM problem in its dual form. Dual optimization enables the utilization of kernel methods, rendering it a potent method for managing data that is not linearly separable. Nevertheless, it can require more processing resources, particularly when dealing with larger datasets.

- The SVM with Polynomial Kernel utilizes a polynomial kernel to measure the similarity of vectors (training samples) in a feature space using polynomial functions of the original variables. This enables the model to learn non-linear patterns and relationships. The polynomial kernel can regulate the intricacy of the decision limits by modifying the polynomial's degree.

Within our visualization: Each box plot represents a specific SVM setup and displays the distribution of accuracies acquired from the cross-validation folds. Distinct colors were assigned to each box plot to improve visual differentiation and comprehensibility. A cool-warm color palette was selected to create a visually captivating contrast amongst the models. Box plots are chosen to facilitate an easy comparison of the models' central tendency (median accuracy), variability (interquartile range), and the presence of outliers.

This provides thorough insights into the consistency of each model's performance.

This analysis showcases the relative performance of Support Vector Machine (SVM) models when using various kernel functions and settings. Additionally, it highlights the importance of employing cross-validation and visualizations as crucial tools in evaluating machine learning models. By conducting a meticulous analysis, our objective is to determine the optimal SVM configuration for our sentiment classification problem, so making a valuable contribution to the wider domain of natural language processing and machine learning.

It has been implemented SVM models by means of the Scikit-Learn. machine learning library in Python with default configuration para meters. Scikit-learn provides a range of supervised and unsupervised learning algorithms via a consistent interface in Python. It is licensed under a permissive simplified BSD license and is distributed under many Linux distributions, encouraging academic and commercial use. The library is built upon the SciPy (Scientific Python) that must be installed before you can use scikit-learn. The vision for the library is a level of robustness and support required for use in production systems. This means a deep focus on concerns such as easy of use, code quality, collaboration, documentation, and performance. For the SVM models, we implemented a variant based on word n-grams (unigrams and bigrams), and one with character ngrams (with n ranging from 1 to 4). It has also been tested a model combining said word and character n-gram features.

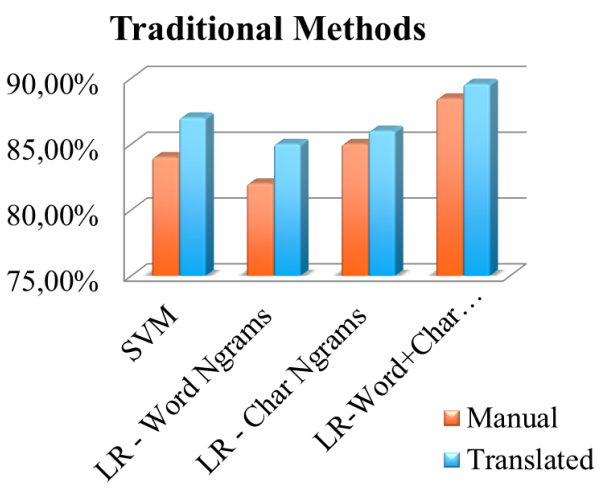

Figure 1. Traditional method.

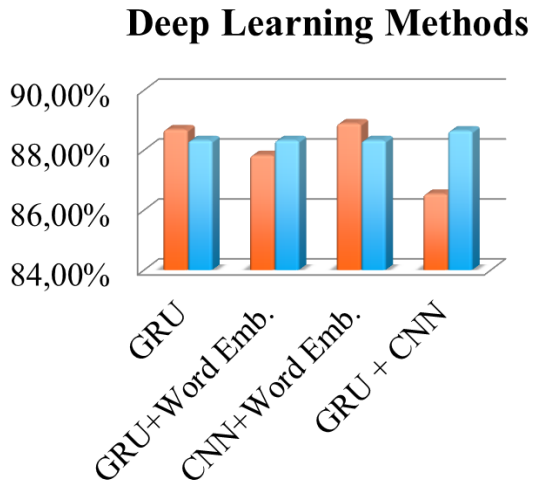

Figure 2. Deep learning method.

In the case of Deep Learning models, we used Keras [5] on top of TensorFlow. Designed to enable fast experimentation with deep neural networks, it focuses on being user-friendly, modular, and extensible. It was developed as part of the research effort of project ONEIROS (Open-ended Neuro-Electronic Intelligent Robot Operating System), and its primary author and maintainer is François Chollet, a Google engineer. Chollet also is the author of the XCeption deep neural network model[wiki] We use as input the FastText pre-trained word embeddings of size 300 for Uzbek language, that were created from Wiki pages and CommonCrawl, 9 which, to our knowledge, are the only available pre-trained word embeddings for Uzbek language so far. The source code for all the chosen baseline models is available on the project's GitHub repository. For the CNN model, we used a multi-channel CNN with 256 filters and three parallel channels with kernel sizes of 2,3 and 5, and dropout of 0.3. The output of the hidden layer is the concatenation of the max pooling of the three channels. For RNN, we use a bidirectional network of 100 GRUs. The output of the hidden layer is the concatenation of the average and max pooling of the hidden states. For the combination of deep learning models, we stacked the CNN on top of the GRU. In the three cases, the final output is obtained through a sigmoid activation function applied on the previous layer. In all cases, Adam optimization algorithm, an extension of stochastic gradient descent, was chosen for training, with standard parameters: learning rate $\alpha = 0.0001$ and exponential decay rates $\beta_1 = 0.9$ and $\beta_2 = 0.999$. Binary cross-entropy was used as loss function.

