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ELECTRICAL STIMULATION OF BIODEGRADATION OF POLYMER PACKING FILMS

Abstract: *It was established that adsorptive immobilization of microorganisms on the electret polyethylene films runs faster than on the non-electret ones independently of the adsorbate polarity. Immobilization was found to occur together with the charge carrier transfer from the surface layer traps of the electret film into the structure of the microorganism cells, and neutralization of the charges during metabolism in the cells. The electric intrinsic field of the electret polyethylene films was found to intensify the vital functions of soil microorganisms and promote the accelerated growth of their colonies. The optimal surface charge density range of starch-containing polyethylene films was 4-8 nC/cm^2. Named phenomena lead to the accelerated biodegradation of the polymer films. The kinetics of biodegradation of electret and non-electret polymer films by soil microorganisms was found different. Strength of the electret films decreases immediately after burial in soil, because in the competition of polymer aging and accumulation of biodamages in the film the latter process is prevailing. This is why the destruction of the electret films by soil microorganisms takes less time.*

Key words: *biodegradation, electret, films, microorganisms, polyethylene, starch, wastes.*

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1. INTRODUCTION

Since the 1960ies polymer film wastes have started to be a hazardous source of contamination of the upper soil and coastal waters of world's ocean. This problem is worsening due to a constant growth of their consumption volumes in the form of the packing materials [1]. Degradation of polyolefins in natural conditions that constitute above 40% of the whole polymer film refuse takes dozens of years [2, 3]. Biodegradable polymer materials (BPM), created at the end of the 20th century, with controlled lifetime have laid the basis for the optimal, ecologically safe approach to the problem of the polymer waste recovery [4, 5]. The properties of biodegradable films do not in fact change during the package service life whereupon they are disposed. Under the action of atmospheric factors and soil microorganisms they undergo accelerated physicochemical and biological transformations via joining metabolic processes of the natural biological systems [6-8]. Biodegradable plastics are not dangerous for the environment since the main

products of their destruction are safe for the ecological equilibrium [9].

The term "biodegradable" is commonly used to denote the materials degraded at least partially by the biological systems. According to ASTM standard D-5488-94d and European norm EN 13432-2000, "biodegradable" means "capable of undergoing decomposition into carbon dioxide, methane, water, inorganic compounds, and biomass". Biodegradation is the degradation of an organic material caused by biological activity (biotic degradation), mainly microorganisms' enzymatic action [7].

Today's industry of plastic materials has a range of BPM with a wide spectrum of properties meeting the requirements of different economic spheres. These materials can be subdivided into the following classes according to their structural and technological parameters [10]:

- biodegradable plastics based on natural polymers (polysaccharides, proteins, lignin, etc.) [11-13];
- biodegradable polymers synthesized by chemical and microbiological techniques [14-16];
- composite BPM [17-19].

During manufacture of composite BPM, their synthetic polymer binder is most often filled by some natural polymer, e.g. starch, cellulose, chitin, and etc. [20-22]. Biodegradable materials based on polyethylene and its copolymers, polypropylene, γ-butyrolactone and natural polymers are in great demand in today's market. Most important advantage of these materials is their lower cost as compared to the non-modified synthetic polymers. They are not so costly because the recovered vegetable raw stock used as biodegradable filler is 2 to 3 times cheaper than the binders. Development of composite BPM with a high degree of biopolymers content became a main way of plastics biodegradation ensuring. But this way is connected with technology complication and worsening of film properties. It is reasonable to suggest that on this way the chemical-technological reserves of biodestruction degree increase are exhausted.

New in principle approach to solution of the problem of biodegradation of polymeric wastes consists in transformation of polymer materials and their products into the electret state. An electret is the electric analogue of magnet, i.e., it is a dielectric generating a permanent electric field in the neighboring space [23]. Thermoplastic polymers are typical dielectrics. They acquire a stable electret charge during extrusion without application of any external electromagnetic effects. The spontaneous electret state is intrinsic for the polymer fibers [24], polymer blends [25], and filled plastics [26]. Microorganisms are extremely sensitive to any changes in the external electromagnetic field. The weak electric field of the polymer films and fibers (the surface charge density is about a few nC/cm^2) intensifies adsorptive immobilization of microorganisms and exerts an essential effect on bacteria metabolism, thus accelerating their growth. It makes sense to electrify polymer disposables since electrization does not alter their service properties but assists significantly in multiplication of the microorganisms destroying the polymer macromolecules. The method of converting polymer materials and goods into the electret state can make a base for a new modern trend in reclamation of polymer wastes.

The way microorganisms respond to the electric field is not yet fully understood. It is believed that cells polarized in the electric field are brought into the adsorptive-electrostatic interaction with the electret substrate during which the field changes the elementary forms of motion of the ions, polar molecules, double electrical layers and so on.

The purpose of the present work was to disclose the principles of microorganisms immobilization on the electret polymer films and to study how the intrinsic electric charge of the films affects their biodestruction kinetics by the soil microorganisms.

2. EXPERIMENTAL

2.1. Materials

In our experiments we have used low-density polyethylene (PE) (Russian State Standard GOST 16337, PE grade 15803-020), corn starch (St, GOST 7697), and inorganic salts: ammonium sulfate $(NH_4)_2SO_4$ and potassium dihydrophosphate KH_2PO_4. These salts are traditionally used as components of culture mediums for the microorganisms cultivation, they are heat-resistant and endure co-extrusion with polymers. They are known as biogenic fillers for polymeric carriers of the microorganisms able to accelerate immobilization and biofilm growth on the carriers [27].

The polymer compositions were prepared by mechanical mixing of the ingredients and granulation. The granulate was used further to form 100±5 mcm thick films on a hose film machine.

To study immobilization of microorganisms on the film we have used yeast of *Saccharomyces* family as a model culture as they have no pathogenic forms among the species of this family. Besides, they are eukaryotic (nuclear) cells that are widely applied in food industry (brewing, bread baking, production of vitamins, and etc.).

In the experiments on studying immobilized microorganisms, we have also used associations of soil microorganism-destructors isolated from the universal soil. The soil presents a mixture of turf, humus, fertilizers and biological dopes. This culture was grown in Petri dishes on a mineralized nutrient medium wherein the films under study were placed. The dishes with the samples were endured in a thermostat under T = 26 ± 2°C, after which the

growth rate of the microorganisms was visually recorded following the Russian Standard GOST 9.049 (Polymer materials and their components. Methods of laboratory tests for mould resistance).

2.2. Investigation methods

Circular (10 mm) film samples used in the immobilization experiments underwent annealing to remove the technological charge. The samples were then electrified in dc corona discharge with varying field intensity $(2\div5)*10^5$ kV/m. The efficient surface charge density σ_{ef} of the films was controlled (GOST 25209) by the methods of the vibrating electrode and by the electret-thermal analysis (ETA). The ETA is one of the most informative methods for studying the electret charge in the condensed media. Its essence consists in recording the kinetic parameters of charge relaxation. Charge relaxation in solid dielectrics proceeds rather slowly in usual conditions therefore it is expedient to use thermal stimulation in the electret studies. The temperature dependence of thermally stimulated currents (TSC), called in the physics of dielectrics the TSC spectrum, helps to understand the mechanisms of generating the electret effect.

The TSC spectra of the electret films were obtained by the method described in our paper before [28]. The film sample was placed onto grounded aluminum electrode and was covered by a Teflon film overlaid with another aluminum electrode. The current in the electrode-film- electrode circuit was recorded during heating the system at a 5°C/min rate.

We have recorded the currents generated under thermally stimulated depolarization (at 2,5°C/min heating rate) of the culture fluid drops with suspended in them *Saccharomyces* cells in a series of experiments using the method described in [29]. The TSC spectra shown hereinafter are the result of at least ten replicate tests averaged by a software used for statistical processing of spectra.

Crystallinity of the films having different compositions was determined by the X-ray diffraction analysis in the monochromatic CuK_a radiation by the X-ray diffractometer DRON-3M (Burevestnik, Russia).

To study physicochemical interactions between the constituents of the films and assimilation of biogenic components by the microorganisms we have used the IR spectroscopy (Specord-80, Carl Zeiss Jena).

The degree of biodestruction of the films was estimated by monitoring breaking stress at tension as related to their endurance time in soil. The films were cut in the form of spatulas of standard sizes (GOST 14236) and were placed into the cups with a soil to 3-5 cm depth. Once a week, the soil was watered. The samples were periodically removed from the soil and tested on a tearing machine Instron.

The results of experiments cited below were processed by the methods of mathematical statistics (confidence intervals and standard deviations were controlled).

3. RESULTS AND DISCUSSION

3.1. Microorganism's immobilization

The polymer films charged in the negative corona discharge have shown a peak of the positive current on the TSC spectra (Figure 1*a*). This peak corresponds to liberation of the charge carriers during the heat-induced destruction of the PE crystalline structure (melting point T_m = 107ºC). The stronger was the intensity of the polarizing field the higher was the peak. The "halo" of the positive current with a maximum at $T \approx 60$ºC corresponds to relaxation of the surface charge localized on the film defects.

When the films are charged in the positive corona discharge (Figure 1*b*) the peak corresponding to the PE melting point shows a negative polarity. Two "halos" of opposite polarity of the surface charge with the maxima at about 65 and 80°C were also detected. These "halos" resulted from relaxation of heterocharge (charge of the opposite sign) field which was directed against polarizing field [26]. The most likely interpretation of these peaks is the following: During TSC, at about 65°C, the internal field due to the surface charge aligns some additional dipoles in the film. This process yields a positive peak. At 80°C, the dipole alignment is thermally destroyed, yielding a negative peak. This latter peak has the same polarity as the peak at about 110°C caused by internal drift of the surface charges.

The endurance of the polarized films of both signs in water has resulted, firstly, in a noticeable drop of the peak at $T \approx 110$ºC and, secondly, in a complete disappearance of the surface charges and the corresponding "halos".

The TSC spectrum of the culture fluid containing *Saccharomyces* cells (Figure 1*c*, curve *7*) looks like a positive "halo" with a maximum at $T = 60\div70$ºC. It corresponds to liberation of the charges due to protein denaturation and thermal destruction of the lipids incorporated in the membranes and cell protoplasm. The temperatures of these processes are a bit higher than those of the surface charge relaxation of the electret films.

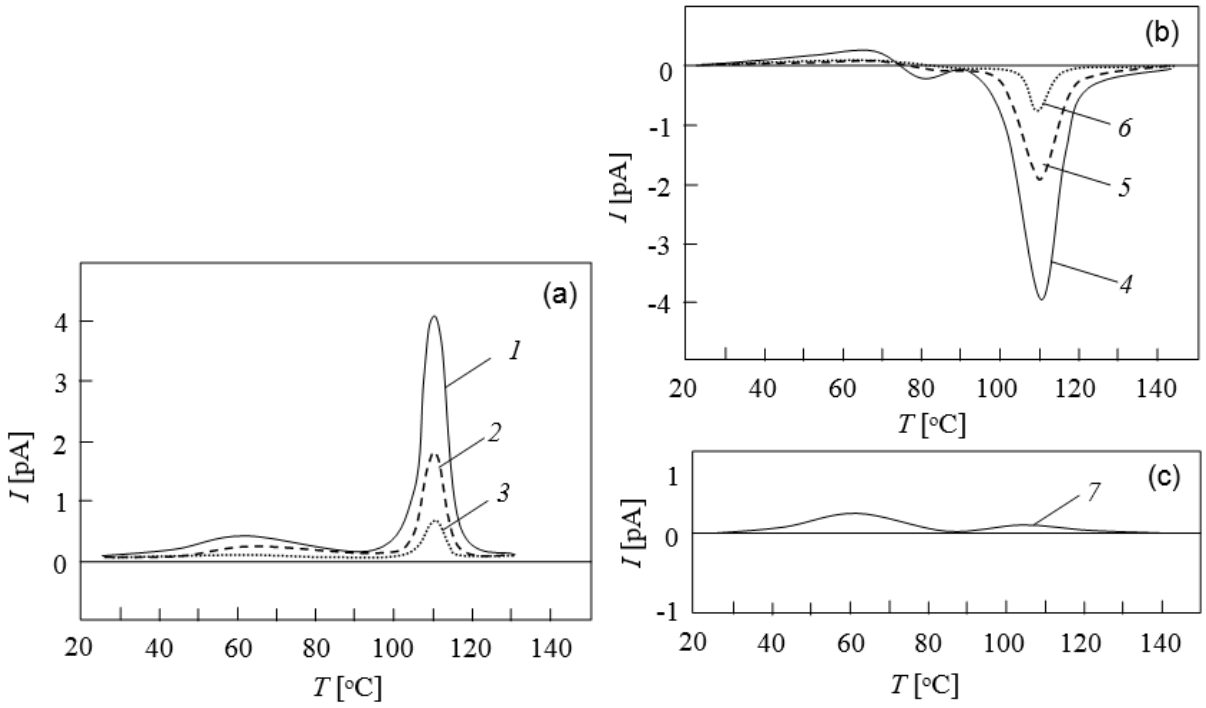

Figure 1 – TSC spectra: *a* – PE films subjected to a negative corona discharge, curves 1, 2 and 3 correspond to field intensity E = –12, –6 and –4 kV/cm; *b* – PE films subjected to a positive corona discharge, curves 4, 5 and 6 correspond to E = +12, +6 and +4 kV/cm; *c* – drop of the culture fluid with *Saccharomyces* cells (curve 7).

Exposure of the films in the culture fluid leads to the reduction of the electret charge density. The analysis of the TSC spectra of the films subjected to the corona discharge of unlike polarity –12 kV/cm and +12 kV/cm (Figure 2) has revealed the following.

First, the current peaks corresponding to T_m of the PE have reduced after the first day of exposure in the culture fluid (curves *2* and *6*). Secondly, a "halo" has appeared on the spectra in the region 50–80 ºC and its area has been expanding till some limits with exposure time. Thirdly, the "halo" has disappeared with washing of the biofilms away from the polymeric substrate (curves *4* and *8*).

Evidently, adsorption of cells from the culture fluid on the film substrate goes together with neutralization of the charge carriers entrapped in the surface layer of the film. The fact that the large peak on the TSC spectra decreases independently of the substrate charge sign is a confirmation to the presence of both positively and negatively charge areas in the cells participating in the electrostatic interaction with the substrates.

As we have mentioned earlier, the surface charge disappears fully when the films were exposed in water. Consequently, the "halo" of the positive currents at 30-90 ºC presented in Figure 2 complies with denaturation of proteins, enzymes, polypeptides and lipids found in the composition of the cells. This is confirmed by coincidence of the form and typical for the "halo" temperatures presented in Figures 1*c* and 2 (curves *2*, *3*, *6* and *7*). The "halo" vanishes as soon as the biofilm is washed away.

The height of the main peak on the TSC spectra that complies with thermal decomposition of the PE crystalline structure reduces during exposure of the film in the culture fluid (Figure 2). It looks as if crystallinity of the films reduces. But the control measurements of the X-ray crystallinity of the film substrates before and after immobilization of microorganisms have proved it to be invariable. It means that the electrically unbalanced cells adsorbed in the sites of the substrate where unlike charges are localized have neutralized them. The removal of the biofilms from the substrates does not irreversibly rise the peak. Therefore, the charge carriers entrapped in the PE crystalline structure undergo annihilation during immobilization of the cells. Apparently, the charge carriers are travelling during metabolic processes from the traps into the cellular structure and are neutralized there.

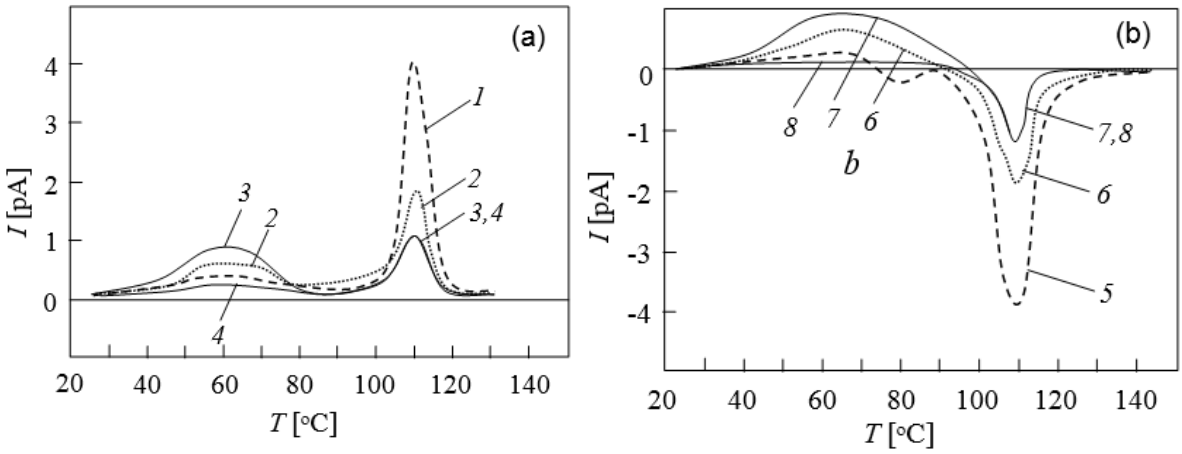

Figure 2 – TSC spectra of PE films charged in corona discharge of the negative (a) and positive (b) signs: 1 and 5 – initial, 2 and 6 – after a day of exposure in culture fluid, 3 and 7 – after 2 days of exposure, 4 and 8 – the same with the washed away biofilm.

3.2. Biofilm growth

We have estimated the electret charge effect on the microflora growth immobilized on the films by the extent the film samples overgrow with the soil microorganism culture. The intensive growth of the colonies was observed around all electret samples of the initial PE and its compositions PE + starch and PE + KH_2PO_4, in contrast to the non-electret films. This confirms the fact that the electric intrinsic field of the films intensifies metabolism of the microorganisms and growth of the colonies. Figure 3 illustrates the dependence of zone width L of microorganisms colonies intensive growth around the film samples on the surface charge density σ_{ef} of the films. The optimal value of charge density ranges from 4 to 8 nC/cm^2.

It is observed from Figure 4, that the spectra of the polymer composites PE + starch display the absorption bands of polysaccharides characteristic for the –OH group, i.e. the broad and intensive bands of valence vibrations in the region 3600–3200 cm^{-1}, and characteristic bands in the region 1646–1644 cm^{-1}. Strong absorption in the region 1200–1000 cm^{-1} and in the configuration-sensitive region 900–800 cm^{-1} characterize the vibrations of the starch molecular skeleton [30].

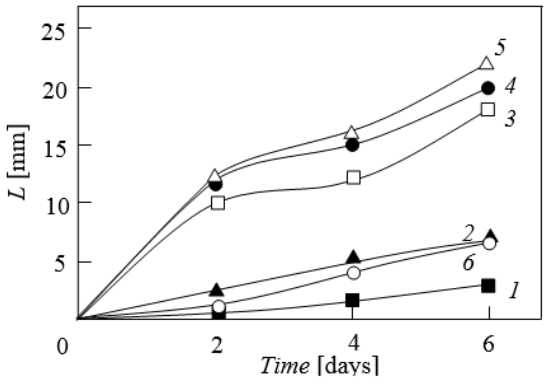

Figure 3 – Time dependence of zone width L of film samples overgrowing by microorganisms at different value of surface charge density of starch-containing PE films σ_{ef} (nC/cm^2): 1 – 0, 2 – 2, 3 – 4, 4 – 6, 5 – 8, 6 – 10 nC/cm^2.

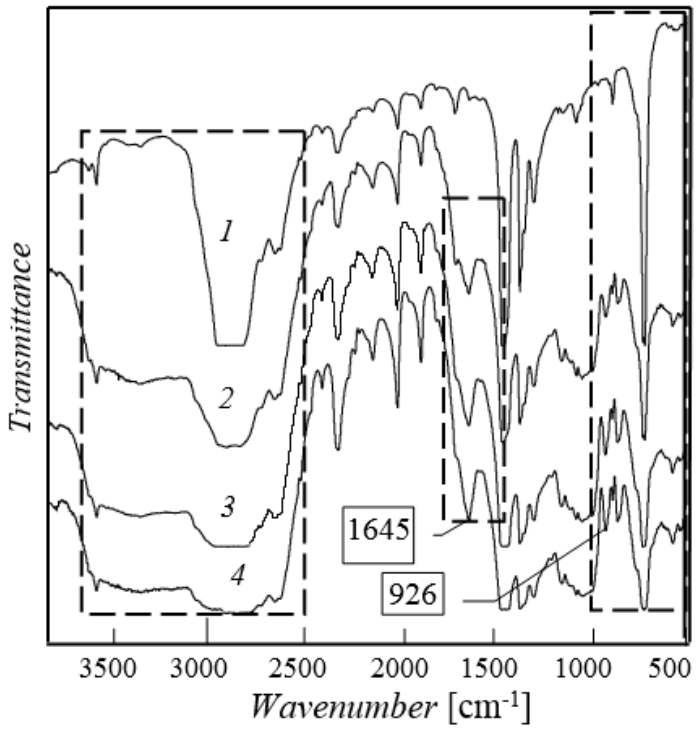

Figure 4 – IR spectra fragments of film samples:
1 – from initial PE; 2 – non-electret composition PE + starch (10%); 3 – electret of similar composition;
4 – electret of similar composition after exposure in soil (for 6 months)

The IR spectral analysis of the film samples 2 and 3 in the initial state and after their exposure in soil (sample 4) has shown that the electret composite films contain polysaccharide with a deep amorphization degree [31]. This is confirmed, in particular, by changes in the IR spectra intensity in the 1476 cm^{-1} and 730 cm^{-1} regions. So, we can state that a recombination of the supramolecular structure takes place in PE which become apparent in the effect of intensity smoothing of so-called "crystallinity bands" seen after starch introduction into the composition (samples 2 and 3), and after starch assimilation by soil microorganisms (sample 4).

Broadening of the band and reduction of the valence vibration intensity in the region of 3600-3000 cm^{-1} for samples 3 and 4 confirms that polysaccharide hydrogen bonds in the initial system are partially reordered and reconstructed under the electret charge effect, which results in increase of the number of hydroxyl groups available for hydration. The fact of starch amorphization is supported by variations in the absorption band intensities at 1645 cm^{-1} (characterizes C=O bond) and 926 cm^{-1} frequencies (characterizes α-1-4 glycosidic starch linkage). To interpret the IR spectra qualitatively in specified regions we have measured their optical density and compared to the one of the absorption band at 720 (valence vibrations of groups $–CH_2–$) chosen as a reference one [32]. The analysis of the relationship between optical densities of the absorption bands under study has brought us to a conclusion that the absorption band at 1645 cm^{-1} has expanded by 20-25% in the electret sample 3 as compared to sample 2, and by 50-55% in the electret sample 4 after exposure in soil in contrast to sample 3. This proves amorphization of polysaccharide due to the electret charge effect on the supramolecular structure of starch (sample 3), which accelerates further decomposition of starch by soil microorganisms (sample 4). So, it is evident that biodestruction of the samples in soil is intensified by the presence of the electret charge in starch-containing polymeric films.

Considerable changes in the IR spectra have been recorded also when PE films were doped with such fillers as inorganic salts known to be a source of energy for the microorganisms. This filling results in the intensity growth and a shift to a lower mode number of the peak 1077 cm^{-1} corresponding to oscillations of the oxidized molecular groups (with a C–O bond). In the case PE is filled with potassium hydrophosphate, this peak shifts to the region of 1050 cm^{-1} due to phosphorus tailing to the oxidized groups and formation of P–O–C and P–OH bonds.

Ammonium sulfate, used as a filler, shifts the peak to the region of 1060 cm^{-1}, which corresponds to the valence vibrations of the S=O bond. However, characteristic peaks KH_2PO_4 (850, 1080, 1300 cm^{-1}) and $(NH_4)_2SO_4$ (600, 1060, 1400 cm^{-1}) overlap with peaks of the PE vibration spectra. Thus, it is hard to detect the difference in assimilation rates of inorganic salts by microorganisms in the electret and non-electret films by means of IR spectroscopy. This can be easily done by estimating their strength loss.

3.3. Biodegradation of films

As of now the biological mechanisms and stages of polymer degradation by soil microorganisms have been established. Biodegradation of starch-filled films begins with assimilation of starch particles on the film surface by the microorganisms and formation of the pores instead of particles, as a result of which the film looses its mass. The threads and conidial fungi heads forming colonies cover the film. The polymeric material experiences embitterment and cracking due to the invasion of mycelium and pore clogging by the metabolic products. Using the electret-thermal analysis the relaxation transitions in polysaccharides were identified [33] along with sorption of soil moisture by the film and microbiological failure of starch structure. Assimilation of starch particles opens way for the microorganisms to the least ordered interfacial areas at the PE-starch interface.

Nevertheless, strength of the electret films initially is increasing when exposed in soil (Figure 5*a*, curve *1*) This is possible due to migration of stabilizers from the film, plasticizing effect and chemical action of humic acids found in soil that initiate secondary crystallization of PE and its macromolecular cross-linking [3, 6]. Strength of the films decreases afterwards exponentially in time with increasing amount of microbial damage. After 9-10 months of endurance in soil the film looks like a brittle perforated structure, and its strength approaches zero. We may consider the problem of creating biodegradable films solved since the resultant structure is penetrable for water and air, it is safe for the living beings and does not affect environmental equilibrium. The final stages of biodestruction of the film are decomposition of separate film fragments till the end products in the form of water and CO_2.

The kinetics of biological decomposition of the electret films is essentially different (Figure 5*a*, curve *2*). The original strength of the electret films is higher than that of the non-electret ones since the formation of the polarizing charges is accompanied by structural ordering of the polymer binder [26]. Loss of strength starts immediately after burial in earth. It follows that the intrinsic field of the film induces the activating effect on the kinetics of adsorption immobilization of microorganisms, their metabolism intensity and growth rate, and vital functions of their colonies grown on the film. This does not mean that aging processes leading to restructuring of the film have stopped. The competing process of macromolecular breaking by the microorganisms-destructors are more intensive than those of film strengthening. As a result, the period of biodestruction of the films in soil shortens by the time during which strengthening of the non-electret films and their further weakening till the initial strength value takes place (Figure 5*a*, period τ_0).

Figure 5*b* illustrates the initial areas of microbial changes in the film strength with time. Both non-electret PE films (diagram 3) and the ones filled by the salts giving energy for microorganisms (5, 7) display almost a similar strengthening rate independently of the film composition. Transfer of the films into the electret state results in their strength loss immediately after their exposure in soil (4, 6, 8). The rate of this process is conditioned by the nature and concentration of the biogenic filler, as well as its electric conductivity that defines the value of the polarizing charge formed in the film.

Figure 5*c* shows the similar dependencies for the starch-filled PE film. The strengthening rates of the films with different filling degrees (curves 9 and 10) are different because the content of PE in them is also different. The strength loss with 5 and 10% filling degrees (10 and 12) differs insignificantly because a similar relation is observed in the velocity of two competing processes: i) aging, cross-linking of macromolecules and strengthening of PE in soil; ii) microbial damage of the films compensating the strengthening effect.

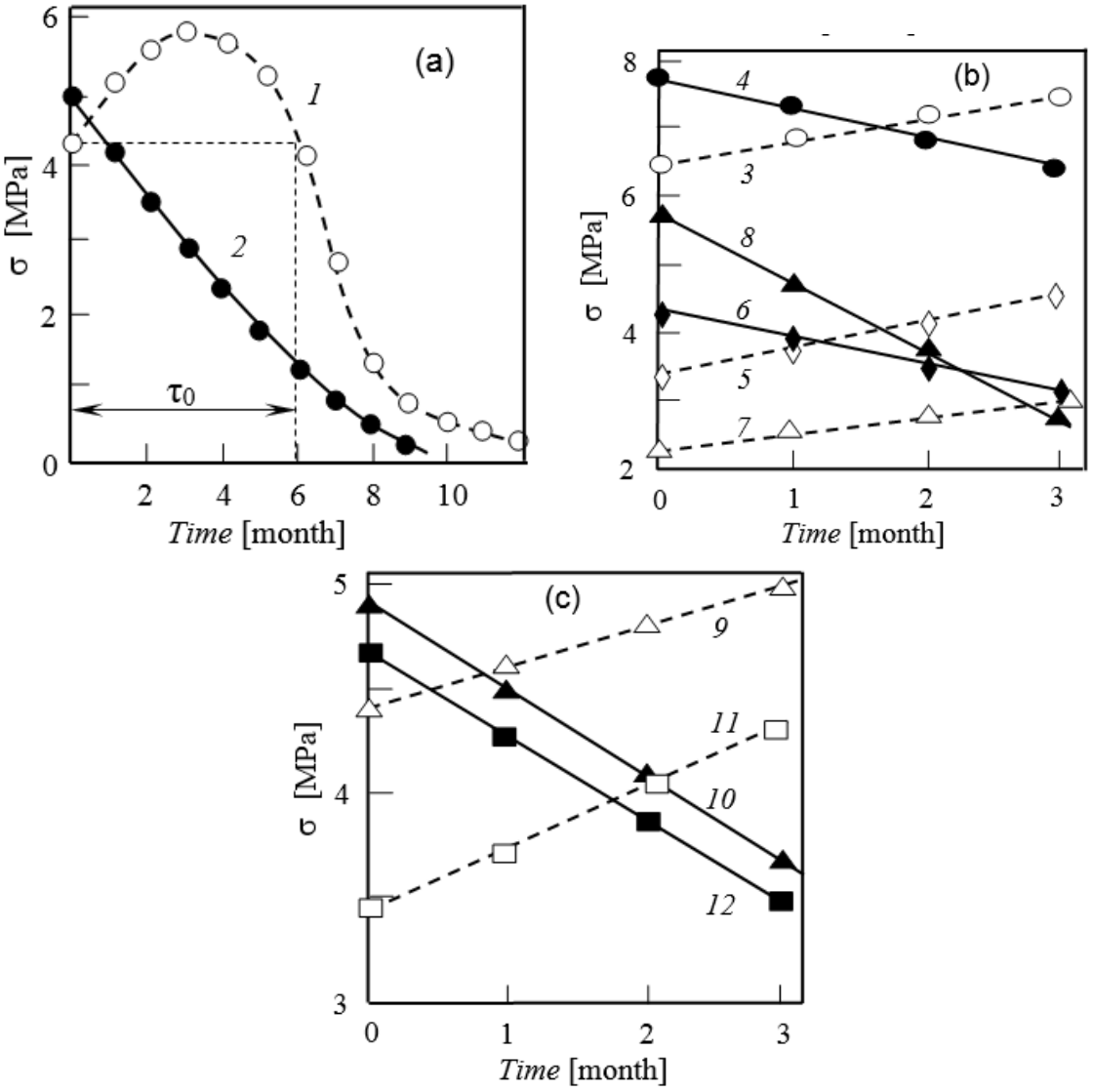

Figure 5 – Strength variation of the films of different compositions during exposure in soil for 8 months (a) and 3 months (b, c): 1, 2 – PE + starch (20%); 3, 4 – PE; 5, 6 – PE + KH_2PO_4 (5 %); 7, 8 – PE + $(NH_4)_2SO_4$ (5 %); 9, 10 – PE + starch (5%); 11, 12 – PE + starch (10%). Dashed line indicated non-electret films, solid lines – electret films with the surface charge density (nC/cm^2): 5.5 (2 and 4); 2.5 (6 and 8); 6.0 (10 and 12)

CONCLUSION

It was established by electret-thermal analysis that adsorptive immobilization of microorganisms on the electret PE films runs faster than on the non-electret ones independently of the adsorbate polarity. Immobilization was found to occur together with the charge carrier transfer from the surface layer traps of the electret film into the structure of the microorganism cells, and neutralization of the charges during metabolism in the cells. These findings can be used to improve manufacturing technologies for biodegradable films and biotechnological processes.

The electric intrinsic field of the electret PE films was found to intensify the vital functions of soil microorganisms and promote the accelerated growth of their colonies. The analysis of IR spectra of biodegradable electret starch-filled films has shown that polysaccharides undergo amorphization due to the electret charge formation in the films and the effect of soil microorganisms. The optimal surface charge density range of starch-containing polyethylene films is 4–8 nC/cm^2. Named phenomena lead to the accelerated biodegradation of the polymer films.

The kinetics of biodegradation of electret and non-electret polymer films by soil microorganisms is different. Strength of the non-electret film after burial is increasing at first due to aging of the polymer (secondary crystallization, cross-linking of macromolecules) and is reducing afterwards exponentially as a result of biological damage. Strength of the electret films decreases immediately after burial in soil, because in the competition of polymer aging and accumulation of biodamages in the film the latter process is prevailing. This is why the destruction of the electret films by soil microorganisms takes less time.

The production of the electret films is ecologically friendly and needs no extra expenses. The films obey the rigid requirements of biodegradability imposed on packaging materials in majority of countries. Commercialization of the electret packaging films may alleviate significantly the problem of the polymer waste recovery.

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MYCORRHIZALFORMING MAKROMITCETY AS ULCERATIVE CYCLE PHOSPHORUS IN FOREST ECOSYSTEMS

Abstract: *The article examines the impact of agrochemical properties of soil phosphorus content in fruiting bodies of forest macromycetes. It was established that the humus content and mobile forms of phosphate in the soil does not have a significant effect on the accumulation of phosphorus macromycetes. It is shown that an increase in the acidity of the soil solution decreases the content of mobile forms of phosphorus in the forest floor, while there is a relatively stable accumulation of phosphates in fruiting fungi bodies' which form mycorrhiza.*

Key words: *mycorrhiza, makromitcety, phosphorus, the soil, humus content, the acidity of the soil solution.*

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МИКОРИЗООБРАЗУЮЩИЕ МАКРОМИЦЕТЫ КАК ЗВЕНО КРУГОВОРОТА ФОСФОРА В ЛЕСНЫХ ЭКОСИСТЕМАХ

Аннотация: *В статье рассматривается влияние агрохимических свойств почв на содержание фосфора в плодовых телах лесных макромицетов. Установлено, что содержание гумуса и подвижных форм фосфатов в почве не оказывает значимого влияния на накопление фосфора макромицетами. В работе показано, что при повышении кислотности почвенного раствора снижается содержание подвижных форм фосфора в лесной почве, при этом наблюдается относительно стабильное накопление фосфатов в карпофорах микоризообразующих грибов.*

Ключевые слова: *микориза, макромицеты, фосфор, почва, содержание гумуса, кислотность почвенного раствора.*

Введение

Микоризообразующие макромицеты играют важную роль в лесных экосистемах, они образуют симбиоз с растениями многих видов, трансформируют в почве соединения элементов минерального питания и переводят их в доступную для поглощения форму. Тем самым они компенсируют дефицит биогенных элементов в лесной экосистеме путем включения этих элементов в биотический круговорот [1-3]. Функциональная роль грибов в процессе круговорота веществ в природе определяется их способностью синтезировать комплекс внеклеточных ферментов, с помощью которых происходит деградация растительного субстрата [4,5]. Ферментативная система эктомикоризных грибов способствует образованию органических кислот, которые содействуют химическому выщелачиванию минеральных поверхностей с последующей мобилизацией P, K, Ca, Mg и увеличению их доступности для растений [6]. Одним из основных свойств микосимбионтов является способность аккумулировать определенные химические элементы из почвенного субстрата, которые служат фактором, определяющим протекающие в них физиологические и биохимические процессы. В лесной подстилке содержится (до 20 %) мицелия дикорастущих грибов, который способствует запасанию растворимых полифосфатов и переносу их в растение-хозяин [7].

Способность мобилизации макро- и микроэлементов субстрата обусловлена агрохимическими свойствами почв [6]. Все

причины, влияющие на аккумуляцию микро- и макроэлементов в макромицетах, изучены не достаточно полно, однако можно выделить основополагающие факторы, среди которых геохимический состав субстрата, pH почвы, содержание органических веществ, а также факторы, влияющие на подвижность элементов и их доступность для биоты [8].

Одним из важнейших макроэлементов в растительной клетке является фосфор, физиологическая роль которого заключается: в регуляции синтеза белка, деления и развития клеток, механизмах энергетического обмена. Съедобные микориообразующие грибы служат источником фосфора в рационе питания жителей Республики Беларусь [9]. Существует проблема доступности фосфора для растений на различных типах почв. В Гомельской области средневзвешенное содержание фосфора в почвах сельскохозяйственных земель составляет 179 мг/кг [10], для лесных почв предполагаются более низкие значения этого показателя. В регионе преобладают дерново-подзолистые супесчаные и песчаные почвы, образовавшиеся на мелкозернистых песках, часто подстилаемых моренным суглинком. Главным источником соединений фосфора для почв служат почвообразующие породы. Минеральные фосфаты, в частности соли ортофосфорной кислоты, являются основным источником питания для растений и, как правило, преобладают в почве над органическими соединениями. Растворимые формы фосфора представлены в основном двумя группами солей: фосфатами кальция, магния и фосфатами оксидов железа и алюминия. Для почв подзолистого типа характерны фосфаты железа и алюминия. Устойчивость минеральных соединений фосфора (ортофосфатов Ca, Al, Fe) в значительной степени зависит от почвенных условий: от величины кислотности почвенного раствора, от органического компонента, от гранулометрических характеристик, от влажности и температуры почвы. Повышение кислотности почвенного раствора, способствует понижению подвижных форм фосфора и образованию трудно растворимых фосфорных солей. Фосфор, связанный с органической частью почвы, для растений труднодоступен и используется по мере минерализации органического вещества. Количество наиболее подвижных групп фосфатов увеличивается при переходе от суглинистых почв к песчаным. С уменьшением влажности величина поглощения фосфора возрастает, температура либо ускоряет, либо замедляет физико-химические реакции, непосредственно связанные с процессами поглощения фосфора [11, 12].

Для дерново-подзолистых почв Гомельского Полесья с высокой кислотностью характерна низкая подвижность фосфора и сниженная его доступность для растений. Это вызвано образованием нерастворимых соединений фосфора, в частности фосфатов алюминия и железа. Тем не менее, для кислых лесных почв с pH 4-5 богатых грибным мицелием в сравнении с нейтральными и щелочными почвами, сохраняется высокая трансформационная способность, обеспечивающая доступность фосфора и улучшающая плодородие в лесных формациях.

Цель работы состояла в оценке влияния некоторых агрохимических свойств на накопление фосфора микоризообразующими грибами.

Материалы и методы исследования

Объектом исследований служили микоризообразующие макромицеты и почвенный субстрат лесных насаждений Гомельской области. Были заложены 11 пробных площадей. Пробы съедобных макромицетов и почвы отбирали на территории Терюхского, Макеевского, Грабовского и Романовичского лесничеств Гомельского лесхоза, а также Любанского лесничества Октябрьского лесхоза. Лесничества Гомельского лесхоза расположены преимущественно на дерново-подзолистых слабо - и средне оподзоленных супесчаных и песчаных почвах, образовавшихся на мелкозернистых песках, часто подстилаемых на небольшой глубине (в пределах 1 м) моренным суглинком. Для почв характерна кислая и сильнокислая реакция среды, низкое содержание гумуса (с преобладанием фульфокислот), низкая насыщенность основаниями, поглащенные основания в основном H^+, Al^{3+}, содежание фосфора (0,06 – 0,08 %) с преобладанием минеральных фосфатов [13]. Любанское лесничество находится на территории дерново-подзолистых заболоченных песчаных и низинных торфяно-болотных почв. Почвы имеют кислую реакцию среды, содержат чаще 3-5, иногда до 7 % гумуса. Общее его количество существенно растет с увеличением степени гидроморфизма, в целом состав гумуса – гуматно-фульватный, содержание фосфора (0,05 – 0,5 %), с преобладанием органических соединений.

На пробных площадях производился отбор проб почвы и сбор образцов дикорастущих грибов. Пробы почв отбирали согласно ГОСТ 28168-89. Общее количество проб составило 55, по пять образцов с каждой площади, из них формировалась усреднённая проба почвы. После высушивания проб каждого стационара проводился химический анализ по определению обменной кислотности, содержанию гумуса и фосфора. Анализ проб почвы выполнялся в соответствии с ГОСТ 26483-85 и ГОСТ 26213-84. Определение кислотности почвы выполнено с помощью pH-метра 150 МИ, Содержание фосфора в почве определяли согласно ГОСТ Р 54650-2011.

При сборе грибов учитывался размер плодового тела и их видовой состав. Отбирали грибы следующих видов *Boletus edulis Bull., Leccinum scabrum Bull., Leccinum aurantiacum Fr, Cantharellus cibarius Fr.,Russula vesca Fr.*Для каждого вида грибов собранного на разных стационарах были сформированы объединенные пробы. После высушивания и озоления каждой пробы определяли содержание фосфора в грибах согласно ГОСТ 26657-97.

Таксационная характеристика типичных древостоев, где были заложены пробные площади, приведена в таблице 1.

Таблица 1

Таксационные показатели пробных площадей

ПП	Состав насаждения	Возраст, лет	Тип леса/ эдафоп	Средние		Полнота насаждений
				высота, м	диаметр, см	
1	5Б3С2Д	70	Б. ор./B_2	26,2	27,4	0,8
2	8Б2С	65	Б.кис./C_2	28,0	28,2	0,8
3	5С5Б+Д	40	С. ор./B_2	17,1	17,4	0,7
4	4С3Б1Ос1Д1С	56	С.чер./A_3	19,8	20,2	0,8
5	7С3Б+Д	50	С.мш./A_2	20,4	21,0	0,8
6	8С2Б+Д	26	С.мш./A_2	10,1	8,9	0,8
7	6С1Д3Б	30	С. ор./B_2	13,4	13,5	0,7
8	7С3Б	65	С.мш./A_2	24,0	26,2	0,6
9	6С4Б	24	С.вер./A_2	7,8	8,0	0,8
10	7С2Б1Д+Е	60	С.кис./C_2	25,4	28,0	0,9
11	10С	40	С.вер./A_2	12,2	12,0	0,6

Статистическая обработка результатов химического анализа проводилась с помощью табличного редактора MSOffice Excel 2010. Были использованы методы корреляционного и дескриптивного анализа данных.

Результаты исследований и их обсуждение

Результаты оценки агрохимических показателей почвы и содержание фосфора в грибах различных видов представлены в таблице 2.

Таблица 2

Свойства лесных почв и содержание фосфора в пробах макромицетов

№	pH	Гумус, %	Содержание фосфора, г/кг сухого вещества					
			Почва	*Boletus edulis*	*Leccinum scabrum*	*Leccinum aurantiacum*	*Cantharellus cibarius*	*Russula vesca*
1	5,0	2,0	0,144	5,8	5,7	5,1	4,5	3,2
2	4,7	3,6	0,074	4,4	4,5	4,1	3,6	3,0
3	4,5	2,2	0,082	4,8	4,7	4,4	4,0	3,4
4	4,3	0,4	0,091	5,2	4,4	4,6	5,2	3,0
5	4,2	1,3	0,077	6,9	5,9	5,5	4,4	4,9
6	4,1	1,5	0,079	5,4	5,3	5,7	4,2	4,4
7	4,1	2,7	0,088	5,5	4,3	4,9	3,8	4,8
8	4,0	1,4	0,085	5,9	6,7	5,4	4,8	4,9
9	4,0	0,9	0,073	5,4	5,4	4,9	4,9	5,3
10	3,8	2,5	0,039	4,1	4,8	4,1	4,5	3,2
11	3,6	0,8	0,042	4,9	4,7	4,1	3,5	3,9

Значения кислотности почвы пробных площадей варьировали в диапазоне 3,6 ÷ 5,0 (коэффициент вариации 10 %), содержание гумуса в значительной степени варьировало от 0,4 до 3,6% (коэффициент вариации 54 %), концентрация подвижных форм фосфора составила 0, 039 ÷ 0,144 г/кг сухой почвы (коэффициент вариации 35 %). Данные в таблице 2 сгруппированы по степени увеличения значений кислотности почвы.

Прослеживается общая закономерность снижения содержания подвижных форм фосфора с понижением кислотности почвы. Значение коэффициента корреляции составило 0,81 ($p<0,05$).

Достоверной зависимости между содержанием гумуса и подвижных форм фосфора в почве не установлено ($R<0,1$).

Корреляционный анализ между содержанием фосфора в грибах и почве позывает, что содержание подвижных форм фосфора в лесных почвах не оказывает значимого влияния на коэффициент накопления фосфора в плодовых телах грибов разных видов. Так коэффициент корреляции между содержанием подвижных форм фосфора в почве и в карпофорах *Boletus edulis составил* (-0,34), *Leccinum scabrum* (- 0,29), *Leccinum aurantiacum* (- 0,27), *Cantharellus cibarius* (- 0,53) *и Russula vesca* (- 0,31).

Между грибами разных видов не установлено достоверного различия по содержанию фосфора ($p>0,05$), вариация составила 18 %, что указывает на однородность выборки. Проанализировав результаты содержания фосфора в грибах по видовому составу можно сказать о незначительной вариации этого показателя. На рисунке 1 представлены распределения содержания фосфора в грибах разных видов.

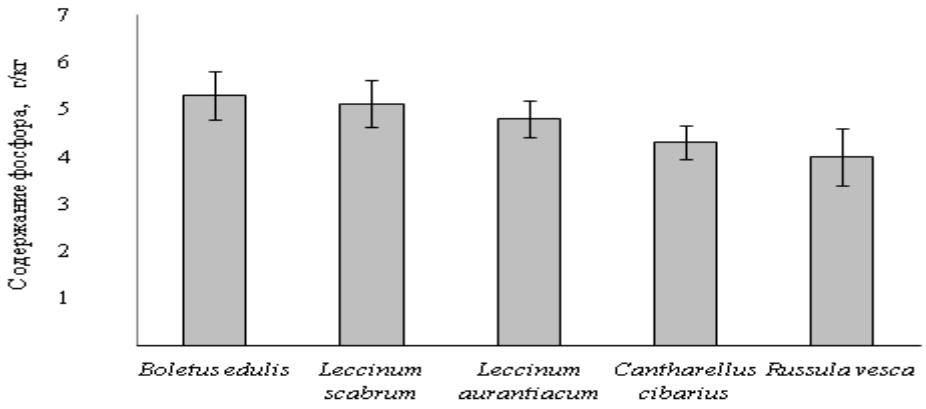

Рисунок 1 - Содержание фосфора в плодовых телах макромицетов.

Значения коэффициентов вариации изменялось от 12 – 22 %, для *Leccinum aurantiacum* 12 %, *Cantharellus cibarius* 13 %, *Boletus edulis* 14 %, *Leccinum scabrum* 15 % до *Russula vesca* 22 %. Среднее содержание фосфора в пробах грибов составило 4,71 ± 0,85 г/кг сухого вещества.

На рисунке 2 показано отношение концентрации фосфора, приведенное к средней в макромицетах и в почвенных образцах с различной кислотностью. С повышением кислотности почвенного раствора наблюдалось снижение содержания подвижных форм фосфора на опытных участках, при этом концентрация фосфатов в грибах менялась не значительно.

Зависимость содержания доступных форм фосфатов в почве от pH почвенного раствора имеет линейный характер, хорошо описывается линейным уравнением регрессии $R^2 = 0,82$. Не установлено зависимости между содержанием фосфора в грибах и кислотностью почвы $R^2 = 0,04$. Так же не наблюдалось достоверной связи между содержанием фосфора в грибах и содержанием его в дерново-подзолистых почвах. Можно предположить, что высокая ферментативная активность микоризообразующих грибов, являются важными факторами перевода в почве малорастворимых соединений фосфора в доступные формы [4].

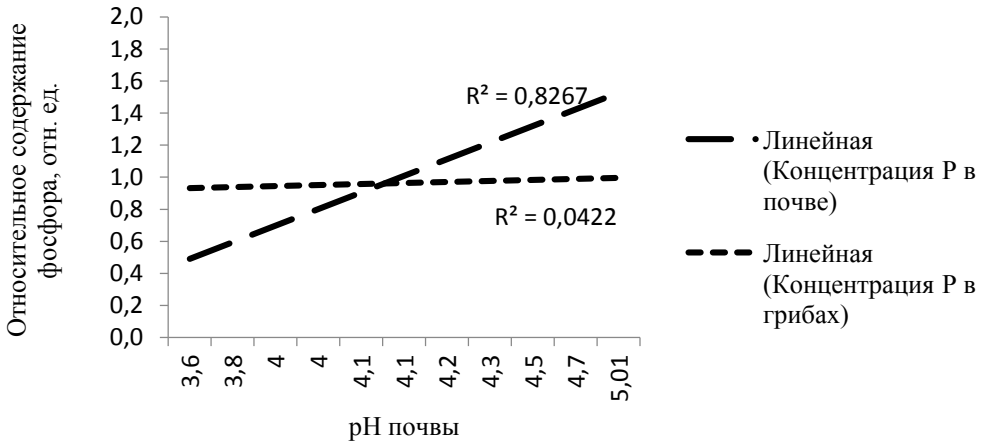

Рисунок 1 - Влияние pH почвенного раствора на величину содержания фосфора в системе почва – грибы.

Заключение

Агрохимические свойства почвы – содержание гумуса, кислотность почвы, содержание подвижных форм фосфора не оказывает значимого влияния на накопление фосфора макромицетами. Показано стабильное накопление фосфора в плодовых телах микоризообразующих грибов разных видов в среднем на уровне 4,7 г/кг. Полученные данные указывают на наличие общего механизма фосфорного обмена у высших микоризообразующих грибов, обитающих в лесных экосистемах.

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SECTION 25. Technologies of materials for the light and textile industry.

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THE SYNERGY INFLUENCE OF HAZARDS AT WORKSTATIONS AT A HEIGHT ON MEANS OF LANYARD MADE OF ROPE

Abstract: *The construction workers use individual protection systems against fall from height in both for extra protection and as a single measure of protection when the work is short or for technical reasons other measures of protection are not possible. During the activities at height the hazards at workstations are acting not only to the worker, but also on personal protective system against falling from a height, damaging it. The anchor being a component of individual systems for protection against falls from height, which connects the body holding device and the anchor point to ensure the safety of users must retain the characteristics of protection throughout the period of use. Given the dangers at different workstations in construction, this article presents their influence on the protective characteristics of connecting means made of rope. It also presents the conclusions on the main causes of loss of the protection features of connecting means made of rope.*

Key words: *means of coonection, ropes, danger/hazards, construction*.

Language: *English*

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1. Introduction

The mean of lanyard being an essential component of all protection systems for protection against falls from a height, which together with other components (body support device and safe anchorage) is used in various sectors. The most important tasks of a lanyard means are:

• connect the body holding device to a safe anchor point;

• to support the user's body in the supported position;

• to support the wearer body in case of a fall.

Because it ensure the protection against serious or fatal accidents, maintaining of the characteristics of protection of lanyard means throughout the entire period of use is crucial.

Presently placing into the market of a lanyard means is governed by European Directive 89/686/EEC as amended and supplemented, those must meet the essential health and safety requirements throughout the entire life. In addition, to ensure adequate protection against the risks in question, must be able to withstand to the effects of the inherent environmental factors in the foreseeable conditions of use. Although this requirement exists in the European Directive 89/686/EEC it was not pursued because it was not translated into specific requirement standards by which full compliance is given the presumption of conformity of such a product.

Because over time occupational accidents due to falls from heights continued to appear, it is clear that the risk factors present in the working environment act not only on employees but also on personal protective equipment (abbreviated further PPE), influencing negatively its protection features. The lack from specific standards EN 1891, EN 358 and EN 354 of requirements that establish product performance taking into account the actual use conditions, led to the establishment of erroneous protection features or some false lifetime use, which proved to have repercussions on direct user. Accurate estimation of the life of a lanyard means made from rope is based on understanding the phenomena that adversely affect their protection features.

Studies on the effect of the mechanical factors or the synergistic effect of the various hazards of the protective characteristics of the constituent materials of the various components to the personal protective equipment against falls from height were made by Krzysztof and Marcin Baszczyński Jachowicz [1, p.