Since we have worked on relatively small dataset, other metrics, such as the runtime complexity and memory allocations were not taken into account.

Experiment with different configurations

It has been experimented in three different configurations:

- A first one working on the manually annotated dataset (ManualTT) and the result is as following:
- ManualTT - A second one on the translated dataset (TransTT):
- A third one in which training was performed on translated dataset while testing was performed on the manually annotated dataset:

Although the results obtained have been good in general terms, those obtained for deep learning models have not clearly surpassed the results obtained by other classifiers. This is mainly due to some of the complexities of Uzbek language. Indeed, Uzbek morphology is highly agglutinative, and this aspect makes it harder to rely on word embeddings.

This agglutinative nature of Uzbek poses a major challenge for the definition of word embeddings. In our experiments, we could not associate a word-embedding to about 37% of words occurring in reviews. The reason for that was the noise of the reviews dataset we used, and which contained a large amount of misspelled words. Additionally, while our dataset contains only words in Latin alphabet, about the half of the word embeddings we used were in Cyrillic, decreasing the chance of the word to be found.

Evaluation of Aspect based sentiment analysis corpus: Restaurant domain[1] annotated corpora are used which is collected from Google Maps based on Uzbek cuisine's locations on Google Maps where local national food reviews are the primary target.

We are given the corpus of reviews where our tasks are extracting Aspect Terms, Aspect Terms Polarities, Aspect Category Terms and Aspect Categories Polarities. We have two types of gold dataset: 3500 reviews and 6848 sentences.

Here's a breakdown of the evaluation results for each task [8]:

Task 1: Aspect Term Extraction (T1) F1-score: 75% F1-accuracy, Precision: 75.1% Recall: 74.6%, Cohen's Kappa: 72% Krippendorff's alpha (nominal matrix): 55%	**Task 2: Aspect Term Polarity Estimation (T2)** Simple ratio accuracy: 83%, Cohen's Kappa: 72.4% Krippendorff's alpha (nominal matrix): 88%
Task 3: Aspect Category Detection (T3) F1-score: 87.8% F1-accuracy, Precision: 88% Recall: 87.6%, Cohen's Kappa: 83.4% Krippendorff's alpha (nominal matrix): 83.3%	**Task 4: Aspect Category Polarity Estimation (T4)** Simple ratio accuracy: 85.3%, Cohen's Kappa: 75% Krippendorff's alpha (nominal matrix): 88%

These evaluation results provide valuable insights into the performance of your aspect-based sentiment analysis model for Uzbek language. It's important to highlight the strengths of your model, such as achieving high F1-scores, accuracy, precision, and recall for certain tasks. Additionally, you can discuss the challenges and areas for improvement based on the evaluation metrics where the results might not be as high.

Conclusions

This paper presented the results of conducted experiments. Table 2 shows the accuracy obtained in three different configurations: a first one working on the manually annotated dataset (ManualTT), a second one on the translated dataset (TransTT) and a third one in which training was performed on translated dataset while testing was performed on the manually annotated dataset [9].

[1] https://huggingface.co/Sanatbek/uzbek-restaurant-domain-reviews/blob/main/uzbek_restaurant_domain_reviews.xlsx

Table 2. Accuracy results with different training and test sets. ManualTT - Manually annotated Training and Test sets. TransTT - Translated Training and Test sets. TTMT - Translated dataset for Training, Annotated dataset for Test set.

Models used	ManualTT	TransTT	TTMT
SVM based on linear kernel model	0.8356	**0.8956**	0.7756
Logistic Regression model based on word ngrams	0.8547	0.8810	0.7720
Recurrent + Convolutional neural network	0.8653	0.8864	0.7850
RNN with fastText pre-trained word embeddings	0.8782	0.8832	0.7996
Log. Reg. model based on word and char ngrams	0.8846	0.8352	0.8145
RNN without pre-trained embeddings	0.8868	0.8832	0.8052
Log. Reg. model based on character ngrams	0.8868	0.8945	0.8021
Convolutional Neural Network (Multichannel)	0.8021	0.8832	0.8120

The SVM based on word n-grams obtained a binary classification accuracy of 89.56% on the translated dataset, while the one based on character n-grams, with its better handling of misspelled words, improved it to 89.45%. To take advantage of both methods, we combined the two and got 89.56% accuracy, the best performance for the translated dataset obtained in this paper. The deep learning models have shown accuracies ranging from 86.53% (using RNN+CNN) to 88.88% (using Multichannel CNN) on our manually annotated dataset, the latter being the best result on this dataset, while the RNN+CNN combination performed well on the translated dataset with 88.64% average accuracy, slightly better than others (88.32% for single RNN and CNN models).

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