117, p. 123; 2, p 445; 3, p 21; 4, p. 2, p. 18. Although the analyzed studies have led to a better understanding of the size and pattern of accidents, however the allocation of a single specific cause for an accident or incident is rarely accurate and is often considered a flawed approach because it fails to identify the real causes. Regarding the synergistic action of risk factors to the characteristics of protection of lanyard means made of rope, studies are in an early stage. Thus, from the desire to correctly estimate the "life" of complex belt Krzysztof Baszczyński and Marcin Jachowicz conducted a study [32] in which they watched the influence of the synergistic action of weathering, light, mechanical factors and dust on different strap samples used to achieve them.

Due to the large number of work accidents recorded each year in construction [5] by the study carried out I wanted to draw attention of involved factors to the importance of identifying existing hazards in the workplace for the selection of the appropriate lanyard means made of rope .

2. Methodology

The methodology that was the basis of the survey was to identify the existing hazards at different workstations at a height in constructs to identify and develop accelerated test methods by which to determine the impact of hazards on the protective characteristics of different rope types.

Since in actual use conditions is likely that existing risk factors in the work environment to combine, in the study the synergistic effect was achieved by overlapping the factors effect for degradation through accelerated methods. Thus, samples of various diameters of rope were exposed to a sequence of degradation: weather conditions; dust and abrasive edges; moisture and cold. To track the effect of the degradation factors on the rope material, each exposure was followed by a static strength test according to EN 1891[6, p. 7] continued to break.

3. Rope samples and test methods

Considerind that the technology of manufacture of the ropes has reached a plateau, only one polymer is predominantly on the market – the polyamide; for the series of tests were acquired ropes of polyamide with different diameters made by different manufacturers (see Table 1).

Table 1

Rope samples purchased

No.	Static rope type A	Rope diameter, mm	Characteristics	Code
1		10	- the mantle structure has woven strands 40 (8 strands khaki, black strands 32) - the core is made up of 14 twisted strands with a diameter of 0.63 mm	10 NK
2		10	- the mantle structure has colored braided strands 40 (4 strands of black and blue strands 36) - the core is made up of 16 twisted strands with a diameter of 1.86 mm	10 AN
3		10,5	- the mantle structure has 40 strands braided black - the core is made up of 14 twisted strands with a diameter of 1.82 mm	10,5 N
4		10,5	- the mantle structure has 16 colored wires twisted (2 wires blue, one red thread, one thread yellow, gray 12 threads) - the core is made up of 40 twisted strands with a diameter of 0.63 mm	10,5 TRI

No.	Static rope type A	Rope diameter, mm	Characteristics	Code
5		10,5	- the mantle structure has 54 colored wires interlaced (6 wires khaki and black yarn 48) - the core is made up of 16 twisted strands with a diameter of 1.82 mm	10,5 NK
6		11	- the mantle structure has colored strands woven 48 (6 strands of black and blue strands 42) - the core is made up of 16 twisted strands with a diameter of 1.68 mm	11 AN
7		11	- the mantle structure has colored strands woven 48 (6 strands khaki and black strands 42) - the core is made up of 16 twisted strands with a diameter of 1.68 mm	11 NK

To determine how the hazards from the work environment, act during a year, the protective characteristics of the lanyard means made of rope, sets of specimens for each type of rope were exposed to different types of degradation through accelerated methods. Since for lanyard means the static resistance is representative and closely linked to its durability, each degradation was accompanied by a determination of static resistance according to EN 1891 continued to break. In parallel, samples of rope coded as 10.5 TRI were used for a year by workers in construction in various activities at height.

Prior to the exposure of the ropes to the series of degradation, all samples were conditioned at (23 ± 2) ^{0}C and at a relative humidity of (50 ± 5)% for 168 hours. The conditioning was carried out in a climate chamber Feutron provided with a ventilation system, which allows to ensure uniform temperature and humidity conditions, in the whole enclosure.

3.1. The degradation to weathering

Key variables that influence the weather are ultraviolet radiation, temperature and water /humidity. In setting test parameters was taken into account the position that Romania has in the world [(7)]. With a moderate climate, with sunshine yearly on a horizontal surface less than or equal to 5 GJ/m2 [8, p. 8, p 9], calculations determined that 1 year of sunlight is equivalent to an exposure in the laboratory to an energy radiation equal to 201 MJ/m^2. Applying the principle of similarity to the achievement aging of the ropes was used method of ISO 4892-2 [9, p.7].

Thus, sets of specimens of each type of rope were exposed for 400 hours to artificial sunlight using a test chamber Q-Sun Xenon Xe-1 equipped with a lamp Xenon arc (see Figure 1). A day filter was installed between the irradiance source and the sample and the was set at (0.51 ± 0.02) W / (m2·nm) for wavelength of 340 nm.

Specific exposure conditions were:

- Standard panel temperature: (65±3) ^{0}C;
- the temperature in the test chamber: (38±2) ^{0}C;
- relative humidity: (50±10) %;
- radiation - Narrowband: (0,51±0,02) W/(m^2·nm) wavelength 340 nm;
- exposure period: 400 hours;
- The number of cycles of exposure: 200 (1 cycle: 102 min. Drying; 18 min. sprayed with water).

Figure 1- Aging equipment for determining exposure to artificial radiation (xenon) - Q-SUN xenon

Results of the appearance of the ropes after exposure for 400 hours in the UV radiation are shown in Table 2.

Table 2

Notice recorded after exposure of ropes for 400 hours to UV radiations

Type of rope	**Photos before exposure**	**Photo after exposure**	**Observations**
10 NK			– discoloration – rope surface is slightly sticky
10 AN			– slight dulling – rope surface is slightly sticky
10,5 N			– without discoloration
10,5 TRI			– severe discoloration – rope surface is frosted
11 AN			– discoloration – rope surface is slightly sticky

Encoded ropes 10.5 N 11 NK 11 NK showed no changes in the appearance. Since encoded rope 10,5 TRI showed a marked discoloration in order to observe any structural changes that occurred, it was analyzed under a microscope (see Figure 2).

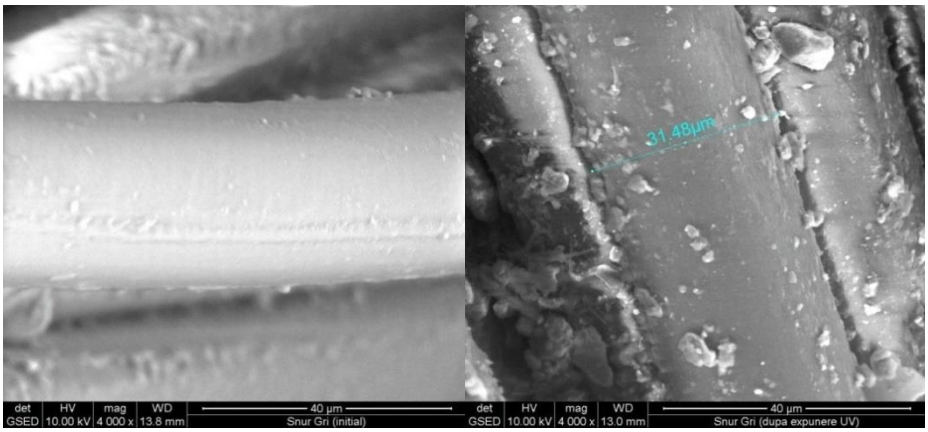

Figure 2 – The microscopic analysis of TRIM 10.5 rope before and after exposure to UV

As shown in Figure 2, following exposure to UV radiation, surface of the rope (mantle) has been damaged, which stresses that under the action of UV radiation the polymer structure undergoes various changes that can influence their physical and chemical properties. This is demonstrated by the results recorded in Table 3.

3.2. The exposure to dust

The idea that particles of dust on most construction workstations could pass through the mantle of the rope and get to the core strands reducing their integrity, determined the need to monitor the influence of this phenomenon on the tensile strength of the ropes.

Method on dust exposure was modeled after the pr. EN 354: 2006 [10, p. 18] and consisted in the exposure of the test specimens of rope to 1000 cycles of abrasion in a sand bath through a roller system. The device used to carry out this degradation being provided with a drum that performs a oscillatory motion at an angle of 90^0, to permit back and forth movement of the test specimen, through sand, over a length of 100 mm.

The device (see Figure 3) has been set so that, for each cycle the specimen to be passed through the sand bath twice (back and forth). As the abrasive material was used special sand with a grain size ranging between 0.1 mm and 1.0 mm (see Figure 4). The abrasive material has been changed at the beginning of each test.

After completion of the test / degradation, samples were visually inspected and then subjected to the static strenght test, continued to break.

Figure 3 - Device used to dust degradation

Figure 4- Abrasive material - sand

3.3. The exposure to abrasive edges

Since the rope connecting means are used in various individual protection systems for working at height, one of the criteria by which the user can decide whether connecting means is defective or not is the mantle damage. If for limiting systems we can not speak about a true contact for the connecting means with the abrasive edges, in terms of positioning systems and access on rope such situations are common. The need to monitor the effects of unprotected edges on the protective characteristics of the ropes was determined by the conclusions of interviews with construction workers that frequently use access and positioning systems on the rope and admitted that there are situations (especially when the rope was new) the protection of the rope at the edges contact area was omitted. To track the effects of the unprotected edges on the protective characteristics of the ropes, it was simulated such action by switching under load (120 kg) samples of rope over the abrasive edge of concrete (with roughness of 18 micrometres and an edge radius of curvature of 2 mm) (see Figure 5). Rope samples were subjected to 5 passes over edge. A crossing over the edge consist in raising and lowering the ground of a mass of 120 kg.

Figure 5 - Exposure to abrasive edges

3.4. Conditioning to moisture and cold

Given that during cool weather unforeseen circumstances may arise the activity at height can be done the test will be made in accordance with section 5.2.2. / EN 354: 2011 and consists of dipping the sample of anchor in water fresh at least 1 h at a temperature of (23 ± 5) °C and then, within 90 s after removal from the water, has been placed in the cold room for at least 4 hours at a temperature of (-4 + 0 / -2) °C.

After completion of the test / degradation, the specimens are subjected to the tensile strength.

3.5. The static strength / the breaking strength

Because the static resistance establishes the relationship between external forces and effort (internal forces) and the relationship between effort and tension; by determining its was monitored the ropes capacity to resist to all demands arising in the entire lifespan. The test method for determining the static strength is described in standard EN 1891 and consists in the exposure of the test specimen (which may be part of the system or part of it) for 3 minutes at a force of 15 kN. It is considered that the requirement for static strength is satisfied if during that time when the force was applied, the specimen does not break.

The test equipment used to perform the static strength test is a traction machine in accordance with 4.1 of EN 364: 1992 (see Figure 6).

Figure 6 - Static test machine for tensile, compression, shear and bending materials, type H50K-S with interchangeable cells

The results of test series are presented in Table 3.

Table 3

The influence of the risk factors on the ropes breaking strength

Rope code	Breaking strength, N, after exposure						
	t = 23 ° C, UR= 50 %, 168 hours	t = 23 ° C, UR= 50 %, 168 hours + 1000 abrasion cycles	t = 23 ° C, UR= 50 %, 168 hours + 1hour immersion in water + 4hours conditioning t= - 4 ° C	t = 23 ° C, UR= 50 %, 168 hours + 400 hours at UV radiation, 0,51 W/(m2·nm), λ=340 nm	t = 23 ° C, UR= 50 %, 168 hours + 1000 abrasion cycles + abrasive edges	t = 23 ° C, UR= 50 %, 168 hours + 1000 abrasion cycles + abrasive edges + 1hour immersion in water + 4hours conditioning t= - 4 ° C	t = 23 ° C, UR= 50 %, 168 hours + 400 hours at UV radiation, 0,51 W/(m2·nm), λ=340 nm +1000 abrasion cycles + abrasive edges + 1hour immersion in water + 4hours conditioning t= - 4 ° C
10 NK	16.550	15.413	16.400	13.987	15.960	15.700	13.373
10 AN	16.260	15.931	15.542	14.340	16.117	15.663	14.230
10,5 N	17.820	17.227	16.973	17.030	17.200	16.600	15.893
10,5 TRI	20.375	16.400	16.427	16.100	16.388	16.143	16.087
10,5 NK	16.620	15.480	15.487	14.800	14.193	14.085	12.877
11 AN	16.987	18.020	16.290	15.840	17.280	16.227	15.275
11 NK	18.494	18.100	16.317	16.827	17.997	16.260	16.143

Analyzing the results recorded in Table 3, it can be seen that the magnitude of synergistic risk factors on the tensile strength of various types of wire exposed to combinations of degradation depends on the number of risk factors, the diameter of the rope and not least the lack treatments applied ropes.

Thus, satisfactory results in relation to the requirements of European harmonized standards have the ropes coded 10.5 N, 10.5 TRI 11 AN and 11 NK, which means that these cords have undergone various treatments, which makes them resistant to the water, UV protection, and not least to the abrasion resistance.

4. The method validation

Also, by comparing the tensile strength of rope samples (10.5 TRI) exposed for 1 year in real conditions of use (see Table 4), on a site with those derived from the exposure of same rope type at all degradation "stacked" (table 3), we can say that the results are similar.

Tabelul 4

The breaking strength results after exposure of the rope 10.5 TRI to synergistic effect of the identified risk factors and the real conditions of use for 1 year

degradation type	Breaking strength, N			
	Epr. 1	Epr. 2	Epr. 3	The average value
Synergy created in the laboratory by the accelerated degradation overlay	16.460	15.900	15.900	16.087
Exposure for 1 year on site in real conditions of use	15.700	16.600	15.720	16.007

This proves both the correct identification of hazards existing at workstations at height in the construction, and the development of a right protocol for test simulation in the laboratory of the synergistic action of risk factors present in the workplace.

5. Conclusion

Results obtained from tests showed that the means of protection against falls from height made of rope lose some of the protection features in use. The main factors causing this process are the synergistic action of ultraviolet radiation and risk factors. As can be seen from the results obtained after carrying out series of tests synergistic effect has a greater negative effect on the characteristics of protection than that caused to the rope by the action of the individual hazards. The risk of injury/accident or occupational disease, defined as the combination of the probability and consequences of a dangerous characteristic event occurred is much higher than that due to a single risk factor.

Therefore, to maintain safe and healthy jobs, special attention should be paid to risk assessment. Identifying all existing factors at workstations is essential in determining the characteristics of the components that PPE must have for work at height.

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SECTION 29. Literature. Folklore. Translation Studies.

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THE DIRECT SPEECH VERBS IN VERSE OF RELIGIONS CONVERSATION

Abstract: *Language communication consider as a complicated human active ; it requires to do different language skills ; in different ways for the purpose of showing the ability and communication efficiency; and perhaps the most important theses submitted in this field (the theory of speech verbs) it considers one of most prominent achievements in the field of linguistic studies, especially deliberative which considers in the recent time the pole which rounds in his course the different deliberative studies. The search of the direct speech verbs in verse of religions conversation in the Holy Quran has studied according to division which Dr. Mahmood Ahmad Nahla has discussed it because it agrees with Arabic language characteristic, benefiting in this from the division of Austin and Searle and their standards for the purpose to exit with (Arabic theory of speech verbs) he divided it to five parts is (rhythms, applications, information, obligations, and expressions) all of these located under the class of direct speech verbs and this which we apply in our study to verse of religions conversation.*

Key words: *religions, language, direct speech verb.*

Language: *English*

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The speech verb:

The definition of speech verb is each vocalized raises as effective achievement indicative formal system in addition it considers as grammatical material active entreats speech verb to achieve fulfillment purposes as demand, order, promise, and effective goals linked to response of receiver act as rejection and acceptance and then it is act aspires to be effective act which mean it aspires to be the impact in speaker social or institutionally and then achieve something .Shukri Alambkhot defined it :speech (which mean lexical and grammatical structure) which construction strength progress it and which mean by this making behavioral or mental effective and say something, which mean making a certain act and behavior, and in another meaning pronunciation with something is getting effective attachment so it is a pronunciation represent meaningful performance act effect in receivers to do something, it is linguistic activity it is aim is changing the reality and searching in it, it is search about interesting in deliberative linguistic .it is one of the biggest basis. since it is the issue of dialogue between us for religions occupied a large area in intellectual, international, Islamic, ancient and contemporary studies. This theory has roots at Arabic scholars in difference of their specializations, but it didn't` study for itself, but it came with signals in difference researches and it might most notably investigation of news and composition but in the west Austin consider establishment stage, but Searle represents maturity and classification stage which basing on clear method. As Austin distinguished between three types of speech verbs :

1-Speech verb(linguistic verb): it means releasing meaningful vocalizations in useful sentences and right grammatically, it consists known linguistic levels, it consists of linguistic voices arranged in right linguistic structure which leads to special meaning, which Austin called it verbs it is: the voice verb, structural verb and meaningful verb.

2-Achievement verb(the verb included speech):is achievement intentional verb from theory, which mean is achievement things and social verb

with words it consider to be verb completed including speech and it isn't` verb resultant from speech when I say :I promise it mean I am doing promise verb itself.

3-Effective verb (verb resultant from speech) it is impact which achievement verb causes in speaker or listener, which mean the impact represents the result of speech.

Austin sees that achievement speech verb is known, but effective speech verb isn't` agreement and the purpose of it reaching to the aim and produce the consequence of saying . we might find in one pronunciation three types of speech verbs.

The efforts of Austin and Searle consider important and effective especially the studying of construction verbs which connecting with direct forms and conditions of its using in speech like report and question, it considers the basic section for its analyzing work. and then reaching to difference using ways to communication and telling speech verb to receiver. Islamic scholars pointed out in their researching to direct and indirect speech verbs and distinguished between them .the scholars of assets and meaning exerted a big effort in their determination, so we find at them a clear realization to the concept of speech verbs which related to direct or letter or original meaning, besides to their knowledge what falls under it from indirect meanings or what called exiting from apparent appropriate . it might the speakers using to direct speech verbs coming from his desire in reaching his intent and commissioning the receiver with something or directed it with his favor from one side and deported it from damage from other side and then fulfillment the aim of speech.

1- The Rhythms :

It means the rhythm of verb with saying, compare its pronounce in the presence, and the verb falls in it just pronounce it, and this kind expands to include the verb of buying, sale, gift, recommendation, awsuit, denial, acknowledgment, abdication about the right, marriage, divorce, agency and similar, Searle called it advertisements.It requires for its authenticity difficult conditions was placed by jurists, it might doesn't` different from the conditions of Austin and Searle, the most important of them:

1-the speech be clear significance on the require without frank.

2-to be followed to language usage, for each verb has especial pronunciation, sale verb different from recommendation verb and so.

3-each of speaker and listener to be know what passed from other and agree on it.

4-the rhythm of verb to be complete .

5-the tense of verb present or future to be pronounce and meaning, or meaning only, if its pronounce and meaning are past, it will be news.

6- as for devotion condition in work is requiring to all speech verbs.

It should be noted now these conditions don't specialize to rhythms only but it is general conditions to perform speech verbs successful performance.

(God received the covenant of the prophets, "Inasmuch as I have given you of scripture and wisdom; should a messenger come to you verifying what you have, you shall believe in him, and support him." He said, "Do you affirm My covenant and take it upon yourselves?" They said, "We affirm it." He said, "Then bear witness, and I am with you among the witnesses. Whoever turns away after that- these are the deceitful. Do they desire other than the religion of God, when to Him has submitted everything in the heavens and the earth, willingly or unwillingly, and to Him they will be returned? Say, "We believe in God, and in what was revealed to us; and in what was revealed to Abraham, and Ishmael, and Isaac, and Jacob, and the Patriarchs; and in what was given to Moses, and Jesus, and the prophets from their Lord. We make no distinction between any of them, and to Him we submit.

" Whoever seeks other than Islam as a religion, it will not be accepted from him, and in the Hereafter he will be among the losers. How will God guide a people who disbelieved after having believed, and had witnessed that the Messenger is true, and the clear proofs had come to them? God does not guide the unjust people)

These verses have many verbs which represent rhythms as acknowledgment , judgment and denial, acknowledgment represent in ((they said we decided)) and ((say we believed in Allah and what descended on Ibrahim……we don't differentiate between anyone of them and we to him Muslims)), the speech verbs which completed with these pronunciations are acknowledge and recognition with what Almighty asked from them and which representation with recognition with prophecy with all prophets without differentiate between anyone of them, the recognition of prophets with the books of all prophets and their religions, it gave us effective represents perfection and faith, because the prophets admitted about this you are their followers you should follow them in this too, as for judgment represents in ((whom take over after this those are libertines)), and ((whom wants other than Islam religion won`t accept from him and he is in afterlife from losers)), it represents his achievement strength in issuing the judgments from God in the matter of whom infringed approval of the prophets, his almighty issued judgments in them because he is the owner of authority and this not need known linguistic, he ruled on them with losing and libertines which mean the exiting from the order of

God, and he pointed out to them with ((those))significance to the moral demission, they are far from the satisfaction of God to their infraction and their exiting from order they are far from its recompense, as for denial represents in((other than the religion of Allah they wanted and to him who in heavens and earth believed willingly and unwillingly)) and ((how Allah guides people who disbelieved after their faith)), the completed speech verbs in this sayings represents in the denial on whom wants to fellow religion than religion of God and it is the right religion which prophets and apostles approved it, who live in heavens and earth believed it, {who} is using for human.

From other verses which included acknowledgment and denial ,

(Say, "Who provides for you from the heaven and the earth? And who controls the hearing and the sight? And who produces the living from the dead, and produces the dead from the living? And who governs the Order?" They will say, "God." Say, "Will you not be careful?" Such is God, your Lord-the True. What is there, beyond the truth, except falsehood? How are you turned away?)

The prophet Mohammed (peace be upon him) reminded them blessing of God on them, in the form of question then his Almighty when reminded this detail, he reminded after it words altogether, his saying ((who manages the matter))and that because sections of the management of God in the upper world, the bottom world, souls world, bodies world and things without end, he reminded it all, when he reminded some of these details, he followed assuredly with total words to refer on the rest then God explained that prophet Mohammed (peace be upon him), if he asked them about the planner of these situations, they would say Almighty God, and this mean that addressees in this speech was knowing God and was admitting him, they who said in their worship to fetishes, it is making us closer to God and it is our intercessor to God, they was knowing these fetishes don`t work and don`t harm, thereupon he said to his prophet(peace be upon him): ((say won`t believe!)), {won`t believe}this mean you make these fetishes partners to God in worship, with yours recognition that all welfare in the life and afterlife was happened by the mercy of God, and yours recognition these fetishes don`t work and don`t harm, in their answer achievement verb which came approval about what prophet reminded them about, then following with another achievement show, is denial, if he denied on them their worship to the fetches after their recognition and admitting with God.

We notice from this all, these verbs have caused changing in the current situation, it available all conditions which the studiers identified, in it available intent and reporting intention, its achievement power has changed according to the speakers class and their psychological state .

2-<u>Applications:</u>

This kind includes speech verbs which significances to the demand, regardless to its form, and the direction of conformity in it, is being from the world t to words, as for achievement purpose of it, is the effective in the speakers to do something, or telling about something and order application includes suffice form, and prevention in different form, question and call. Order mean: the form which requires from him on the way of snobbery, but on condition it isn`t need from it the threat or overstated or so….the snobbery was required in order application, which mean the student conceived himself high, even he doesn`t in reality, also pray for and petition exit to what is on the way undergo and equality, it is using form which refers to the demand of speaker from listener to do something on the way of snobbery, whether it is snobbery significant at God, like the snobbery of scholars on ignorant, and the equitable ruler on his people or it was height significant at people like the height of rich on poor and something like that, the command has many forms is :

The command verb in the form of (Do), the present verb with (L) for command, the name of command verb, deputy source of command verb, command name like you commanded with something, pronunciation specialized for obligatory like: ought, should, must and other. Sentence semi, formulas morphological like passive voice besides the news forms from sender with authority, it may command verb comes tacitly then we understand it from text. The scholars differentiate in the using of command, it isn`t enough formulas morphological alone in its definition, it must get aid from the text and clues in this, besides to the class of sender and whom send to and this what enter in deliberative, the matter isn`t linguistic but deliberative linguistic, linguistic situation isn`t the only standard, it should be related to the class of sender, because it is changing formulate indication from command to other thing. In this directing with using of command form looks doesn’t belong to linguistic modest only, but it is agreement with authority of sender on condition it doesn’t disagree with authority higher than from his authority…..and it is religions teaching authority. We find command verb in the religions conversation verses significantly, and it led achievement role to effect in the receiver, especially the verb (say)it repeated in these verses significantly, its coming shapes consecutive from speech verbs, the pronounce with him Almighty God by Gabriel (peace on him), and the pronounce for him is the

prophet Mohammed(peace be upon him), it will be pronounced after received to pronunciation, this verb (say)it is command verb from execution verbs fellow it another verbs, especially order achievement

verbs which represent command, call and question (Messengers before you were ridiculed, but those who mocked them became besieged by what they ridiculed. Say, "Travel the earth and observe the final fate of the deniers).The verb (say) is command verb, it is more coming in the conversation situation in Holy Quran, it may its using in this situation to assured the speech which preceded it, God warned the people , and said to his prophet say to them don't be proud about what you find in this life and you reached it with its pleasures and desires, walk in the earth to know the truth about what the prophet told you, the punishment of those who lied the prophets .when you walk on the earth and travel in the countries it may to see those archaeology. The order of God came to direct his prophet in requiring from them walking in the earth and see remnant of mockers with prophets, to investigation achievement purpose represents in emphasis what mentioned before, effective verb is warning them, if they don't leave what are they, they will experience the punishment, besides the entertainment of his prophet (peace be upon on him), the Holy Quran follow the prophet in all his steps, the Holy Quran indicate hypocrisy of the people of the book in many positions, (Some of the People of the Book say, "Believe in what was revealed to the believers at the beginning of the day, and reject it at its end, so that they may return). This speech is transported speech from Jewry people, their sayings came as order represents achievement verbs (believed, disbelieved), its achievement power is the questioning, and represents in deceiving the Muslims, and their skepticism in their doctrine, the pretence with faith in the first of day, and then disbelieved in the end of the day, it is trick which may suspect some of weak minded, especially Arabian who believed that the people of book are more knowledge in the religions and the books, if they see, they will believe and then disbelieved after that, they will tempted them not to enter in Islam for their believing that the people of the book found shortage in it so they retracted from their believing in it, and this represents effective verb. The prevention consider one of applications which effect in the speaker to leave verb or saying , it is one of construction methods, it mean ' it request the desist from the verb on the way of snobbery and compulsion' it is prevention of order, it has two conditions, they are :

_ The snobbery .

_ committed the speaker with it .

If one of these conditions misfire, the prevention will exit from its original to continuous purpose which the text impose it, as the threat, pray for, contact and the like, it has only one form it is the present which coupled with prevention(No), the prevention which opposite to command 'and agree with command in the matter both of them it must has snobbery and both of them related with other, it isn`t possible human command himself or prevent himself, and must be consider the state of the subject of being need for them, and differentiate in the matter both of them specialized in the form which is different from other, the command refers to request, prevention refer to forbidding, the order must has commanded will, the prevention must has completed distaste. As for the amount of desist from the verb between one time or continuous, there isn`t indication in this, it shouldn`t be without presumption in the speech, besides the nature of forbidden thing, for example amount of desist in your saying (don't drink wine) is different from amount of desist in your saying (don't speak), two pictures are sharing in desist indication, but they are different in its amount, as for the first refer to continuous of desist, and not to his will in the second. From theme which is about prevention came in religion conversation verses in Holy Quran :

(And do not argue with the People of the Scripture except in the best manner possible, except those who do wrong among them. And say, "We believe in what was revealed to us, and in what was revealed to you; and our God and your God is One; and to Him we are submissive). The verb (don't argue) is achievement verb, his form is prevention which is requiring fulfillment with desist about arguing with people of the book except the nice of the speech, he doesn't require from them desist from arguing at all, his obligated power lies in using softness in the arguing, without using intensity, he ordered with arguing with what is better, it is the duty which doesn't allow the other he said((and argue them with what is better))this is conversation from God to his prophet and all Muslims people to argue the people of the book from Jews and Christianity ((with what is better)) it mean only with nice of the speech for warning to the verses of God the better is the higher in advantage from one side accept to his mind and it might the higher in advantage from other side accept impression to him and it might prevent the two things, and (arguing) it mean opposition from doctrine in the way of argument in it, and in this indication to advantage of argument, because if it was ugly whatever the case, when he says ((with what is better))and he discovers the class of the speaker sympathy in the argument which lead to effective verb represents in convince them and effect on their thoughts, and their return to the mind in explanation arguments which displayed on them and then investigation the purpose from the speech, intensity in speech had to aversion and protest from it. As we notice in religions conversations verses in Holy Quran, that prevention combined with command and this return to the nature of the Holy Quran which connect legislative side and the system of transaction, worship and creeds, it has to be from command to performance all duties and

then prevent from all forbidden things, it is rare that one of them separated from other, saying of God :

(And mention in the Scripture Abraham. He was a man of truth, a prophet. He said to his father, "O my father, why do you worship what can neither hear, nor see, nor benefit you in any way? O my father, there has come to me knowledge that never came to you. So follow me, and I will guide you along a straight way. O my father, do not worship the devil. The devil is disobedient to the Most Gracious. O my father, I fear that a punishment from the Most Gracious will afflict you, and you become an ally of the devil. He said, "Are you renouncing my gods, O Abraham? If you do not desist, I will stone you. So leave me alone for a while) These verses come in the text of speech about the invitation of Ibrahim (peace on him) to his father to worship God and leaving the worship of fetishes, this verses contain command verbs like {remember, follow me, leave me} also contain in about negation ((don't worship to fetishes)) for command verb {remember}, it is order to prophet Mohammed (peace be upon him) in remembering the strong of Ibrahim (peace on him) it may the reason for this prophet Mohammed (peace be upon him), his people and the people of his town didn't occupied with education and reading the books, if he told about the strong of Ibrahim (peace on him) as it happened, it would report about prescient and evidence to his prophecy, command verb came achievement verb his doing effect with proof the prophecy Mohammed (peace be upon him), besides another effect represents reply their claim on them Ibrahim was father of Arabs and most of them appreciation and they are closer to him and religion, it seem Almighty God say to them as you were imitators to yours fathers as you claim, saying of God: (But they say, "We found our parents on a course, and we are guided in their footsteps) the most honored of their fathers Ibrahim (peace on him) they imitated him in leaving the worship of fetishes that you were from imitators or infer evidences which Ibrahim (peace on him) reminded about the corruption the fetishes that you were from inference people this is from one side, from the other side there were many from infidels in the time of prophet (peace be upon him) were saying :how we leave the religion of our fathers and predecessors , Almighty God reminded the story of Ibrahim (peace on him) to be evidence indicate to them, Ibrahim (peace on him) to be evidence indicate to them how Ibrahim left the religion of his father and undone it, in this preferred the right evidence on his father, and then after that the command and negation verb came ((I will guide thee to the way that is even and straight)) ((serve not Satan : for Satan is a Verb I against (Allah) most gracious ((guide)) is command verb which lead to achievement verb his power lies in guidance to the right way prevention from worship evil, it mean don't obey the evil because he is repel against the most gracious {God}, so God repelled him with this adjective, God reminded this adjective to evil with he has from qualities and sins, God reminded the greatest sins of evil, disobedience to God isn't coming except the person who has weak opinion ((guide)) and ((serve not)) are coming to formation speech verbs which its achievement power represent in guidance, and what follow it from effective verb be clarified in breaking the evidences of his father in worship fetishes and then his invitation with mind evidence and guidance to the straight way in worship, invitation of prophet Mohammed (peace be upon him)to them, it is invitation to guide them because they are his people. The class of speaker which formulate the order with special from and leads with it the pronunciation conversation purpose and its function is certain communication, as we see, we find that command and negation are classes, and they are using according to deliberative text, which represent acknowledge the nature of command which meaning order picking or sufficiency from it, besides to the acknowledge characteristic of both sender and receiver and this what holy Quran clarified in religions conversation verses from order applications is the question, it mean ((is requiring)) science with some thing which isn't known before, it is information which they said in it, it request report what you don't have it mean question, which mean request understanding and of them who differed between them and he, said it is information what mention before it doesn't understand, if you ask about it again it was question, it is from construction methods which complete with special tools, it is tools according to the questioner about three types

1-It is using to ask for conception sometimes and ask for ratification at other and its tool is {Hamza}

2-It is using to ask for ratification only and its tool {Do, Does, Did}

3-It is using to ask for conception, it includes other tools.

Question was considered from applications which Searle called it (directives), its function to guide the receiver to answer it. The sender uses it to control the events and he uses it control on the mind of receiver and he use it to progress the speech towards what the sender wants, in holy Quran the question in it differs from the question in human speech, it isn't real question, the reason for this return to questioner doesn't know what he question about, he wants the answer to know about it .except God, he doesn't question from his creatures about something, because he is prescient, so question in holy Quran be reprimand and report and this expressed it with achievement power it might mean by this question from God to his believers holy Quran has many types of question which happened between prophets the followers of other religions one of them (They said, "Who did this to our gods? He is

certainly one of the wrongdoers. They said, "We heard a youth mentioning them. He is called Abraham). These verses came in the story of prophet Ibrahim when he came out from town to his people to celebrate their feast, he beg the question with illness because he didn't want to be with them, after their exiting, he crashed the fetishes and he left axe in the neck of the biggest one of fetishes, when the people came back and saw what had happened to their God, they asked themselves by their saying ((who had done this to our God?)) this is question for the purpose of lament and investigation in the matter to get perpetrator this lead to their saying ((they said we heard young man reminds them)) ((he is from oppressors)) decision from them he is oppressor he should punish for his doing because he oppressed the God with aggression this is aggrandizement and oppress the people aggression to their right, and respect to their god sanctification their sacred and He oppressed himself with trespass to thing he doesn't have right. To do something he shouldn't to do this is their speech about prophet Ibrahim, saying verb came in the form of question ((who done this to our God)), achievement verb represent in knowing fetishes crusher his achievement power represent in getting on doer, as for effective verb which consequent from saying, he make it lesson in order not someone else to do something as he done from one side and to proof their power on other side from question which came from almighty God on the tongue of his prophet in his speech to the people of the book, (Say, "O People of the Scripture, why do you reject the Revelations of God, when God witnesses what you do? Say, "O People of the Scripture, why do you hinder from God's path those who believe, seeking to distort it, even though you are witnesses? God is not unaware of what you do). Achievement speech verb which represent with question in ((why are you disbelieve, why are you repel)) fulfilled achievement power which represent in denial to them, their disbelief with verses of God and their rebuff people about faith with their acknowledge it is right, biggest which represent with prophet Mohammed (peace upon on him) who find his character Torah and Gospel, their acknowledge broadcast doubt in Muslim, especially the weaker faith of them, effective verb is reprimand to them.

These verses contain another order verb and it is calling , it mean :calling advocated to agree, or it request acceptance of who is invited to who called . It came in speech for purpose as : making relation with the other for invitation or conversation and for purpose which understanding from text, and in it encourage to attention to theme or with advocated, Dr . Mohammed Ahmad Nahla had taken out it

It from type of applications, so he said "as for the call doesn't consider speech verb, it doesn't consider about issue or it doesn't stand on reference and their appreciation to support deleted is unacceptable .and here we don't agree with him in the opinion because the call is achievement pronunciation leads to order and recall who is invited for going to who is called, and making receiver to answer sender .besides it is entrance to other speech verbs from command, negative and question, also command is entrance to it and it unites with it to achieve speech verb, its purpose effective and achievement, from guidance speech verb because it simulates the receiver to reaction of speaker, and it occupied significant space in the text of Quran because it connects to command and negative, the call is the first speech verb, the speaker do it to be able after that to determine his aims, in returning to verses we find the repetition of calling ((the people of the book)) to attract their attention but not others it is achievement verb, its achievement power lies. In refuting their argument and their rebuke because Arab was respecting what the people of book has from science, so specialization the book with them and cancelled their value, it reveals to annulment what at others from gentiles and whom don't have the book for them .As for effective verb represent in encouraging people especially Muslims not to taking from them, their science are distorted and void, the command verb (say) has repeated, the repeat leads to effective verb representative in emphasis. The supplication consider from application verbs, it belongs to the speaker, besides its tense present and future, it mean command on the way of supplication and submission in the style of command be, if it emits from lower class to higher class, the different between it and command the first called for the verb is different from which prevents about it, it doesn't be unless from lower to higher, As for command is encouragement in doing and Preventing from leave it, is requiring that whom ordered from him inferior from who ordered for the supplication has three forms: command form, Negation form and report form :

(So We inspired him: "Build the Ark under Our observation and by Our inspiration. And when Our decree comes to pass, and the oven boils over, load into it two pairs of every kind, together with your family, except those of them against whom the word has already been pronounced. And do not speak to me concerning those who did wrong; for they are to be drowned. Then, when you and those with you are settled in the Ark, say, "Praise be to God, who has saved us from the wrongdoing people. And say, "My Lord, land me with a blessed landing, as you are the best of transporters). These verses came in the text of speech about the people of prophet Noah (peace on him) and what has done to him and how God rescued him from them, these verses have achievement verbs and its purpose is supplication, even the pronunciation ((claim)), supplication came in many positions to indicate that doing doesn't carrying out without supplication, from that positions ((Oh my

cord! Help me for that they accuse me of false hood)) his victory their destruction it had for this effective verb represent in Gods saying ((say praise be to Allah who saved us from oppressive peoples)), the effect of supplication is salvation from who lied him, then achievement verb came in the form of the call and the command, achievement power has moved to the supplication which receiver understands it when he hears it, in Gods saying ((Oh my lord ! enable me to disembark with thy blessing for thou are the best to enable us to disembark)) his order that he call for God with supplication which is more important and more benefit to him, it is request that God descend him in the ship or in the earth when he exits from it, disembark which God bless him in it and give to him increase with goodness and he intercedes the supplication with compliment in his saying ((thou are the best to enable us to disembark)), also these verses contain another rhythm verb represent Gods saying: ((they are flooded)) , it is achievement verb refers to rhythm from God, approved this, God talked about them in form, command is past, order of God be and it will be.

3-information:

Information mean "the saying which is requirement by it the proportion of known to known with negative and affirmation, and it is, the speech which enter in it honesty and lying, information is describing with honest if it agrees the case and it describes with lying if it doesn't agree with the case, and it sometime is describing with honest only or lying only it isn't for information but for purposes is outing from the text of sentence which emphasis its honest or lying, from this information of holy Quran, information of holy Quran have honest only because it is the speech of almighty God, even the information regardless of who say it, saying of Jew :Aziz son of God, and saying of Christianity :

Jesus son of God, speech which is lying because the reality lie and refuse it, even it honest and lying whence it is information the information is describing with honest and lying to reason which is out from phrase includes it within the deliberative because it doesn't study the pronunciations for itself but it studies its using in the speech, taking with consideration status and reference which is returning to it, circumstance of the receiver and whatever surrounds the speech .taking with consideration when telling the state of receiver, it may the first one who referred to the information is Almbrad when he was asked by Canadian philosopher that he finds in speech of Arab, much speech without meaning, they say {Abdallah is getting up}then they say {that Abdallah is getting up} {Abdallah will get up} and the meaning is one only, Almbrad answered him : no, different meanings when they say {Abdallah is getting up} it is information about his getting up, and {that Abdallah is getting up} it is answer about question of the questioner and {Abdallah will get up} it is answer about denies his getting up.

Information is verbs which describe facts and events in the outside world, and it enter with it what confer from the news of world, social issue and the religion issue and else, as for achievement purpose of it, it transferring the reality honest transferring, if honesty had achieved in transferring, it would have been achieved fidelity condition, and if fidelity condition achieved, the verbs would achieve a successful achievement .

Holy Quran presented the stories of prophets and their conversations with their people, and their facing to heavenly messages and this is from unseen news which prophet Mohammed didn't know about it nor his people, their information was coming from high level, its knowledge expanded the time and the place on its extension and informing about their stories consider as one of the Miracles which supports call of prophet Mohammed (peace be upon him) and honest of his prophecy, besides taking wisdom and sermon from it. (These are some stories from the past that we reveal to you. Neither you, nor your people knew them before this. So be patient. The future belongs to the pious). The information and stories of holy Quran form particular style, in spite of the existence style of the story called {the historical story} which aim to tell about the historical events without submission to phenomenon of {possibility} and {potentiality}, it submit to artificial elements that form plot which is surround with events, situations and people, as for the story of Holy Quran which we call it {the practical story} which concerns about transferring the fact in the way which appears aimed ideas from text, the difference between it and (artificial) returns in nature of effective, its size increases in {the practical story}, the emotion of the receiver remains sentimental more than artistic in it, because he realizes it deals with the reality without additions and possibilities and in this achieving conviction element to connect reality events with artistic methods and it give to it miraculous character. Religions conversations verses have news and stories prophet, their calling .to their people, from this saying God : (And mention the brother of Aad, as he warned his people at the dunes. Warnings have passed away before him, and after him: "Worship none but God; I fear for you the punishment of a tremendous Day. They said, "Did you come to us to divert us from our gods? Then bring us what you threaten us with, if you are being truthful. He said, "The knowledge is only with God, and I inform you of what I was sent with; but I see you are an ignorant people. Then, when they saw a cloud approaching their valley, they said, "This is a cloud that will bring us rain." "In fact, it is what you were impatient for: a wind in which is grievous suffering. It will destroy everything by the command of its Lord. And when the morning came upon them,

there was nothing to be seen except their dwellings. Thus We requite the guilty people). When almighty God gave types of evidences and proofs confirmation theism and prophecy, people of Makkh refrained from and they didn't care about, because they are busy with worldly pleasures so God told them the story of prophet Hood with his people tribe of add, they have more money and power than them, God ruled on them with torment because of their disbelief, and God told us how he tortured them with storm, and what happened of conversation between Hood and his people and their urge with torment, this story has came to take lesson from it and to leave their ignorance and their pertinacity, if they continue on their denial, the torment will descend on them, saying speech verbs have came news about people of prophet add his achievement power represents in intimidation the people of Makkh, Add had power and money, they didn't escape from punishment so how about them. As for effective verb is taking lesson from who precede them and to proof miracles of holy Quran in information about previous nations, besides entertainment prophet Mohammed (peace be upon him) and mitigation to his heart, the rejection of his people to accept the evidences and the proofs aren't the qualities of his people, but it is habit is happening in all previous nation and direction of identical in it from the words to the world, with fulfillment devotion and honesty conditions in transferring the information. From information is the negation it means : division of the all speech whether it is affirmation or negative when rejection person is honest in what he said, his speech mean negative speech and when he knew it is lying what he negated, it is odium in negative, that all odium negative without contrary it can call odium negative, because negative can not call negative odium . Some of them say that who published validity of negative about the thing validity of negative about it, so in this speech verb came in to cancel the speech which precede it, from it saying of almighty God : (And for their saying, "We have killed the Messiah, Jesus, the son of Mary, the Messenger of God." In fact, they did not kill him, nor did they crucify him, but it appeared to them as if they did. Indeed, those who differ about him are in doubt about it. They have no knowledge of it, except the following of assumptions. Certainly, they did not kill him). The pronunciation came in pride and brag status in what they have done from sins, in their point of view is heroism, it is considering to them, and they assured with ((we are)), holy Quran made what they considered good deeds to them, the negative came in the pronunciation saying of God : ((they not kill him nor did they .crucify him but to them, he (the crucified) had been given the look of prophet Jesus)), his mandatory power represents in rejection what Jews have claimed, with its free from certainly, to be evidence on falsity of their claiming, it doesn't need confirmation, effective verb being in making it temptation to disbelievers, and guidance to believers about falsity of their claiming .and from the negative the saying of God :

(Abraham was neither a Jew nor a Christian, but he was a Monotheist, a Muslim. And he was not of the Polytheists.) After that Jews claimed that Ibrahim from them and Christianity claimed that Ibrahim from them, God protested on them, that the Torah and the gospel have descended after Ibrahim, how is it possible that he is Jewish or Christian, making the lawsuit without proof isn't permissible in the mind, how it is possible making the after appearance of its corruption, then God denied of his being Jewish or Christian, because it is disparagement characters in holy Quran, as distorted from their way, but he was Hanafi which mean he is leaving all religion except Islam, by using the tools {not} and after it {did}, in saying of God ((he was neither a Jew nor a Christian)) and ((and he was not of the polytheists)) the negative become stronger and tougher to achieve honesty condition in transferring from one side and separation the words from the world in the speech which preceded the negative and the direction of the conformity from the words to the world after negative the negative speech verb resulted achievement power which represent in annulment the previous claims, as for effective verb represents in Islam is more correct than other religions, because it is extension to the religion of prophet Ibrahim (peace on him), so it isn't distorted and the first to follow.

4-the obligations:

It is speech verb which the speaker means by it doing something willingly to the listener in the future and he is sincere in his speech, and he is insistent on fulfillment with it . it contains: the promise intimidation pact, security, warning and other . and it participates with applications toward conformity and both of them the direction of conformity in it from the world to the words both of them differs in the reference, the reference in the obligations (the speaker), as for in applications is (listener). The promise and intimidation consider the most prominent obligation verbs, because it returns to the speaker, he is able person on fulfillment with it and achievement it, it means by it: the promise, the appointment, intimidation and time are resources, I promise him, he promises is exceeding to objects, it can in it exclusive on one of them, the promise in goodness and the intimidation in evil I promise him it doesn't be except in evil, it saying I promise him with evil and it doesn't say I promise him evil, and the truth of the promise is telling about goodness which teller achieves in the future or evil, and the difference between the promise and intimidation, that intimidation in the evil especially, as for promise in the goodness and evil and when it released, it would specialize with goodness. From

what it came in religions conversation verses promise and intimidation, saying of God:

(Those who disbelieved said to their messengers, "We will expel you from our land, unless you return to our religion." And their Lord inspired them: "We will destroy the wrongdoers."). And it might from naughtiness of disbeliever and their oppression, their warning to their prophets and believers, their threat with expulsion them from their country after they couldn't speak with them unless they return to them and this intimidation with evil to prophet, almighty God confronted it with promise and intimidation, the intimidation when God swear that he will damn them, and the promise was for the prophets and believers that he will stay them the earth after destruction of disbelievers, and this is penalty for whom fears status of God and his threat, threat speech verb is coming from speakers, the first speaker are disbelievers and their intimidation doesn't have conformity from the world to the words, because the speaker can not execution his intimidation, for this devotion has denied, as for the second speaker is almighty God who confronted their intimidation, making it without importance, he assured it with swear ((to destroy oppressive)) and he promised them, living their place effective verb represents in reassure the prophets and who believed with them, that God reward and supports them, the direction of conformity in it from the world to the words. And from intimidation which and specialized with it the people of the book, saying of God:

(O you who were given the Book! Believe in what We sent down, confirming what you have, before We obliterate faces and turn them inside out, or curse them as We cursed the Sabbath-breakers. The command of God is always done.). In this verse speech the people of the book and it doesn't include them all, so God said ((those who have received the book)). This is on us which is particular to those who was knowing the whole Torah, and who was like this, so he is knowing the evidences which are referring to the prophecy of Mohammed (peace be upon him), because Torah was including all these evidences, so that God said : ((confirming that which is {already} with you)) which mean is confirming to the verses which are existing in Torah, which are referring to the prophecy of Mohammed (peace be upon him), and if the knowledge was happened, this was disbelief downright obduracy. God ordered them with affirmation in believing prophet Mohammed (peace be upon him), and that God joints strong intimidation with this, when it happened, he teach them their disbelief with it become excuse on them, and evidence on their obduracy and their interesting on the falsehood, as for their threat with damnation like the people of Saturday, it is from obligation verbs which represent intimidation and threat with descending the punishment on them, as for effective verb which represents in obligating them to believe the prophecy of Mohammed (peace be upon him). And from the obligations . the treaty, it is obligation between two sides or more, and it came in religions conversation verses, saying of God :

(Say, "O People of the Book, come to terms common between us and you: that we worship none but Allah, and that we associate nothing with Him, and that none of us takes others as lords besides Allah." And if they turn away, say, "Bear witness that we have submitted."). The speech has came to all people of the book, the prophet Mohammed called them to gather on word to work with it and publish it, their calling to the people of the book, in it there is kind of kindness to the heart of the receiver, the situation is situation of inviting to conciliate between sides and communication to treaty. Which mean by this Quran, Thora and gospel are concurrent in invitation to it, and it is monotheism word. Obligated monotheism and refuse partners and don't taking lords without Almighty God, it is invitation to practical monotheism, which mean by it ((that we worship none but Allah and that we associate no partner with him, and that some of us take not others for lords besides Allah)). The speech is preceding with negative, refusing polytheism, and achievement power represents in contracting treaty with all religions and the agreement on worship God, as for effective verb is amity in invitation the people of the book to contract the agreement, the direction of conformity in it from the world to the words, with achievement devotion condition to obligate all sides in the future. And in this we find that obligation verbs achieved the achievement purpose to it, it is belong to the speaker who is capable of achieving it, specially which connecting with God and his prophets, as for which is connecting to other side, it doesn't achieve its purpose, because it doesn't have ability on achieving it, even it seems to him, he able on this, obligations came to refer on the present and the future identical to its conditions .

5-the expressions:

It is type of direct speech verbs, it contains the speech verbs and what includes from styles and terms which by it the speaker expresses his feeling in the case the satisfaction, anger, success, failure and others . these verbs don't limited on the special events of the speaker, but exceed to what happened to the people who participates in the verb and it effects psychologically and sentimentally on the speaker and it is entering in it : thanks verb congratulation verbs, sympathy verbs, regret verbs, sorrowfully, wish, love, hate, anger, apology and else . it doesn't have direction to conformity, it is compensated for it devotion condition, when it achieved, the verb completed successfully. We find in religions conversation verses in holy Quran many speech verbs which express about psychological and

sentimental cases which the prophets felt it and imagine the reality which they were living in it, from this saying of God :

(We sent Noah to his people. He said, "O my people! Worship God; you have no god other than Him. I fear for you the punishment of a tremendous Day." The dignitaries among his people said, "We see that you are in obvious error." He said, "O my people, I am not in error, but I am a messenger from the Lord of the Worlds." "I deliver to you the messages of my Lord, and I advise you, and I know from God what you do not know Do you wonder that a reminder has come to you from your Lord, through a man from among you, to warn you, and to lead you to righteousness, so that you may attain mercy?").

In this verses is telling from almighty God about the story of prophet Noah (peace on him) and we find the kindness in his invitation to them, beginning with the call, he called them ((O my people)) the calling has warning power to make them feel that he Cares about them because they are his people, in meditation to this calling, it appears he doesn't call people unless God tortured them, it is call the torment of God, what assured that the way of calling . Here is coming to warn to the importance of the matter which they invited for it and it is from kindness with them in order to make their hearts respond to the great matter which is worship God, so we see the prophets invite their peoples with what they feel from alliance with them and this by adding pronunciation people to conscience of the prophet to close their souls, and order them in worship God, he clarified the reason for this, the worship mean submission in the heart in higher level of submission, it has a greatest blessings, so no one deserve the worship except God, there is no God nor idol except him (Allah)and he afraid on them ((the punishment of tremendous)), the torment is continuous pain on them, it might another punishment, but it means here the painful punishment on what it was from sins, he didn't make his fear on them with doubt but telling them the torment will be on them, if they don't accept his invitation and his advises he said ((I advise you)) . The advise is sincerity of intention from corruption in treatment, (advise) is opposite in cheating in the work, cheating doesn't be except with bad intention, prophet Noha (peace on him) expressed his feeling toward the situation of his people and their reality, they are worshipping fetishes, he expressed his fear on them, the speech verbs ((I fear for you)) and ((I advise you)), and hopefulness in ((so that you may attain mercy?)) it has achievement power represents in advising and guidance, it expresses what he feels toward his people from kindness, clemency and compassion on them, in them there is his house hold who doesn't believe God, he spoke with his son after the flood in other verse, with saying of God:

(And it sailed with them through waves like mountains, and Noah called to his son who was apart [from them], "O my son, come aboard with us and be not with the disbelievers." [But] he said, "I will take refuge on a mountain to protect me from the water." [Noah] said, "There is no protector today from the decree of Allah, except for whom He gives mercy." And the waves came between them, and he was among the drowned.) as for effective verb refers to sympathy and mitigation about prophet Mohammed (peace be upon him) and encourage him on patience and constancy, from natural of nations is denial prophet and messengers, if their invitation conflicts with their interests. From the expressions is wish, wishing the thing : want it, is requesting something which the self love and desire in it, but he doesn't please to get it, as for hopelessness in saying of God:

(But if bounty comes to you from Allah, he will surely say, as if there had never been between you and him any affection. "Oh, I wish I had been with them so I could have attained a great attainment."). Or it may for which mean it is possible and don't coveted in getting it . as the saying of God:

(So he came out before his people in his adornment. Those who desired the worldly life said, "Oh, would that we had like what was given to Qarun. Indeed, he is one of great fortune."). The difference between it and the please, the wish enters in impossibilities and the please enters in possibilities, its tools are: would that, do you, albeit, might, may be . From verses which the wish came in it, saying of God:

(It was said, "Enter Paradise." He said, "I wish my people could know Of how my Lord has forgiven me and placed me among the honored."). The wish is coming on the tongue of the friend of Yasin (Habib Bin Israel Najar) after his people hit him with their feel till he died, say to him enter the heaven, he wishes that his people who scorned him knew the recompense, forgiveness and status which he reached by his faith, to wish such as it. The wish is expression verb which refers what he feels toward his people, his achievement power represent in wishing his people knew situation which he reached to it. Effective verb refers to encourage on the work as he worked, there isn't direction in it for conformity with achieving devotion condition in the wish, from the case which indicated psychological emotion of the prophets, the story of prophet Ibrahim (peace on him) with his father, this story repeated in many verses, it has came in the poets Sara verses (69 – 84) and in the prophet Sara verses (52 – 70) and in Zukhruf Sara verses (26 _ 28) and in Mariam Sara verses (41_ 48) it might the more

clarification to human emotion previous Soras almighty God said: (And mention in the Book [the story of] Abraham. Indeed, he was a man of truth and a prophet. [Mention] when he said to his father, "O my father, why do you worship that which does not hear and does not see and will not benefit you at all? O my father, indeed there has come to me of knowledge that which has not come to you, so follow me; I will guide you to an even path. O my father, do not worship Satan. Indeed Satan has ever been, to the Most Merciful, disobedient. O my father, indeed I fear that there will touch you a punishment from the Most Merciful so you would be to Satan a companion [in Hellfire]." [His father] said, "Have you no desire for my gods, O Abraham? If you do not desist, I will surely stone you, so avoid me a prolonged time. [Abraham] said, "Peace will be upon you. I will ask forgiveness for you of my Lord. Indeed, He is ever gracious to me. And I will leave you and those you invoke other than Allah and will invoke my Lord. I expect that I will not be in invocation to my Lord unhappy."). Ibrahim called is father ((O my father)), because in that politeness notification and lobbying the self, this from what the status require, because its speech from son to his father about something great from one side and, speech for invitation from other side, so the sentence is coming with two achievement purpose, the first represents in calling the relative with tool of distance person, warning to the great of the matter its importance and the second is politeness and pity with father. The effective verb represents in lobbying the selves with nice speech, his father faced him with calling which refers to the feeling of anger ((O Ibrahim? If you do not desist, I will stone you . so leave me alone for awhile)), here the calling came with the name of the son without pity or love notification and with stoning threat and expulsion, as for the calling in the speech of Youssef and his father Yacoub (peace be on them) in the saying of God: ([Of these stories mention] when Joseph said to his father, "O my father, indeed I have seen [in a dream] eleven stars and the sun and the moon; I saw them prostrating to me." He said, "O my son, do not relate your vision to your brothers or they will contrive against you a plan. Indeed Satan, to man, is a manifest enemy.). Here the speech from father to his son ((O my son)) which refers to the pity of the father toward his son, and it might the reason for this the difference in religions between the father and his son in the speech of Ibrahim and his father, if we compare it with the speech of Youssef and Yacoub (peace be on them). The summarize from this religions conversations verses discovered the human self cases and what happened to it from emotions, it gave us complete imagine about the case of prophet and messengers in their invitation to their people, the psychological reaction to their people and its effectiveness in the prophets, the purpose of it achieved in expressing about the cases in the shape which available in it devotion condition and what it leaves from effect in every one who repels to invitation from being patient with what happened to other nations.

Conclusion and result:

So that communication is linguistic science which searches in how the sender use the language in achieving higher level of successful communication with receiver, then of signs, it was the most suitable to study religions conversation in holy Quran, because it is communication active which standing on transferring linguistic efficiency to achievement communication efficiency. The conversation consider as important means of invitation means to worship God and follow the right religion, it clarifies by it the right picture to dogmas of religion and its rule and its decency and it including what the prophets done with their people or with all people of the religions from conversation in the different ways and in different styles and it all have one name (religions conversation) rhythm happened change in current situation it has the conditions which students defined it . it has intent and reporting and its achievement power changed accordance to the class of the speakers and their psychological state. Command verb was in religions conversation : verses significantly, it led achievement function which followed by effect on the receiver, especially the verb(say) it has repeated in the verses significantly and its coming shaped continuous of speech verbs who pronounced it God by Gabriel (peace be on him) and who pronounced for is prophet Mohammed (peace be upon him), it became pronounced after received the pronunciation, this verb (say) is command verb from achievement verbs which is followed by other verbs, especially application achievement verbs which represents with command, the call and the question. Command and call shaped entrance to other speech verbs the speaker uses to reach with it to other purposes, from command, negative and question, it gather with other achievement verbs to achieve speech verbs, achievement and effective purpose for it. The obligation verbs fulfilled the achievement purpose for it, it belongs to the speaker who able an achieving, especially which connected to almighty God and his prophet (peace be upon him)as for which connected to other side, it doesn't achieve its purpose Because he doesn't has the ability on achieve it, even it seems to him, he has ability on this, the obligations came to refer to the present and the future identical to its conditions. Religions conversations verses in the expression verbs, it discovered about human psychological cases and what it has from emotions, it presented a total imagine about the cases of prophets and messenger

in their invitation to their people, and their psychological reaction to their people and its effect in messengers, the purpose of it has achieved in the expression about these cases in the form which available in it devotion condition, and what it leave from effect in every one who repels to invitation from being patient with what happened to other nations .

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SECTION 29. Literature. Folklore. Translation Studies.

"SAADATNAMA"S IN THE MEDIEVAL LITERATURE

Abstract: *One of the well-known representatives of Sufism in Azerbaijani literary history is Sheikh Mahmud Shabustari; his "Gülşəni-raz" has been extensively researched, mainly for the philosophical views found in the 1006 couplets it contains. However, his "Saadatnama" verse have not yet been explored in research. This valuable work of Shabustari's is one of the most important sources for the study of mysticism and Sufi literature. This article deals with research of the "Saadatnama" verses written by other authors in medieval centuries.*

Key words: *felicity, Saadatnama, medieval eastern literature.*

Language: *English*

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Sheykh Mahmud Shabustari (1287-1356), the philosopher-poet is renowned mostly with his work "Gulshani-raz". His other esteemed and reputable work "Saadatnama" gives details of the poet's life, philosophy and views. The work, being abundant with valuable information and ideas regarding Sufi teaching, meanwhile draws attention as a philosophical source that reflects crucial ideas of sufi's views in it.

While we were looking through catalogue and internet resources regarding this work that we included into the research for the first time, we also discovered some "Saadatnama"s written by other authors. Tracing back to such "Saadatnama"s written in the medieval literature, we could identify availability of some works with similar subject. We have to highlight that, even though some of those works were indirectly associated with Shabustari's "Saadatnama" in terms of its idea and content, the other part of it had only a name in common with the abovementioned work. The works are the following:

1. *"Saadatnama"(XI century) by Nasir Khosrov* is a work with 30 sections containing 300 couplets which teach the rules of morality by advice. It is no coincidence that the work consists of 30 sections. So that, 30 birds are characterized as 30 symbols of perfection and wisdom, which was published with its French translation by Edmond Fagnon. Seyid Munir Badakhshani published the masnavi under the name "Kitabi-Kheyrhayi-Muvahhid-Vahdat" together with "Rovshaninama" and "Risala" by Kheyrhayi Herati" (Bombai,1333/1915). This work, published under the name "Safarnama" and "Rovshaninama" by Mahmud Ganizada (Berlin, 1341/1922) was translated into Turkish by Maliha Ulkar Tarikahya (Istanbul, 1958).

Nasir Khosrov has brought forward such theories in his "Saadatnama" by which he wanted to believe and convince that he could make the human being happy. He has widely used sayings in his work, and mentioned that, genuine felicity can be reached by the talks of mystics (Arefs). He saw the felicity in giving up the sense of self-esteem, like all other sufis:

If you forget about your self-esteem, you can be a man who worship God (1, p.14)

The following couplets by Nasir Khosrov given at the end of the book, aim at to deliver the value of his work:

"I told three hundred couplets about pure and clean heart,

And the wit called it "Saadatnama"

If you want to stick it in your mind by wit and thought, and desire the help of felicity in every work, always weigh such high and valuable bywords.

Since these are valuable pearls, and words by Khosrov oghlu Nasir (1, p.27)

Meliha Ulkar Ambarjioghlu, the researcher, stated that he had found a note in sources explaining that "Saadatnama" is also attributed to another author named Nasir (Bahar, Maliku'sh-Shuera. Sabk-Shinas).

2. *"Saadatnama"by Shekyh Mahmud Shabustari*. Manuscripted copies of this work, written in masnavi, khafif verse of prosodic meter, are preserved in British Museum's Library, Nurosmaniyya Library of Turkey, Majlis Library of Tehran and Tehran University Library. Although "Saadatnama" work is introduced with 3000 couplets and 8 chapters in the major memoirs and catalogues, it is summed up in all copies with 1568-1570 couplets and 4 chapters. The authors of memoirs and catalogues provided false information, having referred to opinions written by "Shabustari" in the introduction of "Saadatnama". We think that, even though Shabustari, at the beginning, aimed to conclude "Saadatnama" by 3000 couplets and 8 chapters, he summed up it in 4 chapters (Recognition of holy and Almight Vajibul-Vujud's being, Recognition of God's attributes, Recognition of God's names, Recognition of acts of God) and 1570 couplets for unknown reasons.

It is important to state that, this work has not randomly been called "Saadatnama", which is wide in volume and deep in content compared with other "Saadatnama"s. As the author told:

"There is not a work in verse containing mystical insight, divine evidence and the verses of Holy Quran. Furthermore, nobody had any information all over the world about the availability of prosaic book that contain the abovementioned scientific fields together"

Therefore the author decided to write such work. Afterwards he emphasized:

"But the thing is that, such couplets will be referred to by the figures of science, thought and lore.

Special terminology of the four masters has been mentioned there, so have a look at it with certainty."(2, p.152)

The thinker added one more thing to make clear why he called his work by the word "felicity (Saadat)":

بلکه توحید و حکمت است و اصول
پاک کرده ز حشو شعر و فضول
چونکه تام دیدم در او سعادت
کردمش نام نامهٔ سعادت
ذکر اهل سعادتست در او
ختم گشت این مقام جمله بر او

"On the contrary, this work summed up the fundamentals of divine unity, wisdom and religion, and no additional senseless words are reflected in it. (2, p.153)

I called it "Saadatnama", because I saw genuine felicity in it.

Felicity of the ahli-zikr is in it.

Its destination will always be felicity which will start with felicity and end with worship.

We think that, Shabustari, like previous "Saadatnama's authors, used "felicity" not only in mystical and religious meaning, but also as a "rule", "law", "treatise" and "constitution". It is true that, the author seeks felicity in being reunited with the Truth, like his predecessors. He explains what he has to go through on the way to God in his work:

"If you want to find a way to the presence of God Almighty, hold firmly the mind and action". (2, p.151)

Like thinkers, Shabustari is based on heart, not mind to reach the Truth in his work, although he treats God with rational thought:

"A fool, who has ascended the peak of Sufi's pleasure and pure heart, prevails over agile man of reason." (2, p.185)

In another couplet he writes:

"It is heart affair, ask it from heart, and never deal with senseless things again". (2, p.168)

-Hereby he also reminds of "sufism" being "heart science" and "state science".(3, p.80) According to Lahiji, "Mind is helpless in ingenuity of the truth" (4, p.192,)

He wrote "Know yourself, as you are self-universe" in "Gulshani-raz" " (4, p.41,) masnavi by which he wanted to say that he felt pity, for all perfect faces have been accumulated in human, but the human was unaware of it, and couldn't reach the truth which was main purpose of mysticism. Shabustari indicated the way to felicity in his "Saadatnama":

"If you can get them, but cannot reach what you want, God's slave has composed its basis in poem for you" (2, p.152)

Based on unity (tawhid) on this way, he explained the essence, attributes, names and actions of God from the viewpoint of *'ilm-ul-yaqeen* (the knowledge of certainty), *Ayn-ul-yaqeen* (the vision of certainty), *haqq-ul-yaqeen* (the level of certainty gained through experience). He duly used fables and stories to argue his opinions:

"A lover, whose heart burns with the flame of love, dreamed Hazrat Haqqi, Allah Taala.

Sunk into grief and sorrow, the man turned to Him and asked him for help telling that he did not have any other way out to turn to. (2, p.165)

That is, affinity with the Truth is perfect level of the human. Here another motive attracts attention: Attar's coordination with Simurg and Simurg's (thirty birds) sameness.

But another point has to be noted that, he called his work "Saadat" (felicity) to put all such issues in scientific order, because "saadat" was reflected not only in religion and mystical literature, but also as abovementioned in scientific literature. "Saadat" used in religious meaning is different from that used in mundane meaning. "Saadat" in the medieval literature was used as "rule of law". Both "Gutadgu-bilik" by Yusif Khas Hajib, or "Saadatnama" by Nasir Khosrov" or "Saadatnama" by Falakeyi Alayi Tabrizi, or "Kimyayi-saadat" by

Gazali are set of certain rules. “Gutadgu-bilik” deals with the rules of state, “Kimyayi-saadat” by Gazali tells about the rules of faith and mysticism, “Saadatnama” by Nasir Khosrov is about the rules of morality, and “Saadatnama” by Falakeyi Alayi Tabrizi refers to the rules of the science of accounting.

Shabustari substantiates his opinions as below:

نشوم بعد از این دگر خرسند
که به تألیف و درس و دادن پند
از پی کار دین کنم منظوم
بلکه این علم را ز جمله علوم(2, p.152)

I will not be satisfied with writing, teaching and giving advice

I will compile this science above all sciences for religion (in verse form) -hereby he clarified the name of the work to certain extent.

3. *“Saadatnama” by Falakayi-Alayi-tabrizi Abdullah b.Ali* The work was written by the command of Sadaddin Mahammad ibn Tajaddin Ali Us Savaji, Gazan khan’s vazir in 1309 in order to teach state accountancy, and was completed in 1336-37. This is the first among four books (“Saadatnama”, “Ganuni-saadat”, “Jamiul-hesab” and “Risaleyi-Falakkiya” (“Kitabus-siyagat”)) written on the science of accountancy of Elkhanilar state. “Saadatnama” was written in “siyagat” writing method then used in the offices of finance stationary and waqf. (see, 5)

The work reflects initial traces of double counting method (graded method) in modern calculation system. Whereas the renowned founder of such system of computing practices is considered Fra Luca Bartolomeo Pacioli who was the author of “Summa de Arithmetica, Geometria Proportioni et Proportionalita”. The book was first received by dr.A. Zaki Validi Togan in 930 from Konya Yusufagha Library. According to Dr.Jamal Elitash, a copy of the work is preserved in Ayasofya library.

4. *“Saadatnama” by Sahar Abdal (1459). This work is, actually, turkish version of “Saadatnama” written by Nasir Khosrov.* The work is a translation in verse. Sahar Abdal lived in the XV century, and was priest in nature. He made a number of trips. Having visited the grave of Nasir Khosrov during his trips, dreamt Nasir Khosrov and thereafter translated his “Saadatnama”.(6, p.3) Sahar Abdal fell under the influence of the Nasir Khosrov’s “Saadatnama” while translating; therefore he added two sections himself: “Haza kitabe-Saadatnama” və “Dar bayani-xatimatul-kitabe-Saadatnama”. Hence the volume of the work increased from 300 couplets to 500 couplets.

5. “Saadatnama” by Vahidi,(see, 7) one of the prosaists of the XVI century classic Turkish literature. We cannot provide any information about its content, because we couldn’t access to the work.

6. “Saadatnama” by Prizranli Shami, poet of the XVI century. Prizranli Shami (date of death: 1591), who interpreted “Pandnama” by Faridaddin Attar considered useful to write a work; therefore he called it “Saadatnama”(8, p.85). Shami, known with his translation and interpretations made from persian, is one of the figures of classic turkish literature. His main works are: “Sharhi-Mathnawi”, “Sharhi-Gulustan”, “Sharhi-divani-Hafiz” (21 manuscripted copies of this work are known), “Sharhi-Baharistan” (This is is the interpretation of “Baharistan” by Abdurrahman Jami), “Saadatnama” (“Sharhi-pandi-Attar”). This work has been written as an interpretation of “Pandnama” ascribed to Faridaddin Attar. Such interpretation called “Saadatnama” has been dedicated to Zeyrak Agha, one of the companions of III Murad. Meanwhile, such interpretation has more copies among interpretations made on “Pandnama”.

7. *“Saadatnama”,* translation work written by Jami Rami (Galibolulu Jami) in the XVI century. The work was translated from “Rovzatush-shuhada” of Huseyn Vaiz Kashifi. The work is considered to have been written in 1553 in some sources, or 1534 in others. (see, 9)

The work is a sample of magtali-Huseyn in a certain sense. “Saadatnama” is about shahaadat (martyr) of Imaam-e-Hussein, grandson of Prophet Mahammad, and Karbala events. The work has been written both in prose and in verse. (see, 10) Quran verses, hadiths and kissas have been widely used in the work. At present this is preserved in (nu.42Yu516) in Nurosmaniyya Manuscript Library under the name “Saadatnama:Tarjumeyi-Rovzatush-Shuhada”.

As it seems, most of works with similar names abovementioned, have been written in religious-mystical theme. Namely for this reason, we tried to seek linguistic shades of meaning, and definition of the notion “saadat” (felicity) in religious, mystical and scientific literatures, as this notion was the source of idea-content of the foregoing works.

Definition and scope of meaning of “Saadat”

“Saadat” is an Arabic word, and means “happiness or felicity”(11, p.261)

Alongside with “saadat” (سعادت) which means felicity, we can come across some phrases that express the shades of the same meaning like “səəd” (سعد), or “səud” (سعود), (12, p.44-45) “səədeyn”-سعدين, or “səədan”سعادان- (Venus and Yupiter-stars that bring happiness), as well as ezafe constructions like “səəd əxtər”- سعد اختر (star of happiness), which are expressions formed by “saad” in Arabic.

There is a notion “saadat” in Holy Quran, too. “Səid” (سَعِيدٌ) is used to mean “happy” (səid) and “they became happy” to mean “suidu” (سُعِدُوا) (13, p.300)

In the old Turkish language, a word “kut” was used as an equivalent to “saadat” to mean “felicity”. “Kut” has some shades of meaning like “luck”,

"state", "fate", "destination" and "saadat" in "Divani lugat it-turk" by Mahmud Kashgarli (14, p.388-389). Based on it, we can tell that, "Gutadgu-bilig" (1069-1070) written by Yusif Khass Hajib is "Happiness bringing science" or "Happiness carrying science".

"Saadat" in religious and mystical literature

"Saadat" is a notion expressing comfortable and carefree lifestyle that human being tries to reach in this world. But such felicity that human waits for and wants to reach, is conditional that is related to mundane conditions. "And only believer can live permanent felicity" (15, p.13)

In accordance with Indian myth, wise men decided to hide the secret felicity, because people evaluate felicity when they reach it. One of them suggested hiding it on the top of mountain, while others preferred to hide it in the seventh level of the Earth, or in the deepest of the sea. Finally, one wise man put forward an interesting offer: "Human beings have that intelligence to discover mountains, seas and seventh layer of the Earth. But they do not direct such intelligence to discover and know them. We have to bury felicity in their heart, so it will never come to their mind to have a look at their hearts." (16, p.28)

According to Islam, genuine felicity is related neither to people, nor events, nor fortune, nor position, nor opportunity. Felicity has only a secret that is love and trust in God. The tradition locates felicity in paradise, and wretchedness in hell (15, p.13)

Sufis maintain that, "saadat" (felicity) is "tranquility of soul after giving up the world" (17, p.149)

Felicity is also a genuine beauty. "Genuine beauty is in occultation, do not seek it anywhere except occultation" (attar151). Therefore Attar finds the following ways appropriate:

"Firstly sacrifice yourself, then come to reason" (17, p.172), "I do not know any other condition that is more superior than the person's disappearance by sacrificing his existence.. .... Nobody would be able to reach such felicity." (17, p.175)

Conclusion:

Consequently, although main idea of "Saadatnama"s written in the medieval centuries was the dream to reach felicity, conditions required to realize such dream or ways to felicity etc., the word "saadat" mainly bore the meaning of "designed rules" or "an issue considered as perfect". It is of great importance to mention that, "saadat" in mundane definition means recognition and perfection of oneself, while in religious meaning it stands for "settle in paradise being close to God". Although felicity was used in mystical definition to mean "reach the Truth, ultimate union or the level of certainty, "saadat" had not found its definition in relevant dictionaries.

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SECTION 29. Literature. Folklore. Translation Studies.

PSYCHOLOGIC ANALYSES OF THE NOTION OF ASYMMETRY IN THE PROCESS OF COMMUNICATION

Abstract: *In this article the psychologic changes in the process of speech are discussed. The influence of psychologic and affect states in the process of speech is analyzed on the bases of the texts taken from fiction.*

Key words: *mentality, motivation, thought, inner speech, loud speech, text.*

Language: *English*

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Psycholinguistics in the Uzbek linguistics is considered a relatively new interdisciplinary science. Thanks to its innovative approach it has established itself as a scientific space of the national psychology, physiology and linguistics. Considering the production of speech, psycholinguistics describes how the language system and the rules for constructing speech enable a person to express his thoughts. Describing the process of speech perception, psycholinguistics analyzes not only the process itself, but also the result of understanding human speech. Psycholinguistics describes how it reflects our involvement in joint activities interlocutor. When we learn the relation between the language and thought, how the impact on the human mind through language, we understand why language is a powerful tool for the control of human behavior. As we know, the object of psycholinguistics is a collection of individual objects which it studies. The subject of science is an abstract system of objects or some system of abstract objects. The subject of Psycholinguistics is other than that of linguistics. Psycholinguistics interested in the process of functioning of the sign system, namely, the process of creation and perception of sign language by people. Thus, psycholinguistics on the project coincides with linguistics, and on the subject varies with it. Psycholinguistics deals with the processes of encoding and decoding, as they relate to the state of information with the state of the participants of communication. Here it is supposed that the processes of speech relates not to a language system, but to a man, with his mentality.

Psycholinguistics has three subject areas:

a) the production of speech;

b) the perception of speech;

c) the formation of speech.

And in each case it is assumed that psycholinguistics draws its attention to those sides of these types of speech activity, which are due to the language system. In fact the intercourse is considered not as a simple way of sending information from one individual to another, but as a process of internal regulation of society itself. Perceptions of speech are considered in the context of in psycholinguistics. Every reader will understand the text in its own way and it is called the interpretation of the text. In such interpretations the special role is played by cultural and national characteristics of the subject. Psycholinguistics studies the text, how the text exists in the minds of those who perceive it. That`s why the idea of individuals on the language system bear the imprint of the personal experience. According to psycholinguistic concepts of the human speech organization is not a passive repository of information about language. This is dynamic (moving) functional system. Receiving new information a person remakes it. Language reflects the culture of the people. Language is the main activity not only the human, but also the national spirit - the spirit of the people. Specially studied the psycholinguistic characteristics of speech under emotional stress, where the correct orientation is difficult or completely broken. In such cases the following psycholinguistic signs of emotion reveal: the average length of the interval between the speech

pauses is less; the average duration of a pause is longer; the ratio of the durations of pauses to the duration of the speech sound better; the number of false starts, paraphrases, semantically irrelevant repetitions, grammar disagreements, logically and grammatically incomplete sentences, functional inversions, speech stereotypes are more; volume fluctuation (more noticeable); the percentage of statements with a clear positive or negative connotation are (much more); Semantic fragmentation or meaninglessness, usually while maintaining the integrity of the grammatical phrase. The phonetic monotony or patients reinforce the tone in the subsidiary, secondary parts of the sentence and muffles it in the main, the semantic part. Repetition of words pronounced by the interlocutor and the senseless shouting the same words, the same phrases as can be seen. As it is seen the symptoms are very different, reflecting the diversity of forms of schizophrenia The so-called Korsakov psychosis: a sharp memory disorder, reflected in speech (eg, in paraph - one word "pops up" instead of another) occurs in organic brain lesions, or as a consequence of chronic alcoholism. The so-called Pick's disease or Alzheimer's: a noticeable speech stereotype - phrases are composed of the same expressions and are pronounced with the same tone, and the same facial expressions and gestures. The study of the mechanisms of development of language and speech ability, Rece perception and speech production process takes place through research relationships with speech consciousness and sub consciousness, emotions and intellect. Moreover, all mental processes without exception, both cognitive and emotional, not simply matched with speech, but were considered as indispensable components of speech. We have also considered speech in the context of its relations with the mental qualities and the state of the individual. On a materials taken from the Uzbek literature there was traced a link between cognitive (perception, attention, memory, thinking, imagination) aspect of speech, psychodynamic (motive, affective, emotional) features and a communicative aspect. As a rule studies on such issues and also the development of language and speech ability, perception and speech production in adults were the subject of investigation.

The aspiration for studying the formation of speech and the factor of a person who perceives it has a long history in the Uzbek linguistics. The person who is producing words picks up them like a jeweler as Navoi stated “in the form a bunch of pearls (words)” [1.77-8.168]

According to Modern linguistics the linguistic structures (phoneme, morpheme, lexeme and forms) are general and they appear in speech in the form of a sound, letter, syllable, suffix, word, word combination, sentence and a text. [2.10-10.84]

That’s why psycholinguists analyzing these characteristic features of speech are general phenomena and the result of a person’s natural speech activity has achieved much success in solving the problems of text analyses.

Psycholinguists studies the speech as the method of expressing the reality. And at the same time speech being the main method of exchanging and keeping information is also the reflection of culture, a period of history and a person’s spiritual world. And this was the reason why there appeared different definitions given to this phenomena by the linguists. The definition “text doesn’t exist out of the process of its creation” given by A.A.Leontiev demands to give a special attention to above mentioned processes in psycholinguistics and study them in the semantic, psychologic, pragmatic, cognitive aspects.

The approach to the text as the result of speech activity is the characteristic feature of psycholinguistics. During the speech intercourse one of the partners tries to influence on the other and change his/her motions and emotional state. In other words during the conversation one of the partners by actions without a word or by words tries to influence on his/her spiritual state and speech. The changing of spiritual state follows the changing relations of a person to interlocutor and it sometimes brings to changing relations. And that means it is important to understand the terms of relations, because speech as the bases of relations has influensive strength.

At first it is important to select the language units according to the terms of speech contacts. And then the recipient should receive the speaker’s idea according to his own needs. Such approach to the problems of speech contacts planed two directions of text analyses. The first direction studies the process of text formation and the second how the recipient understands the meaning of the text.

Two stages of speech formation first stressed out by A.S.Vigotskey who said that “the movement in the program of thought speech begins with motive and progresses in thought first in the form of a word in inner speech and then in loud speech”. [4.43-9.21] Here it is important to stress one movement. We think this theory is characteristic for healthy people but in mentally sick people this inner stage of forming words is absent. In such people it appears in loud speech unwillingly. According to A.S.Vigotskey the first is a motivating stage, which precedes the stage of formation of thought. Here we’d like to present some examples taken from fiction to prove this idea.

“Good received our daughter’s prays at dawns, I feel better, don’t wake her up at dawns now”. She closed her eyes and didn’t open then. At dawn she died. Father wanted to take his little girl to another room from her mother’s dead body and at this moment she didn’t open her eyes and prayed: “Oh

God bless my mother and give treatment to her illness. [5.290] In this passage, taken from famous story by Abdulla Qahhor a little girl repeats the words sleeping and without knowing that her mother has already dead. Here the reality hasn't found its reflection in her mind yet. The aim, thinking, word selecting processes didn't exist here in interior speech but reflects in loud speech. The little girl's words appear here in the form of conditional reflex, because she was made to pray at dawns every day for the sake of her sick mother. This often happens in young children's speech and they don't analyze the words weather they are positive or negative. We think that interior stage is absent here.

Here is another example taken from the novel of "The past days" (O'tkan kunlar) by A.Qodiriy.

"… There was somebody coming.

"Who is this?"

"It 's me, Kumush…"

Otabek recognized her, that was crazy Zaynab.

"Go away!"

"It's me, Kumush" said Zaynab.

Zaynab become crazy because of her love to Otabek and even then she wanted to be "Kumush" for her beloved person. Because of this love she goes mad and then became murderer. And for this unhappy woman the only word "Kumush" was the key for happiness and love. But miracle wasn't happened, this magic word had been lost for ever and then looking back again and again Zaynab went away" [6.385]

This example proves that mentally sick persons usually repeat the words because of which they become mad. They don't really recognize the meaning of the words which they repeat unconsciously. Here is one more example. "Qurbonbibi always talks to herself and if somebody approaches to her, she praised Zebi and said how she played dutor, how she sang a song, sew scull caps and she also praised her beautiful figure, eyes and brows. And then all of a sudden she begins to ask everybody saying "Where is Zebi? Where is my dolling Zebi? Then begins to cry".

In this both above mentioned examples there are no thought and motive processes according to speech situation. That is why such affect states should be studied from the theoretical point of view.

Let's analyze one more example.

"… Mother, I'm not upset of him. My life and my youth are spent waiting for him at night", -she said. And at this moment the door of the room opened and drunk Qodirjon entered the room. Seeing him they both said "there, he has come". But instead answering them Qodirjon asked "Where is, where is my Anna, where is my dolling Anna? And then fell down [8.285]

There is saying among the people "A drunken person says the truth". And that's true because a person becoming drunk tells the words which he would not say them when they are conscious. But the words, hidden under thought usually come out or realized in loud speech when a person is under hypnotic state or being drunk. Having analyzed above mentioned psychologic conditions we differentiate three types of speech formation processes.

The first type is characteristic for mentally healthy people's speech, the second type is characteristic for formation of speech in affect conditions. And the third type can be seen in the speech of both types of people: mentally healthy and mentally sick. In the first type the realization of speech happens in the following way.

I. Inner speech: 1. Aim. 2. Thought. 3. Inner programming.

II. Loud (enter) speech.

The second type is characterized with missing all processes concerning to the formation of inner speech in affective states. It has the model: inner speech- 0. (zero) Loud speech doesn't always correspond to the real speech situation but it is a speech corresponds to psychological state of a person. In the strong state of stress the speech may loose its activity and may not work. That's why the following model is characteristic for the second type, i.d. for loud speech in such cases:

I. Inner speech -0

II. Loud speech- 0

Here is an example for it: "… after that she burst out into tears" [7.265]

In such situations mimes play the main role in the process of communication. That's why it needs a special psycholinguistic analyzes correspondingly to a new direction of scientific researches.

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SECTION 13. Geography. History. Oceanology. Meteorology.

FEATURES OF RULING OF THE SOVIET GOVERNMENT IN UZBEKISTAN: PARTICULARLY IN ORGANIZATION OF DOMESTIC AFFAIRS AND THEIR ACTIVITIES (1925-1945 YEARS)

Abstract: *The article consists the analysis of the process of the consolidation of governing system, specifically the organization of the organs of domestic affairs and their participation in the process of accomplishing socio-economical and political changes.*

Key words: *state control, the Soviet police, law, authorities, Turkestan, regulations, orders, the People's Commissariat of Internal Affairs.*

Language: *English*

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INTRODUCTION

As a result of the coups, in October, 1917 the Soviet government came to power in russian and then in Turkestan(1917- in Turkestan, in 1920- in Khiva khanate and Bukhara emirate). For strengthening its power Soviet government started creating a range of governmental institutions of public administration and control. For protecting and establishing the soviet system, in November, 1925 following the public order and participation in socio-economical and political processes there were created the organs of domestic affairs. [1,p.163-164]

At the end of 1924 as a result of the national-territorial delimitation of Central Asia and the Uzbek SSR (1925, February), the internal affairs bodies, carry out their activities in the territories of the Turkestan ASSR, the Bukhara and Khorezm People's Republic came under the jurisdiction of the People's Commissariat of Internal Affairs of Uzbekistan. Powers and tasks defined on the basis of legal regulations, statutes, decrees issued, the decisions and instructions of the People's Commissariat of Internal Affairs of the Republic of Turkestan were mutually agreed and coordinated. As a result, the general supervision over the activities of the police and the criminal investigation department was entrusted to the People's Commissariat of Internal Affairs (NKVD) of the Uzbek SSR. In the resolution adopted by the NKVD of the Uzbek SSR, it was stated that the Commissioner of Internal Affairs of Turkestan ASSR, national inspectors Bukhara and Khorezm People's Republic temporarily remain in their posts. The police and criminal investigation department, created in the Uzbek SSR, subordinated 7 regional offices, one-city district (old town in Tashkent), 13 district offices and Privokzalny department of Samarkand region. [2,p.44]

In order to improve the activities of the newly established bodies of internal affairs December 1, 1925 the NKVD took the "Charter of the Soviet workers' militia dehkan Uzbek Soviet Socialist Republic." In particular, in paragraph number 1 of the Charter states that "The Soviet workers' militia Dekan Uzbek SSR is the executive body of the central and local government, which is implementing all the decisions, orders and decrees for the protection of revolutionary order and ensure the independence of the central and local authorities" . The tasks assigned at the time to the police, were as follows: the protection of revolutionary order, to ensure personal and property safety of citizens; participate in the implementation of all decisions, orders and decrees issued by the parent organizations; security prisons; fight against crime; control of the sanitary condition of settlements; issuance of passports to the population; the paperwork to receive parcels and postal money orders, recovery of lost documents; imposition of

administrative penalties; control of agriculture; Checking the number of head of livestock and more. al. [3,p.14]

In May 1927 in the Uzbek SSR NKVD it was liquidated and on its basis was created by the Central Administration, concerned with the protection of public order, fight against crime and others. However, this restructuring did not last long. So, in October 1928 the People's Commissariat of Internal Affairs was re-organized. According to Resolution of the All-Russian Central Executive Committee and Council of People's Commissars of December 31, 1930 the activities of the NKVD was suspended. As a result of these changes, the police with all his presence staff were transferred to the CPC, and the regional, city and district police stations were subject to the relevant territorial executive committees. May 25, 1931 for the first time in the USSR was developed and approved by the Charter of the worker-peasant militia. In 1932, at the Joint State Political Administration (OGPU) was organized by the General Directorate of the police. In 1934, the NKVD was again organized by the police and the Home Office was to submit to him. During this period of the Internal Affairs of Uzbekistan was carried out simultaneously with the changes in the socio-economic sphere. December 2, 1925 at the extraordinary session of the Central Executive Committee of the Uzbek Soviet Socialist Republic adopted a decree "On the nationalization of land and water." Since that time and until 1929, was abolished in Uzbekistan 4801 farm landlord type, extra land were confiscated 23,036 households. In general, the land and water reform the Soviet government was one of the measures aimed at the elimination of the propertied classes, the construction of a classless society and created the basis for the forced collectivization of agriculture in the coming years. [4,p.141]

As a result of the publication of November 7, 1929 in a press article of Stalin's "Year of Great Change", as well as support for the Plenum of the Central Committee of the CPSU (b), held in the same year, it offers a policy of accelerated collectivization of agriculture and dispossession were defined tasks mass collectivization. [5,p.3-4]

In the course of the policy of nationalization of property, means of production, livestock, agricultural products, seed reserves of rich and medium farmers, to restore its economy under the conditions of the New Economic Policy (NEP), were forcibly expropriated. States were strictly defined area of land sown and prices for agricultural products, grow and pass by farmers. [6,p.448]

As can be seen from archival documents, the issue was considered at the dispossession of various sessions and meetings of the Soviet government organizations. At one of these meetings in the course of the dispute on "Who is the fist and how to fight it?" Was asked, "Is it right to consider the fist sector, which has three cows?" One of the participants of the meeting (Osa) responded as follows: "Of course. Naturally, farmers, stands out for its developed economy, transformed into a fist, in addition, they are afraid of dispossession, do not want to have excess stock. ... Generally speaking, a fist in the first place, "socially dangerous element" and secondly "political enemy of the Soviet government. "'[7,p.13]

Since that time, the pressure on farmers, which had a practical focus on collectivization, turned to the destruction of dekhkan farms. He began the pursuit of the figures. As in all regions of the Soviet state in Uzbekistan is carried out by the collectivization campaign, "threats and pressure." Farmers forced, under intense pressure to join the kolkhoz. Those who were against it, regardless of social status, "dekulakize." [8,p.9]

From archival documents it is clear that in the process of collectivization number deported from Uzbekistan in 1933 amounted to 5500 farm fist, while from the entire territory of Central Asia was sent over 10 thousand dekhkan farms across the Union, the number of deported families since the end of 1929 until the middle of 1930 was 320 thousand, the vast majority of the deportees were sent to special camps or special settlements located on the outskirts of the country. [9,p.31]

World history knows a lot of wars and military conflicts, but the worst tragedy of the twentieth century is the Second World War, its consequences are felt even today. After Nazi Germany attacked the Soviet Union (22 June 1941) June 30, 1941 under the leadership of Stalin organized the State Defense Committee. In the hands of the State Defense Committee was concentrated state and military power. [10,p.29]

Based on the military conditions began to implement changes in the structure, tasks and powers of state institutions. For example, in 1941 on July 20 issued a decree of the Presidium of the Supreme Soviet of the merger of the People's Commissariat of State Security (NKGB) of the USSR and the People's Commissariat of Internal Affairs (NKVD) (It should be noted that in February 1941 the NKVD and its field offices were divided into 2 parts, namely, the NKVD and NKGB. In April 1943, the NKVD was again divided into two independent Commissariats). The main aim of these reforms, it was said, was to "ensure the security of society and state in the country to improve the work on prevention activities and foreign agents for the prevention of crime."

RESULTS AND DISCUSSION

As can be seen from the documents in the first days of the war in Uzbekistan in the city and district military commissariat it received more than 14,000 applications. Most of the applicants in the first days went to the front, among them were the police, as an

example, that 50% of students of the Tashkent police school, 149 employees of the police in Samarkand, 204 police departments best employee of the Tashkent Railway became part of the Uzbek Division and the Division of General Panfilov who participated in the battles of Moscow. [11,p.31]

In the translation process on a war footing of the economy on a national scale, the NKVD Uzbek Republic issued an order "On the abolition of the holiday staff personnel of the Interior and review them from leave the service" (30 June 1941). The tasks assigned to the police and their powers were extended.

It should be noted that in the studied years the tasks entrusted to the bodies of internal affairs in the scale of the Soviet Union to some extent differ from the territorial point of view, depending on the proximity of the front. For example, frontline police officers, along with the tasks assigned to them under the Charter were to lead the armed struggle against the enemy saboteurs, spies and traitors, to ensure timely execution of military orders.

The tasks assigned to the bodies of internal affairs of Uzbekistan also were different in the field of public order and safety, they were as follows: a) enforcement of discipline and order in public places; b) the control of traffic safety on the roads (the use of transport, effective participation in road construction and maintenance of repair works); c) for various kinds of natural disasters to provide comprehensive assistance to the population, the protection of public property; g) provision of first assistance to the victims in an accident or a criminal attack, shipping them to the hospital; d) ensuring the proper implementation of the passport system (setting temporary and permanent residence of citizens and foreigners, checking their attitude to conscription); e) provision of reference works to levy administrative penalties within the powers given to the police and other authorities. [12,p.575]

After the adoption of the Central Committee of the CP of the Uzbek SSR and the CPC decision "On measures to implement the plan of deliveries of grain production of all kinds of" (18-20 November 1943), on the internal affairs agencies in the field have been tasked with the protection of grain products, installed in the control points and reception delivery, protection of places of storage of agricultural products, participate in the sowing and harvesting of grain and other agricultural products. [13,p.48-49]

CONCLUSION

In conclusion, it should be said, that after the establishment of the soviet government in Uzbekistan there were organized the institutions of public administration and control. Within the scope of their tasks and powers the organs of domestic affairs participated in socio-economical and political processes being accomplished in the area. The transfer of organs of police into military situation increased their obligation in enforcement the law and fight against crime.

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ON CONDITIONS OF LOCAL SELF-DIAGNOSIS OF MULTIPROCESSOR COMPUTING SYSTEMS UNDER MULTIPLE FAULTS

Abstract: *Multiprocessor computing systems with point-to-point communication links in which t-multiple faults are allowed at the level of the processing modules are considered. For the known model of Preparata, Metze and Chien the conditions are found under which a technical state of each module can be determined by results of the comparative analysis of the outputs of tests relating to modules from its limited neighborhood. The state of the modules is defined in the course of diagnosis and its results are used for the management of sequence further testing of the system modules.*

Key words: *the multiprocessor computing systems, system diagnostics, graph models, local self-diagnosis, conditions of self-determination of a state of processor modules.*

Language: *Russian*

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ОБ УСЛОВИЯХ ЛОКАЛЬНОГО САМОДИАГНОСТИРОВАНИЯ МНОГОПРОЦЕССОРНЫХ ВЫЧИСЛИТЕЛЬНЫХ СИСТЕМ ПРИ МНОЖЕСТВЕННЫХ ОТКАЗАХ

Аннотация: *Рассматриваются мультипроцессорные вычислительные системы со связями точка-точка, в которых допускаются t-кратные отказы на уровне обрабатывающих модулей. Для известной модели Препараты, Метца и Чжена найдены условия, при которых техническое состояние каждого модуля может быть определено по результатам сопоставительного анализа исходов тестирования, относящихся к модулям из его ограниченной окрестности. Состояние модулей определяется в процессе диагностирования и его результаты используются для управления последовательностью дальнейшего тестирования модулей системы.*

Ключевые слова: *многопроцессорные вычислительные системы, системная диагностика, теоретико-графовые модели, локальное самодиагностирование, условия самоопределения состояния процессорных модулей.*

Работа выполнена при поддержке Российского фонда фундаментальных исследований (проект № 14-07-00169.а)

1- Введение

При конструировании масштабируемых многопроцессорных вычислительных систем (ВС) в виде совокупности процессорных модулей, функциональные характеристики которых позволяют им в одиночку проверять и оценивать техническое состояние других модулей, их диагностические способности рассматриваются на системном уровне, т.е. на уровне отдельных обрабатывающих модулей и связей между ними.

Рост сложности практически применяемых ВС опережает рост надежности обрабатывающих модулей, из которых система строится. Определяющей характеристикой ВС становится не ее производительность, а способность продолжать функционировать в течение продолжительного времени при наличии отказов ее элементов (живучее функционирование). Это ставит задачу автоматизировать процедуру определения технического состояния системы (системы с самодиагностированием). Для исследования диагностических свойств ВС на системном уровне используется теоретико-графовая модель, предложенная в [1] и называемая ПМЧ-моделью. В этой модели идентификация технического состояния ВС осуществляется с помощью алгоритмов сопоставительного анализа исходов тестирования, выполняемого одними модулями системы над другими. При анализе учитывается диагностическая структура ВС — отношения тестируемый–тестирующий между ее модулями.

Мерой отказоустойчивости самодиагностируемых ВС служит *кратность неисправностей t*, представляющая собой наибольшее число одновременно присутствующих в системе неисправных модулей, при котором еще возможно определение ее состояния. Наличие в системе кратных неисправностей вызывает утрату тестами свойства надежности. Последнее означает, что оценки, получаемые исправными тестирующими модулями, соответствуют фактическому состоянию тестируемого модуля, а оценки, получаемые неисправными тестирующими модулями, не зависят от состояния тестируемого модуля.

Общим для многочисленных методов самодиагностики, известных из литературы (см., например, [2]), является то, что состояние ВС выводится из априорных предположений о техническом состоянии (исправный или неисправный) некоторых модулей, в общем случае выбираемых произвольно, и базируется на необходимости выполнения над модулями системы всех возможных тестов — независимо от фактического состояния системы. Самодиагностирование представляет собой процесс проб и ошибок, направленный на «вычисление» состояния ВС, которое не противоречит ни одному из полученных исходов тестирования при заданных правилах ненадежной интерпретации результатов тестов, выполняемых неисправными тестирующими модулями.

Основные недостатки описанного подхода состоят в следующем. 1. Процедура сбора информации для определения состояния ВС и «отката» при обнаружении ошибочности априорных предположений о состоянии выбранных модулей может захватывать всю систему. 2. Самодиагностика строится на базе сопоставительного анализа результатов *полного* множества тестов над системой независимо от фактического состояния ВС. 3. Целью самодиагностирования провозглашается обнаружение неисправных модулей системы. Идентификация исправных модулей рассматривается как побочный результат.

Эти недостатки ограничивают возможность применения подхода [1] к самодиагностике живучих систем. Для таких систем перспективна постановка задачи системного диагностирования, как проблемы идентификации хотя бы одного исправного модуля. Выделенные один или группа исправных модулей составляют диагностическое ядро системы. Модули ядра используются для определения состояния ещё не проверенных модулей, в том числе — идентификации новых исправных модулей, пополняющих диагностическое ядро. Тем самым реализуется известный ещё для компьютеров первых поколений принцип диагностирования методом расширяющегося диагностического ядра. При использовании диагностического ядра состояние любого модуля, смежного с модулем из ядра, определяется по исходу единственного теста над ним. Это уменьшает число тестов, необходимых для определения состояния системы и, как следствие, увеличивает время использования системы по назначению. Использование метода выделения диагностического ядра обеспечивает бОльшую надежность защиты системы от разрушительного воздействия со стороны еще не выявленных неисправных модулей и бОльшую оперативность реакции на попытку такого воздействия. Образуемая на базе ядра связанная подсистема из исправных модулей может немедленно переключаться на решение прикладных задач, что создаёт основу для совмещения счета с диагностикой и организации живучего функционирования ВС. Впервые использование метода выделения диагностического ядра для самодиагностирования описано в [3].

В [4, 5] для модели ПМЧ предложен «безоткатный» метод самодиагностики с помощью функционально выделяемого диагностического ядра для случая кратных устойчивых отказов. Метод допускает использование адаптивных децентрализованных алгоритмов, позволяющих достичь для системы свойства живучести. Как выделение диагностического ядра, так и идентификация состояния остальных модулей системы осуществляются на основе анализа исходов тестирования, получаемых в ходе тестирования системы. Идентификация состояния модулей ВС осуществляется по результатам тестирования

модулей, находящихся в их ограниченной окрестности, в связи с чем предложенный метод назван *методом локального самодиагностирования*. В [4, 5] введено определение и доказаны необходимые и достаточные условия диагностируемости при использовании ограниченного набора локальных признаков идентификации состояния модулей, названного *базовыми условиями самоопределения*. Отличительной особенностью базовых условий самоопределения является то, что они основаны на анализе лишь тех исходов тестирования, которые позволяют идентифицировать *действительное* состояние модуля.

В [5, 6] найдены новые признаки локального самоопределения, использование которых ведет к построению более эффективных децентрализованных адаптивных алгоритмов самодиагностирования.

В данной статье проводится систематизация известных и предлагаются новые условия самоопределения, обеспечивающие построение эффективных децентрализованных адаптивных алгоритмов самодиагностирования для живучих ВС. Новизна используемого подхода состоит в возможности корректировать значение проектной характеристики самодиагностики ВС — кратности неисправностей — по числу неисправных модулей, достоверно выявленных в ходе самодиагностирования, что ведёт к уменьшению числа тестов, необходимых для определения состояния системы в целом.

2- Определения и обозначения

Диагностическая структура ВС представлена ориентированным графом $D=(V,E)$ с взвешенными дугами, в котором $N=|V|$; здесь $|X|$ означает мощность множества X. Вершины $v\in V$ графа отображают модули, а дуги $(v,w)\in E$, $v,w\in V$, — тестовые связи между ними. Вес $a(v,w)$ дуги (v,w) диагностического графа равен двоичному исходу соответствующего теста: $a(v,w)=0$, если модуль v считает, что модуль w исправен, и $a(v,w)=1$ в противном случае. Как сказано выше, для ПМЧ-модели исход теста, выполняемого исправным модулем, достоверен, а исход теста, выполняемого неисправным модулем ненадежен: он не зависит от фактического состояния тестируемого.

Чтобы упростить изложение, переносим терминологию системы на представляющий ее граф.

Состояние графа описываем перечислением присутствующих в графе неисправных вершин $F_k=\{v_i\}$ и называем его «образом неисправностей». Множество $F(t)=\{F_k\}$ допустимых неисправностей составляют все возможные сочетания из N вершин по n, где $n=\overline{1,t}$, а t —кратность неисправностей. Рассматриваются отказы — устойчивые неисправности модулей ВС. Упорядоченное множество $\sigma(F_k)$ исходов тестов, которое может быть получено для заданного образа неисправностей F_k, называем синдромом состояния графа. Синдром $\sigma(F_k)$ *совместен* с образом неисправностей F_k, а F_k *порождает* синдром $\sigma(F_k)$.

Для модуля, которому сопоставлена вершина v, множества $\Gamma^{-1}(v)=\{w\in V:\ (w,v)\in E\}$, $\Gamma(v)=\{w\in V:\ (v,w)\in E\}$ и $H(v)=\Gamma^{-1}(v)\cup\Gamma(v)$ представляют в диагностическом графе модули тестирующие, тестируемые и смежные. Согласно весу дуг, инцидентных вершине v, выполняется: $\Gamma^{-1}(v)=\Gamma_0^{-1}(v)\cup\Gamma_1(v)$, $\Gamma(v)=\Gamma_0(v)\cup\Gamma_1(v)$. Здесь $\Gamma_0^{-1}(v)\cap\Gamma_1(v)=\varnothing$ и $\Gamma_0(v)\cup\Gamma_1(v)=\varnothing$.

Граф называем t-диагностируемым, если и только если по заданному синдрому можно идентифицировать все неисправные вершины диагностического графа, когда их число не превышает заданного значения t кратности неисправностей. В [7] показано, что если в графе нет взаимно тестируемых вершин, то необходимыми и достаточными условиями t-диагностируемости являются: 1) $N\ge 2t+1$; 2) $\forall v\in V\{|\Gamma^{-1}(v)|\ge t\}$. Далее рассматриваем графы, удовлетворяющие этим условиям.

3- Алгоритм самодиагностирования

В [4–6, 9–10] описан подход к диагностированию живучих ВС, основанный на том, что фактическое состояние каждой вершины v, $v\in V$, диагностического графа $D=(V,E)$ определяется с помощью правил сопоставительного анализа исходов тестирования, которые относятся только к вершинам из ее ограниченной (и способной к росту в ходе диагностирования) окрестности и называются *правилами* (локального) *самоопределения*.

Алгоритм локального самодиагностирования представляет собой итеративный процесс и состоит из чередующихся шагов 1) тестирования, завершающегося определением значений элементов синдрома, которые относятся к участвующим в

тестировании вершинам, и 2) сопоставительного анализа полученного *фрагмента* синдрома. Результатом сопоставительного анализа является изменение состояния вершин диагностического графа (или просто "состояния графа"). Состояние графа описывается с помощью меток, сопоставленных его вершинам. Каждой вершине v сопоставлена метка $m(v) \in M$, $M = \{0, 1, 2, 3, ...\}$ [1]. Значение $m(v) = 2$, если фактическое состояние вершины v не идентифицировано (в частности, перед началом диагностирования); значение $m(v) = 0$ или $m(v) = 1$, если по результатам анализа текущего значения синдрома вершина v признана соответственно исправной или неисправной (эти состояния называем *финальными*). Совокупность найденных финальных меток вершин, так же, как сам процесс их определения, называем *разметкой графа*. Разметка графа завершается, когда установлено финальное состояние для всех его вершин[2].

При выполнении разметки поведение каждой вершины графа зависит от состояния смежных с нею вершин. Каждой вершине v графа присваиваются метки-списки, сопоставленные некоторым выделенным состояниям из множества M. В процессе разметки вершины обмениваются метками-списками, так что каждая из них знает состояние вершин из некоторой своей окрестности. Величина и состав окрестности для каждой вершины индивидуален и зависит от порядка тестирования, исходов выполненных тестов, от задержек в пересылке индивидуальных меток-списков и др. Важно, что каждая вершина "вычисляет" свое состояние, исходя из текущего значения ее меток-списков.

3. Базовые условия локального самоопределения

Разметка диагностического графа осуществляется по шагам. Если на очередном r-м шаге идентифицирована неисправная вершина v, то в дальнейшем условия самоопределения для смежных с нею вершин $w \in H(v)$ рассматриваются на остаточном множестве $R^{(r)}(w)$, образованном исключением из $H(w)$ вершины v (равно как и других смежных с нею идентифицированных неисправных вершин).

Существенной новой особенностью развиваемого подхода к локальному самодиагностированию является возможность оперативной корректировки значения проектной характеристики системы — кратности допустимых неисправностей t — в случае, когда для некоторых вершин устанавливается финальное состояние неисправности[3]. Установка на шаге r самодиагностирования финального состояния неисправности для множества $f^{(r)}(v)$, $|f^{(r)}(v)| = \tau^{(r)}(v)$, вершин из окрестности, учитываемой в вершине v, приводит к корректировке ее индивидуального *порога самоопределения* $Q^{(r)}(v)$: $Q^{(r)}(v) := Q^{(r-1)}(v) - \tau^{(r)}(v)$. Будем называть $\tau^{(r)}(v)$ величиной корректировки порога самоопределения вершины v на r-м шаге самодиагностирования.

Начальное состояние графа задается следующими значениями, указываемыми для каждой вершины графа:

$$\begin{cases} R^{(0)}(v) = H(v); \\ \tau^{(0)}(v) = 0; \\ f^{(0)}(v) = \varnothing; \\ Q^{(r)}(v) = t; \\ m^{(0)}(v) = 2. \end{cases}$$

Начальное значение порога самоопределения для всех вершин графа равно величине кратности неисправностей t, поскольку априорная информация о мощности образа неисправностей отсутствует. Порог меняется по мере определения финального состояния для новых вершин.

На r-м шаге разметки диагностического графа, $r = 1, 2, \ldots$, для каждой вершины графа выполняются следующие преобразования:

$$[|R^{(r-1)}(\Gamma_1^{-1}(v)) \cup R^{(r-1)}(\Gamma_1(v))| > (Q^{(r-1)}(v) - \tau^{(r-1)}(v))] \mapsto m^{(r)}(v) := 1, \quad (1)$$

$$[|R^{(r-1)}(\Gamma_0^{-1}(v))| \geq (Q^{(r-1)}(v) - \tau^{(r-1)}(v))] \mapsto \mapsto m^{(r)}(v) := 0. \quad (2)$$

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[1] Мощность множества M зависит от выбора условий самоопределения, используемых в конкретном алгоритме самодиагностирования.

[2] Термин *разметка графа* применяем как к процессу определения финального состояния вершин графа, так и к описанию множества вершин графа, получивших метки финального состояния на некотором шаге самодиагностирования.

[3] Чтобы подчеркнуть первичность влияния соглашения о кратности допустимых неисправностей на диагностические свойства системы, его называют *аксиомой кратности*.

$$m^{(r)}(v) := 0 \mapsto [\forall w \in \Gamma_0(v)\{m^{(r)}(w) := 0\}] \& \quad , \quad (3)$$
$$\&[\forall w \in (\Gamma_1^{-1}(v) \cup \Gamma_1(v))\{m^{(r)}(w) := 1\}]$$

$$m^{(r)}(v) := 1 \mapsto \forall w \in \Gamma_0^{-1}(v)\{m^{(r)}(w) := 1\}], \quad (4)$$

$$m^{(r)}(v) := 0 \to [T(v) := \Gamma_1^{-1}(v) \cup \Gamma_1(v);$$
$$\forall w \in (H(v) - \Gamma_1^{-1}(v) - \Gamma_1(v) - \Gamma_0(v))\{f(w) := , \quad (5)$$
$$:= f(w) \cup T(v); \quad \tau^{(r)}(w) := |f(w)|\}]$$

$$m^{(r)}(v) := 1 \to [T(v) := \Gamma_0^{-1}(v) \cup v;$$
$$\forall w \in (H(v) - \Gamma_0^{-1}(v))\{f(w) := f(w) \cup T(v); \quad . \quad (6)$$
$$\tau^{(r)}(w) := |f(w)|\}]$$

$$\begin{cases} R^{(r)}(w) = H(w) - \{v \cup \Gamma_0^{-1}(v)], \text{ если } m(v) = 1, \\ R^{(r)}(w) = H(w) - \{\Gamma_1^{-1}(v) \cup \Gamma_1(v) \cup \\ \cup \{v \cup \Gamma_0(v)\}\}], \text{ если } m(v) := 0. \end{cases} \quad (7)$$

Здесь $m(v) := z$ обозначает операцию присвоения вершине v метки финального состояния: $z \in \{0, 1\}$. Выражения (1) и (2) указывают **базовые прямые** условия самоопределения — признаки финального состояния вершины, исходя из значений синдрома, относящихся только к ней самой. Выражения (3) и (4) представляют **базовые выводимые** условия самоопределения — условия установки финального состояния смежных вершин, являющейся следствием идентификации финального состояния вершины v согласно (1) и (2). Преобразования в выражениях (3)–(4) вытекают из правил определения исходов тестирования для ПМЧ-модели, в соответствии с которыми

$[\Gamma_0(v) \subset (V - F_k) \& [\Gamma_1^{-1}(v) \cup \Gamma_1(v)] \subseteq F_k]$, если вершина v исправна, и $\Gamma_0^{-1}(v) \subset F_k \; X_0(i) \subset F_k$, если вершина v неисправна. В выражениях (5) и (6), задающих условия корректировки порога самоопределения для вершины v, $T(v)$ и $f(w)$ — списки, сопоставляемые вершинам v и w соответственно. Выражения (7) определяют остаточные множества для вершин, не перешедших на r-м шаге в финальное состояние.

4- Функции совместности

В [11] для описания свойств используемых ненадежных тестов предложено использовать булевы функции, называемые элементарными функциями совместности. Элементарная функция совместности перечисляет состояния пары вершин, участвующих в выполнении теста (v, w), которые соответствуют заданному исходу $z \in \{0, 1\}$ этого теста. Для ПМЧ-модели элементарные функции совместности имеет следующий вид.

$$f_0(v, w) = \bar{v}\bar{w} \vee \bar{v}w \vee vw, \quad (8)$$

$$f_1(v, w) = \bar{v}\bar{w} \vee \bar{v}w \vee v\bar{w}. \quad (9)$$

Пусть F_k — образ неисправностей диагностического графа D, $\sigma^{(r)}(F_k)$ — фрагмент порождаемого им синдрома, сформированный на r шагах разметки, $\sigma^{(r)}(F_k) \subset \sigma(F_k)$, и D_T — подграф диагностического графа (называемый далее подграфом тестирования), индуцируемый элементами $\sigma^{(r)}(F_k)$.

Определение 1. *Для фрагмента синдрома $\sigma^{(r)}(F_k)$ функцией совместности называется конъюнкция элементарных функций z-совместности, соответствующих значениям элементов из $\sigma^{(r)}(F_k)$, приведенная к совершенной дизъюнктивной нормальной форме (СДНФ) и из которой исключены минтермы, содержащие более $Q^{(r)}(D_T)$ переменных в инверсной форме. Здесь $Q^{(r)}(D_T)$ — порог самоопределения, рассчитанный на r-м шаге разметки для подграфа D_T.*

Определение 2. *Функция совместности называется определяющей, если она имеет хотя бы одну общую переменную в прямой или инверсной форме. Выделенные общие переменные называем определимыми.*

Определение 3. *Функция совместности называется продуктивной, если ее форма позволяет уточнить (или ограничить) область размещения вершин определенного состояния, их число или взаимное расположение.*

Функции совместности, удовлетворяющие определениям 2 или 3, называем *значимыми*. Наличие или отсутствие свойства значимости заданной функции совместности ассоциируем с неформальным понятием "диагностические свойства"[4] соответствующего подграфа тестирования.

5- Условия группового самоопределения

Функция 0-совместности (8) задает отношение частичного порядка на множестве

[4] Под диагностическими свойствами понимаем любые количественные или качественные показатели, которые позволяют оценить достижимость или эффективность самодиагностирования, а также признаки, которые позволяют идентифицировать состояние отдельных модулей системы.

вершин, участвующих в выполнении теста (v, w), по их состоянию: метка состояния тестируемой вершины не больше метки тестирующей. Транзитивность отношения (8) на содержательном уровне означает, что в простом 0-пути неисправные вершины предшествуют исправным.

Пример. Рассмотрим фрагмент синдрома

$$\sigma^{(r)}(P_0(v_0, v_3)) = \{a(v_0, v_1) = 0, \; a(v_1, v_2) = 0, \; a(v_2, v_3) = 0\},$$

который соответствует подграфу тестирования, представляющего простой путь из вершины v_0 в вершину v_3. Для него функция совместности имеет вид:

$$P_0(v_0, v_3) = f_0(v_0, v_1) f_0(v_1, v_2) f_0(v_2, v_3) =$$
$$= (\overline{v}_0 \vee v_1)(\overline{v}_1 \vee v_2)(\overline{v}_2 \vee v_3) =$$
$$= \overline{v}_0 v_1 v_2 v_3 \vee \overline{v}_0 \overline{v}_1 v_2 v_3 \vee \overline{v}_0 \overline{v}_1 \overline{v}_2 v_3 \vee \overline{v}_0 v_1 \overline{v}_2 v_3 \vee v_0 v_1 v_2 v_3.$$

Для простого контура, порождающего синдром $\sigma([P_0(v_0, v_3)] f_0(v_3, v_0))$, отношение транзитивности приводит к эквивалентности финального состояния его вершин:

$$P_0(v_0, v_3) f_0(v_0, v_1) = \overline{v}_0 v_1 v_2 v_3 \vee v_0 v_1 v_2 v_3. \quad (10)$$

Не останавливаясь на других конструкциях связных подграфов тестирования, описываемых функцией совместности вида (10), сформулируем их общее свойство.

Свойство 1 (*условие группового самоопределения*). *Если для связного* 0-*подграфа* $D_0 = (V_0, E_0)$, *описываемого функцией* (10), *найдется вершина* w, $w \notin V_0$, *смежная хотя бы с одной вершиной* $v_k \in V_0$, *и такая, что* $m(w) = 0$, *то финальное состояние всех вершин подграфа* D_0 *устанавливается по исходу единственного теста* (w, v_k).

Из свойства группового самоопределения вытекает следующее.

Свойство 2. *Если для связного подграфа* $D_0 = (V_0, E_0)$ *функция совместности имеет вид* (10), *то*

1. *Когда* $|V_0| \geq Q^{(r)}(D_0)$, *то все вершины из* V_0 *исправны*: $V_0 \not\subset F \rightarrow \forall v_k \in V_0 \{m(v_k) := 0\}$;

2. *Когда для некоторой вершины* $v_k \in V_0$ *устанавливается финальное состояние* $m(v_k) \in \{0, 1\}$, *то для каждой вершины* $v_i \in \{V_0 - v_k\}$, $v_i \neq v_k$ *выполняется* $m(v_i) := m(v_k)$.

Следующее свойство указывает условия объединения компонент 0-связности, описываемых функцией (10).

Свойство 3. *Если в подграфе тестирования существуют компоненты* 0-*связности* $D_0' = (V_0', E_0')$ *и* $D_0'' = (V_0'', E_0'')$, *описываемые функцией* (10) *и такие, что* $v \in V_0'$, $w \in V_0''$, *а вершины* v *и* w *смежны в графе* D, *то при* $a(v, w) = a(w, v) = 0$ *вершины из* D_0' *и из* D_0'' *имеют одинаковое состояние и эти компоненты могут быть объединены в одну.*

6- Треугольники тестирования

Базовые условия (1), (2) самоопределения вершины v учитывают исходы тестирования, выполняемого на открытой окрестности этой вершины, а именно, исходы тестов вида (w, v) и (v, w), где $w \in H(v)$. Рассмотрение замкнутой окрестности $v \cup H(v)$ дает новые условия самоопределения [8].

Пусть для вершины v диагностического графа $\{w, u\} \subset H(v)$. Рассмотрим ориентированный полный граф K_3 с множеством вершин $\{v, w, u\}$. Назовем треугольником тестирования ориентированный подграф графа K_3, не содержащий взаимно обратных дуг. Для вершины v диагностического графа множество треугольников тестирования на множестве $\{v, w, u\}$ задается выбором дуг K_3. В [6, 8] выделены два основных треугольника тестирования, описываемых наборами дуг: $A_1 = \{(v, w), (v, u), (w, u)\}$ и $A_2 = \{(v, w), (w, u), (u, v)\}$. Показано, что все остальные треугольники тестирования эквивалентны основным с точностью до обозначения вершин.

В [6] показано, что для треугольника тестирования A_1 синдромы

$$\sigma_{11}^{(r)}(A_1) = \{a(v,w) = 0, \; a(v,u) = 0, \; a(w,u) = 1\} \text{ и}$$
$$\sigma_{12}^{(r)}(A_1) = \{a(v,w) = 0, \; a(v,u) = 1, \; a(w,u) = 0\}$$

дают функцию совместности, которая составляет условие самоопределения неисправной вершины v: $m(v) = 1$. В треугольнике тестирования вида A_2 синдромы

$$\sigma_{21}^{(r)}(A_2) = \{a(v,w) = 0, \; a(v,u) = 0, \; a(w,u) = 1\},$$
$$\sigma_{22}^{(r)}(A_2) = \{a(v,w) = 0, \; a(v,u) = 1, \; a(w,u) = 0\} \text{ и}$$
$$\sigma_{22}^{(r)}(A_2) = \{a(v,w) = 1, \; a(v,u) = 0, \; a(w,u) = 0\}$$

составляют соответственно условие самоопределения неисправности вершины v, вершины w и вершины u.

Из всего множества треугольников тестирования, которые можно построить на множестве $V(v) = v \cup H(v)$, выделены те, которые обеспечивают самоопределение вершины v. Для вершин $w, u \in H(v)$

идентификация финального состояния обеспечивается из аналогичных треугольников тестирования, построенных на множествах $V(w) = w \cup H(w)$ и $V(u) = u \cup H(u)$ соответственно.

Принципиальную возможность эффективного использования треугольников тестирования показывает установленное в [8] свойство достаточности использования треугольников тестирования вида A_2 в сочетании с условиями (1) и (2) для достижения локальной *t*-диагностируемости для класса циркулянтных диагностических графов, описанных в [1].

7- Обратное тестирование

В практике построения многопроцессорных вычислительных систем со связями точка–точка определилась тенденция к использованию однородных вершинно симметричных рабочих графов $G = (V_W, E_W)$. Структура рабочего графа задана областью применения ВС. В вершинно симметричном графе все вершины эквивалентны по их положению. Это позволяет применять для управления системой децентрализованные отказоустойчивые алгоритмы, упрощает структуру операционной системы, в частности, облегчает построение операционной системы для масштабируемой ВС. Отмеченные свойства делают вершинно симметричные графы привлекательными также и для использования в живучих ВС.

По экономическим соображениям диагностический граф $D = (V, E)$ ВС реализуется как подграф рабочего графа $G = (V_W, E_W)$, так что $V = V_W$ и $E \subseteq E_W$. Рабочий граф имеет симметрические дуги: если в рабочем графе $G = (V_W, E_W)$ выполняется $(v, w) \in E_W$, то и $(w, v) = E_W$. Классическая модель самодиагностирования [1] предполагает использование ориентированных диагностических графов с асимметричными дугами, что составляет необходимое и достаточное условие для достижения оптимальности диагностического графа. В оптимальном диагностическом графе число дуг при заданном *t* минимально.

Однако применение оптимального диагностического графа в виде подграфа рабочего приводит к неполному использованию в целях самодиагностирования возможностей последнего. Другими словами, если вершины *v* и *w* смежны в рабочем графе, то из двух возможных между ними связей (v, w) и (w, v) рабочего графа для реализации диагностического подграфа используется лишь одна.

Предположим для определенности, что в диагностический граф входит дуга (v, w). Назовем тест, реализуемый этой дугой, *прямым*. Рассмотрим возможность, которую предоставляет для самоопределения вершин графа использование противоположно направленной дуги рабочего графа, соответствующую тесту, называемому *обратным*.

Рассмотрим функции совместности для всех возможных значений синдрома $\sigma^{(r)}(v, w) = \{a(v, w), a(w, v)\}$ при $a(v, w), a(w, v) \in \{0,1\}$. Анализ этих синдромов дает следующие условия определимости вершин диагностического графа.

Свойство 4.

$$\sigma^{(r)}(v, w) = \{a(v, w) = 1, a(w, v) = 0\} \mapsto m(w) := 1$$

т.е. вершина w самоопределима как неисправная.

Свойство 5.

$$\sigma^{(r)}(v, w) = \{a(v, w) = 0, a(w, v) = 0\} \mapsto$$
$$\mapsto m(v) = m(w),$$

т.е. финальное состояние вершин v и w совпадает.

В [9] получены условия, при которых симметричный циркулянтный диагностический граф, описанный в [1], *t*-диагностируем при использовании обратного тестирования совместно с условиями базовой определимости (1) и (2).

8- Условное самоопределение

Симметрический характер функции 1-совместности (9) позволяет рассматривать неориентированные 1-подграфы тестирования.

Пусть $D_1 = (V_1, E_1)$ — (связный) неориентированный 1-подграф тестирования. Для него функция 1-совместности $\Phi(D_1) = \bigcap_{(v_i, v_j) \in E_1} (\overline{v_i} \vee \overline{v_j})$, приведенная к СДНФ, перечисляет все его вершинные покрытия [12], а полученная из нее сокращенная дизъюнктивная форма указывает все его *минимальные* вершинные покрытия:

$$\Phi(D_1) = \bigcap_{(v_i, v_j) \in E_1} (\overline{v_i} \vee \overline{v_j}) = \bigcup_{k=1}^{p} \mu_k . \quad (11)$$

Здесь μ_k — терм, $\mu_k \subseteq V_1$, указывающий состав k-го по счету вершинного покрытия графа D_1, а p — число минимальных покрытий. Терм минимального ранга соответствует наименьшему покрытию, а ранг этого терма есть число вершинного покрытия. Форма (11) единственная, поскольку литералы всех термов взяты в инверсной форме. Термы функции $\Phi(D_1)$ попарно различны и представляют собой ее простые импликанты, а сама функция $\Phi(D_1)$ —

тупиковая ДНФ, перечисляющая все минимальные покрытия заданного 1-подграфа неисправными вершинами.

Условимся, что термы в выражении (11) перенумерованы в порядке возрастания числа литералов в них, так что $|\mu_1| \le |\mu_2| \le ... \le |\mu_p|$. В таком случае значение $|\mu_1|$ указывает число вершинного покрытия рассматриваемого 1-подграфа.

Возможность самоопределения для 1-подграфа общего вида D_1 основана на том, что при пороге самоопределения $q < |V_1|$, $q = Q^{(r)}(D_1)$, функция (11) принимает вид $\Phi(D_1) = \bigcup_{k=1}^{p'} \mu_k$, где p' наибольший ранг простых импликант функции (11) такой, что $p' \le q$. Поэтому диагностические свойства функции совместности для 1-подграфа общего вида определяются следующим.

Свойство 6. *Если в* 1-*подграфе тестирования* D_1 *для заданного образа неисправности* F_j *при пороге самоопределения* $q = Q^{(r)}(D_1)$, *функция* $\Phi(D_1) = \bigcup_{k=1}^{p'} \mu_k$, $p' \le q$, *такова, что*:

1) *не имеет общих переменных, то эта функция совместности непродуктивна*;

2) *имеет общие переменные* $\overline{v_1}, \overline{v_2}, ..., \overline{v_i}$, *то* 1-*подграф тестирования* D_1 *имеет самоопределяемые вершины:* $v_1, v_2, ..., v_i \in F_j$;

3) *состоит из единственного терма* μ_1, *то все вершины* 1-*подграфа тестирования самоопределяемые, а именно:* $\mu_1 \subset F_j$ и $\{V_1 - \mu_1\} \subseteq (V - F_j)$. *При выполнении условий* (1) *или* (2) *осуществляется соответствующая корректировка порога самоопределения. В случае* (3) *идентифицируются исправные вершины, поэтому корректировка порога самоопределения не производится.*

Подчеркнем, что в случае выполнения свойства 6.3 имеет место самоопределение для исправных вершин диагностического графа. Насколько известно авторам, определимость *исправных* вершин из рассмотрения 1-подграфов тестирования ранее не описывалась.

Итак, для идентификации финального состояния вершин для 1-подграфа тестирования общего вида на основе свойства 6 требуется решить задачу о перечислении его минимальных вершинных покрытий. Известно, что даже задача о построении некоторого (любого) минимального вершинного покрытия для заданного графа в общем случае является *NP*-полной. Это требует поиска приближенных решений задачи о вершинном покрытии для 1-подграфов. Одно из таких решений состоит в следующем.

Продуктивность элементарной функции 1-совместности (9) состоит в том, что единичный исход теста не идентифицирует неисправные вершины точно, а указывает на пересечение множества вершин, участвующих в тестировании, с заданным образом неисправностей, выделяя подмножество вершин, к которому они принадлежат, согласно следующему.

С в о й с т в о 7.

$\forall a(v, w) = 1 \in \sigma(F_k) \{\{v, w\} \cap F_k \ne \varnothing\}$.

Выполнение условия $\{v, w\} \cap F_k \ne \varnothing$ означает, что вершины $\{v, w\}$ могут быть исключены из диагностического графа вместе с инцидентной им дугой, а текущее значение порога самоопределения уменьшено на единицу. Поэтому достигаемую определимость и соответствующую корректировку порога самоопределения называем *условными*.

При использовании условного самоопределения из подграфа тестирования удаляются как неисправные, так и исправные вершины. Это требует контроля за соблюдением *аксиомы кратности*, согласно которой общее число исправных вершин в остаточном графе должно быть больше числа неисправных вершин, что следует из условия $N \ge 2t + 1$, характеризующего ПМЧ-модель самодиагностирования.

Свойство самоопределения 7 позволяет получать приближенное решение задачи о вершинном покрытии графа в виде задачи о его реберном покрытии. Кардинальное различие в сложности "вершинных" и "реберных" задач состоит в том, что первые относятся к разряду экспоненциально сложных, в то время как для вторых известны полиномиальные алгоритмы. Хорошо известен следующий результат.

Теорема 1 (Харари). *Для каждого графа G число вершин в любом вершинном покрытии X не меньше числа ребер в произвольном паросочетании M, т.е. имеет место неравенство* $|M| \le |X|$.

Поскольку для элементарной функции совместности вида (9) аксиома кратности выполняется ($a(v, w) = 1 \to |\{v, w\} \cap F_k| \ge 1$), то она выполняется и для любого паросочетания заданного графа *G*. Поэтому теорема 1 в качестве следствия дает следующее.

Свойство 8. *Пусть для 1-подграфа тестирования* $D_1 = (V_1, E_1)$ *его произвольное паросочетание имеет вид*

$M(D_1) = \{(v, w): \ v, w \in V_1, (v, w) \in E_1\}$.

Удаление элементов паросочетания $M(D_1)$ *из графа* $D_1 = (V_1, E_1)$ *с корректировкой порога самоопределения на величину* $|M(D_1)|$ *применимо для условного самоопределения.*

Преимущества, доставляемые использованием теоремы 1, состоят в следующем: 1) можно использовать построение конкретного паросочетания в качестве *решения* задачи о вершинном покрытии, при котором не нарушается аксиома кратности; 2) при использовании паросочетания для условной корректировки порога самоопределения из графа исключаются только и только элементы паросочетания, а оставшиеся элементы 1-подграфа могут участвовать в дальнейшем диагностировании; 3) для построения наибольших паросочетаний известны многочисленные детерминированные и рандомизированные, точные и приближенные алгоритмы с полиномиальной сложностью как для отдельных классов графов, так и для графов общего вида, в том числе алгоритмы, допускающие параллельную децентрализованную реализацию. Лучший из известных алгоритмов построения наибольшего паросочетания имеет полиномиальную сложность $O(|E_1|\sqrt{|V_1|})$.

Кардинальным решением задачи о покрытии вершин 1-подграфа тестирования множеством неисправных вершин, при котором также автоматически обеспечивается соблюдение аксиомы кратности, является следующее.

Свойство 9. *Если при выполнении очередного теста* (v, w) *получено* $a(v, w) = 1$, *то вершины, участвовавшие в выполнении этого теста, удаляются из диагностического графа вместе с инцидентными им дугами и с сопутствующим уменьшением на единицу порога самоопределения.*

Использование такой оперативной условной корректировки порога самоопределения а) увеличивает вероятность продуктивности ранее образованных функций совместности и сопутствующее сокращение общего времени диагностирования, б) позволяет избежать образования больших 1-подграфов и применения трудоемких процедур их диагностического анализа, а для простых структур дает возможность быстрого определения числа паросочетания. Эти преимущества окупают возможную потерю эффективности диагностирования, вытекающую из соотношения $|M| \le |X|$.

Описанное свойством 9 условное самоопределение вершин диагностического графа относится к вершинам, участвующим в выполнении теста, и называется ***прямым*** условным самоопределением. В работе [11] для ПМЧ-модели найдены правила ***косвенного*** условного самоопределения, при котором самоопределение пары вершин осуществляется на основе анализа исходов тестов над третьей вершиной.

Рассмотрим функции совместности для пар смежных тестов, образованных на множестве вершин $\{v, w, u\}$. Имеется три пары смежных тестов, различающиеся степенью полузахода / полуисхода соответствующих вершин: $\{(v, u), (w, u)\}$, $\{(v, w), (w, u)\}$ и $\{(v, w), (v, u)\}$.

Анализ функций совместности, образованных для каждой из указанных пар смежных тестов, дал два следующих признака косвенного условного самоопределения.

Свойство 10. *Если образ неисправностей* F_k *порождает синдром* $\sigma^{(r)}(F_k)$, *такой, что для некоторой пары смежных тестов* $\{(v,u),\ (w,u)\}$ *выполняется*

$$\{a(v, u) \ne a(w, u)\} \subset \sigma^{(r)}(F_k),$$

то при любом состоянии вершины и имеет место $\{v, w\} \cap F_k \ne \varnothing$.

*Свойство*11. *Если образ неисправностей* F_k *порождает синдром* $\sigma^{(r)}(F_k)$, *такой, что для некоторой пары смежных тестов* $\{(v,w),\ (w,u)\}$ *выполняется*

$$\{a(v, w) = 0, a(w, u) = 1\} \subset \sigma^{(r)}(F_k),$$

то $\{v, u\} \cap F_k \ne \varnothing$.

Для пары смежных тестов $\{(v,w),\ (v,u)\}$ отношения косвенного условного самоопределения не существуют.

При использовании косвенного условного самоопределения в случае свойства 10 вершины $\{v, w\}$ с инцидентными им дугами из диагностического графа исключаются. В случае свойства 11 из диагностического графа исключаются вершины $\{v, u\}$ с инцидентными им дугами

Пусть $D_T(v)$ — подграф тестирования, индуцированный множеством вершин $\{v, R(\Gamma_0^{-1}(v)), R(\Gamma_1^{-1}(v)), R(\Gamma_1(v))\}$. Обозначим $V_1(v) = v \cup R(\Gamma_0^{-1}(v))$ и $V_2(v) = R(\Gamma_1^{-1}(v) \cup \Gamma_1(v))$. Будем рассматривать полный двудольный граф с долями $V_1(v)$ и $V_2(v)$. Этот граф задает отношения между вершинами подграфа $D_T(v)$, соответствующие свойствам 10 и 11. Опираясь на свойства 10 и 11, в [11] доказано следующее.

Утверждение. К подграфу тестирования $D_T(v)$ *применимо условное самоопределение, при котором из него удаляются вершины доли с*

меньшей мощностью и равное число произвольно выбираемых вершин другой доли, а порог самоопределения уменьшается на величину $\tau = \min\{|V_1(v)|, |V_2(v))|\}$.

9- Заключение

Рассмотрен системный уровень самодиагностирования ВС при множественных отказах и исходах тестирования, соответствующих ПМЧ-модели.

Выведены условия достоверной идентификации технического состояния модуля ВС, производимой по результатам тестирования только из модулей, находящихся в его ограниченной окрестности. Такое самодиагностирование названо локальным *t*-диагностированием, а условия идентификации состояния модуля — условиями его самоопределения. Предложена классификация локальных условий идентификации состояния модулей ВС по характеру оценки исходов тестов, используемых для самоопределения состояния модулей. Описан избыточный набор достаточных условий самоопределения модулей, которые используются для определения фактического состояния модулей в ходе самодиагностирования. Применение этих условий исключает необходимость выполнения над системой всех возможных тестов. Впервые показана возможность самоопределения состояния модулей без необходимости выполнять непосредственный тест между ними.

Предложенные локальные условия самоопределения модулей могут использоваться для построения децентрализованных алгоритмов самодиагностирования живучих масштабируемых многопроцесорных вычислительных систем.

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SECTION 11. Biology. Ecology. Veterinary.

BASES AND FACTORS OF THE ECOLOGICAL POLICY

Abstract: *In present article at illumination of objective bases and subjective factors of an ecological policy of globalization democratic character and humanistic value of maintenance of biospheric balance necessary for the future of a human civilization are reflected, thus the national ecological policy of each state in the global plan of wildlife management is considered the subject of management of these structures.*

Key words: *globalization, integration, functionality, geoecology, institutionalization, transformation.*

Language: *Russian*

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ОСНОВЫ И ФАКТОРЫ ЭКОЛОГИЧЕСКОЙ ПОЛИТИКИ

Аннотация: *В настоящей статье при освещении объективных основ и субъективных факторов экологической политики глобализации отражены демократический характер и гуманистическое значение обеспечения биосферного равновесия необходимого для будущего человеческой цивилизации, при этом национальная экологическая политика каждого государства в глобальном плане охраны природы считается субъектом управления этих структур.*

Ключевые слова: *глобализация, интеграция, функциональность, геоэкология, институционализация, трансформация.*

ВВЕДЕНИЕ

Интегративная экологическая политика государства выполняет основную детерминирующую роль в его глобализации, то есть его функциональная деятельность по охране природы обеспечивает экологическое равновесие и стабильность. Национальная экологическая политика отдельных государств в качестве структурного субъекта глобальной экологической политики считается основой обеспечения его существования и эффективности. Так как если геоэкологическая политика государств не координируется глобальной экологической политикой, уровень локальных и региональных проблем увеличивается, что приводит к глобализации и этому можно привести сколько угодно примеров. Это происходит потому, что глобальная геоэкологическая картина мира формируется за счет развития общечеловеческой планетарной биосферной эволюции и благодаря рациональной политики стран, которая основана на законах равновесия.

Институциональные структуры по управлению глобальной экологической политикой исходят из общих интересов отдельных государств или государств региона и формирования деятельности организаций оптимизирующих эти нужды. Функции их структурных элементов заключаются в необходимости организации глобального управления и контроля определенных проблем (например атмосферного воздуха, биоразнообразия, предотвращения опустынивания, использование трансграничных водных ресурсов и другие направления).

МАТЕРИАЛЫ И МЕТОДЫ

Управление глобальной экологической политикой – это политическая практика государств мира в планетарных масштабах состоящая из организации деятельности и контроля в своих регионах институтов по гармонизации защиты природы и сохранения возможностей самовосстановления биосферы,

изменения и освоения природы в соответствии с целями и задачами. Для превращения управления глобальной экологической политики в общечеловеческую ценность, эта политика должна отвечать жизненным интересам всех жителей планеты. Поэтому управление глобальной экологической политикой не является стихийным процессом, а исходит из универсального характера объективной необходимостии требует сознательной организации институциональных структур. В ближайшем будущем ожидается, что сфера функциональной деятельности управления политикой будет еще более расширятьсяохватывая отношения человека и общества и даже косвенные направления.

Несмотря на то, что исследования функций элементов институциональной структуры международных эколого-политические отношений и их управления являются объектом науки политической экологии, сейчас основное внимание уделяется охране определенных компонентов природы. Говоря подругому связь между Конвенциями по охране определенных компонентов природы и ратифицированных большинством государств (например по охране озонового слоя в Киото и сохранения биоразнообразия) носит фрагментарный и дискретный характер. Основной причиной этого является представляющий альтернативные интересы философских теорий и методологий диалектический подход которых опирается на бедноту. Хотя сформированное в результате антропотехногенного влияния глобальное экологическое пространство подтверждает общность мирового геоэкологического пейзажа требующего организации комплексной системы взаимосвязанных структурных элементов. В существующей философской литературе в большинстве случаев управление экологической политикой рассматривается как экономия природных ресурсов, организация материального производства на основе экологических требований, ликвидация его последствий, ограничение антиэкологической деятельности или использование мер в рамках закона. Хотя структуры управления глобальной экологической политикой подразумевают установление контроля над исполнением действующих международных межгосударственных договоров и конвенций.

Вообщем в мире в альтернативных теориях управления экологической политики в частности экономистами в сфере управления глобальной экополитикой по оптимизации экономических механизмов внесены множество предложений[1, с. 35; 2, с. 341]. В большинстве из них в сфере управления экологической политикой к субъектам использующим природные ресурсы применяют экономические санкции по принципу (polluter pays principle) с целью обоснования изменения их деятельности. То есть “загрязняющие окружающую среду должны оплачивать расходы”. Также по мнению представителей другого направления экологические контрольные структуры основываясь на принципах взаимосвязи загрязняющих технологий должны планироваться на более длительные сроки[3, с. 127].

С началом последнего десятилетия XX века еще более укрепилось мнение о том, что управление охраной природной окружающей среды со стороны международного научного сообщества с помощью направлений поддерживающих использование экономических механизмов. Процесс глобализации оказал свое влияние на популяризацию данной концепции. Например за последние два десятилетия в решении глобальных проблем экологической политики играет важную роль задачи международного сотрудничества[4, с. 93]. В условиях экономической конкуренции проблемы финансово-технологического обеспечения экологических мероприятий, использование экономических факторов при экономическом контроле над транснациональными корпорациями, и осуществление эмпирико-социологических исследований касающихся ряда государств и регионов.

Таким образом управление общей экологической политикой с помощью экономических механизмов является осуществлением комплекса мероприятий государством приводящих качество окружающей среды в (качественное) оптимальное состояние. Такая политика то есть экономический подход к решению экологических проблем (cost-benefit analysis) несмотря на относительно большое количество претензий и критики, этот подход на сегодняшний день получил на практике наибольшее распространение.

Несмотря на это в управлении экологической политикой этот способ не претендует на всестороннее решение проблемы. Потому что, во-первых он не учитывает другие социальные проблемы происходящие в обществе.Очень сложно достичь качества окружающей среды имеющейся в виду экологической политики. Мнения о приемлемом состоянии окружающей среды в обществе различное, иногда вступают в резкое противоречие различные интересы и ценности. Во вторых в сфере экономического подхода к экологической политике механизмы принятия решений в реальности во внимание не принимаются. Органы власти на самом деле в абстрактной степени имеют одну цель. На самом деле интересы различных предприятий,

организаций и отдельных сотрудников могут довольно серьезно отличаться друг от друга. Политические партии, общественные организации и бизнес структуры могут влиять на принятие политических решений в сфере защиты окружающей среды[5, с. 132].

Несмотря на то, что в настоящий период времени усиливается тенденция управления глобальной геоэкологической политики, нельзя сказать, что этот процесс протекает гладко[6, с. 232].

Кроме этого усиливается участие в других сферах глобальной экологической политики и свойство универсализации все больше бросается в глаза. Поэтому появляется необходимость рассматривания и исследования управления глобальной геоэкологической политики как важного фактора интеграции международных отношений. То есть структурно-функциональное и системно-комплексное исследование этих процессов приводит к полному пониманию управления глобальной экологической политики и показывает актуальность и сложность проблемы.

Государства и региональные организационные структуры являющиеся субъектами институциональной системы и их функциональная роль в охране природы, с одной стороны подходит к степени развития демократического общества. С другой стороны в соответствии с требованиями ситуации адекватно динамически меняется[7]. Поэтому их оптимизация показывает сложность глобальной экологической политики и проблема требует системно-комплексного диалектического подхода, то есть:

- Управление международными экологическими, политическими объектом – определение потенциальных возможностей встраивания внутренней и внешней экологической политики отдельно взятых государств, регионов в глобальную систему экологической политики и их внедрение.
- Субъект отношений глобальной экологической политики – создание правовых основ оптимизации деятельности различных государств, политических партий, государственных и негосударственных организаций, а также развитие институциональной системы.
- Отметив стратегические направления международных экологических политических отношений, обеспечить последовательность тактических заданий по осуществлению цели: разработка проектов, программ, планов и организация их исполнения и контроль.
- Дифференциальный подход к ситуации по глобальному экологическому месту национального государства, оказание материальной, технической, технологической и методической помощи и исполнению международных конвенций, договоров регламентирующих их геоэкологическую политическую деятельность.
- Для привлечения большего количества народа к управлению международной экологической политике необходимо укрепить агитационно-пропагандисткую систему, базу данных и теоретико-методологические основы, улучшение транспортировки экологических знаний и учебных средств.
- Разработка общечеловеческих демократических принципов управления глобальной экологической политикой и создание объективных условий (правовых, политических, психологических положений) по внедрению.
- Поиск потенциальных возможностей усиливающих деятельность ресурсов экологической политики (технико-технологическое и финансовое обеспечение) и повышающий роль субъективного фактора (интеллектуальный уровень человека, корпус кадров) институциональная система (семья, махалля, воспитание, трудовые коллективы) и важное значение имеет его реализация.

Их совершенность на национальном и региональном уровне говорит о эффективности управления международными экологическими отношениями в деятельности институциаональной системы. Основная проблема в этом – строительство материального производства на основе экологической культуры. Потому что любая деятельность в безусловном порядке связанная с экологической культурой показывает соответствие интересам связанных непосредственно (даже косвенно) с материальным производством[8, с. 35]. Усиление “индустриального давления” на природу и его различные региональные свойства усложняют управление международной экологической политикой. В странах мира организация материального производства на современных научных исследованиях и технологиях в управлении международными экологическими отношениями считаются одними из важных направлений[9, с. 207]. Это в свою очередь, требует усовершенствование технических средств системы экологического контроля и создание корпуса высококвалифицированных кадров, и приводит к усложнению системы контроля. Говоря иначе внедрение научно-технических достижений в сферу экологического контроля служит основой обеспечения его политической эффективности. Поэтому технико-технологическое усовершенствование институциональных систем экологического контроля и степень обеспечения кадрами по

праву признается показателем развития современного производства.

РЕЗУЛЬТАТЫ И ВЫВОДЫ

Можно сделать выводы, что:

- **Во-первых,** национальная экологическая политика каждого государства являясь субъектом управления системы защиты окружаюей среды в глобальном масштабе направляется на обеспечение сохранения биосферного равновесия необходимого для будущего человеческой цивилизации и показывает его демократический характер и гуманистическое значение[10, с. 66].
- **Во-вторых**, институциональная система управления национальной, региональной экологической политикой являясь относительно самостоятельной системой функциональные взаимосвязи между его структурными элементами обладают специальными побуждающими мотивами и механизмами в качестве составных частей глобальной политики.
- **В-третьих,** институциональная система глобальной экологической политики не ограничивается только охраной природного равновесия планетной биосферы, но и выполняет функцию контроля за сферами антропогенного, антропотехногенного и антрополитического влияния человека на природу в национальном, региональном уровнях.
- **В-четвертых**, система управления международными экологическими политическими отношениями в соответствии с обострением глобальной экологической ситуации дифференцируясь на национальном, региональном уровнях его направления и задачи еще более конкретизируются. В частности, в настоящее время в сфере экологической предпринимательской деятельности широко распространяются менеджерство и маркетинг.
- **В-пятых,** технико-технологические основы системы управления международными экологическими политическими отношениями обеспечивают развитие и эффективность таких направлений как “интеллектуальную емкость”, базы данных, автоматизация и компьютеризация.

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SECTION 12. Geology. Anthropology. Archaeology.

ABOUT INVESTIGATION OF HISTORICAL-ARCHITECTURAL HERITAGE OF GANJA BASED ON THE LOCAL SAMPLES

Abstract: *In this scientific paper for the first time has been investigated the basic features of historic-cultural and architectural heritage of Ganja on the basis of scientific sources and materials as the multiculturalism sample.*

Tolerance and multiculturalism is the state policy of Azerbaijan. The article examines of multiculturalism in the context of the contemporary globalizing world. The authors believe that the future of global society is impossible without the coexistence of different cultures, and tolerance and multiculturalism are the main principles of the new global society.

Also based on different historical sources, archive materials, manuscripts samples, various arguments and springs have been researched the main characteristics of historical development process of ancient cultural values of this old urban civilization center.

Key words: *Ganja, Azerbaijan, archive materials, manuscripts, architecture, archaeology, ethnology, historical-cultural heritage.*

Language: *English*

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Introduction

One of the main sample of historic-cultural and architectural heritage of Ganja is the Imamzada tomb-complex.

Architectural traditions of ancient and modern Ganja have an importance as the multiculturalism sample from the point of historic-cultural view. This city has more than 4000 years old and here there is one of the main and ancient historical monuments of Muslim East civilization – Imamzada tomb. This important monument is situated 7 kilometers from the city of Ganja, on the right shore of Ganjachai river.

Imamzade complex is one the main symbols of Ganja city and important example of medieval architecture of Azerbaijan. At the present time, as one of the most valued places of pilgrimage of the Islamic world, Imamzade tomb-complex in Ganja is a sacred place for local population, as well as pilgrims that come from different foreign countries.

Imamzade mausoleum, situated in one of the ancient scientific and cultural centers - Ganja State History-Culture Reserve, was built in 739, on site of the grave of mevlana Ibrahim. Imamzade means "the descendant of imam," "from the family lineage of imam" [1, 11-16]

The historic monument of Ganja - Imamzade tomb-complex attracts the attention of a number of features from the point of multiculturalism view:

1. Ganja Imamzade is an important pilgrimage shrine. This place is visited by thousands of people every year. It should be noted that the number of visitors is increasing every year as well as foreign countries. Interesting fact is that non-Muslims are also among that memorial.

2. The mausoleum, built around the grave of mevlana Ibrahim in the VIII century, was enlarged in the XIV-XVI centuries, and subsidiary buildings around it were erected in the XVII-XVIII centuries. The tomb is the most important part of the Imamzade complex. The height of the dome of tomb building is 12m, the height of cupola is 2.7m with diameter of 4.4m, covered with blue tiles. Another designation for Imamzade, also known as the Goy (Blue) Imam Turbe, according to different sources can be related to ancient belief of the Azerbaijanis to Goy Tanrı, from whom the Turkic dynasties claimed to be descended.

3. Ganja Imamzade is a very valuable, ancient epigraphic monument. The inscription on the monument of great importance and recordings are available.

4. This historical monument is an important source of investigation of traditional ethnographic view of the valuable of Azerbaijan people, national and moral values.

5. Ganja Imamzade complex has a very refined, high-quality craftsmanship and architecture features, combining of this complex.

6. The area of Imamzade complex was included in the property of the Sheykhzamanlis – the descendants of Nizami Ganjavi, the great Azerbaijani poet and philosopher. Through the centuries, people carried and protected this sacred site. Ganja Imamzade have the value as an important source of research of the genealogical history of the people. Thus, as a result of the analysis of ancient manuscripts and historical documents it was determined that, a prominent thinker and poet Nizami Ganjavi (1141-1209), as representatives of the owners of the private land owner of the monument over the long term and their graves have been preserved to this day in the cemetery near the monument Imamzade.

7. Ganja Imamzade complex also has been known for years as the shelter, that helped lonely people, people living in poor conditions, or facing sickness and homelessness. Subsidiary buildings of Imamzade complex were used as an orphanage during former Soviet reign in 1930-1944s. This sacred place became a shelter for the little children from various ethnic backgrounds who suffered in the World War II. Nowadays, the members of different religions still come to pay their respect to this holy place. The valuable experience of Azerbaijan in the sphere of interreligious dialogue and cooperation has been highly appreciated and is well-known to everyone in the world.

8. This is an example of valuable historical and architectural importance of the Western region of country, characterized by religious monuments in terms of tourism development. Reconstruction and renovation works carried out now will be further increased the value of this monument in the future for development of this important sector - tourism.

Materials and Methods

One of the basic materials for this research is the traditional craftsmanship.

a) Wool waving was one of the main areas of weaving. Sheep farming made up the main raw material base of wool weaving. In Ganja carpet-weaving formed as one of the widespread sector of wool weaving and handicraft, generally. The majority of women of Ganja and its regions got busy with waving and their carpets were distinguished with their brightness and robustness. According to the sources, hundreds of handicraft enterprises had engaged in the production of carpets in the third quarter of the nineteenth century. In addition to this, one thing should be noted that that the carpet has gone through several stages in its development. Matting which are considered as first tissue material were knitted with hemp and cane. Later, simple rugs have been occurred, following that colorful and embroidered rugs, then zili, verni and sumach. In the last stage, fleecy carpets were knitted with a complicated pattern. Fleecy products were divided different species according to its form and size, such as: carpet, rug, prayer mats moreover, without pile carpets are classified due to its production techniques and the purpose of utilization: palaz(kind of carpet without pile), verni, sumach, ladi, saddle-bag, horse-cloth, holdall, sack, pouch, salt bag etc. Among them palaz hold special place was related to its daily importance. Palaz divided into two groups: Saya (plain) and patterned. Sayapalaz knitted as striped and without striped, patterned knitted like tayuzlu.

b) Generally, during the exploring of weaving artit is important to touch on the condition of mastery neigborhoods which are the units of essential town-building. In this period, Sharbaglar and Boyagchilar which had already been independent, were created like streets and gradually was a part of neighborhood Imamli, in the frontier of the eighteenth and nineteenth century.

In research of problem of multiculturalism has so great significance heritage of genius persons as poets, thinkers.

c) Nizami was a genius who projected his humanism beyond national borders, as clearly evidenced by his choice of main characters of his masnavis. His hero can be Persian, Arabian and Greek. The aim of Nizami is not captured by the nationality of the hero or character. The purpose is to find the supreme literary solution of the idea. However, neither the choice of main characters nor the reperesentation of dozens of nationalities throughout his poems is unintentended. Nizami does so inientionally. Thus he once more demonstrates that he writes about and for human beings, and that the readers of his works should be not one nation but many nations. And consequently it happened exactly that way. Nizami is one of the most wiedly-translated classics in the world. What's more, ever newer languages will join the ranks of these languages. Through his works Nizami not only founded a literary pattern to be repeated over centuries, but also the pattern for building ideas, nations, morality and states.

d) The ideals which Nizami propagated eight centuries ago remain desirable today. Humanity is presently fighting for domination of the features Nizami wished to see human beings and society. The city Nizami depicts in his final poem – in "Iqbal-name" part of "Iskandername" actually was the

society he dreamt of and wished to see implemented. Along with other world genius who served a kind of global school, Nizami has clear stake in the overall progress attained by mankind from Nizami's time until now.

In this city all are equal, while respecting human rights is a bedrock societal norm. Money has already been abolished. There are no police either, rendered obsolete by the absence of legal violations in this conscientious and disciplined society.

e) We have not yet attained Nizami's desired world or the above-mentioned days. Nevertheless, humanity has always longed for such happy life, both eight centuries ago and millennia goneby. Therefore, there is today, and will remain tomorrow, the need for the light of Nizami's word and candle.

f) Each compatriot of Nizami – each Azerbaijani-is in need of this light. Each compatriot of Nizami – each resident of earth and each citizen of the world – is in need of this light. Nizami Ganjavi, a person embodying the wishes of everyone, belongs to all. He is eternal because he belongs to everyone. Nizami will always be one step ahead of us, navigating towards a serene future.

By the way, the heritage of Nizami Ganjavi, especially his poems with different scientific-historical facts and arguments have so great importance as the indisputable sources in research of various aspects in investigation of such academic themes as legal culture and its historical review, also basis of multiculturalism traditions in Ganja and the whole Azerbaijan.

Conclusion

Handicraft traditions of Ganja city is one of the basic characteristics in investigation of urban culture, multiculturalism and tolerance features.

In the research stage of Ganja, carpet weaving was particularly notable in the field of weaving. Without pile carpets that belonged to different areas although had same style but they were distinguished from others with artistic characteristics, colour and patterns. When were knitted without pile carpets in that time, sheep and cave wool made utilized as raw material.

In Ganja and other cities, have been used not only wool, but also cotton and silk, silver and gold helves, even precious stones. At the end of XIX - early XX century without pile carpets, palaz and "cecim" were widespread. Tightly woven wool products Cecim played an important role in the daily life of every Muslim family. Women knitted cecim for themselves and even for their daughters as dowry. With wool and silkcecim case, face blanket, face couch, face pillow, face bolster, curtains, saddle, saddle-bags and mattresses were made too. In the nineteenth century, the majority of women were involved in carpet and palazweaving furthermore, they earned enough.

1. Carpets and palaz were weaved in a long run and it was so complicated, that is why, these aspects were influenced on their prices. The prices of t carpets were 3-4 chevrons up to 18 chevrons, or from 3-4 silver to 7 silver. Thus, for the carpets this was 4 m length, 2.5width had to 2 pood wool. Kilim (tapestry-woven type of rug)which included kind of without pile carpets differed from each other, depending on its area. For them have been used repeated different geometric components decorated with thick and thin horizontal lines. Zili had a special place among without pile carpets. The zili of Ganja was distinguished by its composition and colors. In these zili were reflected geometric elements such as birds, buta, and rhombus without pile carpets shadde, verni and sumakh also were an interesting due to their technology features. Shadde has been used in order to both hanging on the wall and lying down as cover.

2. Usually there were camel caravans, people and domestic animals descriptions. Verni and sumakh that include without pile carpets more widely used in Ganja compare with Baku and other cities. Elm, walnut leaves, red sandalwood, pomegranate peel, onion peel and other plants and herbs have been used for painting yarns and ready products in Azerbaijan. In Ganja dyeing has been developed in the same way. In addition to the above-mentioned dyeing substances, also mineral substances, swampy clay, wood ash, salt, alum and major cattle urine had been used as an auxiliary means. It should be mentioned that the auxiliary items were divided into two groups according to the period of operation, some of them used to paint before (alum, lavashana etc.), whereas others carried out a duty as strengthen and change the color of dye.

3. Divided into two parts for the quality of dyes, dyes consisted of properties and practical. Natural colors has been used for knitting the yarns of carpets which were domestic demand or order, practical dyes has been used for market products. By the middle of the nineteenth century, natural dyes made utilized in Ganja. Even any woman who didn't work as a dyer could get natural paint from plant, fruit leaves that were within arm's reach. After the discovery of artificial coloring matters mostly, products were painted through artificial colors.

4. At this point it is necessary to mention some characteristic features of dyeing, which is an integral part of a weaving. Thus, technological process of dyeing divided into three phases and the first phase was the collection of dye plants and the correction of paint fluid.

5. In the second phase of the material prepared for dyeing, the strengthening of color belonged to the third phase. The quality of wool was very important role in dyeing. So, for waving, etched from the waist part of sheep were considered as better quality in spring clipping. For the preparation of this product,

wool was selected, was washing with substance which was prepared from grass ash and was growing on the ground. Washing with cold water, was giving the softness and shimmer that ensured to store suet in the content of water. Yet, it was influenced on the quality of paints, negatively. Obtaining pigment substance, it means that the preparing of pigment substance was necessary in the field of dyeing.

6. Usually, paint plants were collected in spring and autumn. In the light of this reason, in that period were obtained colorful paints from collected plants. Some of them have been used as desiccated, the rest of them as natural case. During the painting process, yarns were boiled together with paint plants or firstly, dye solution was prepared. Then the solution was released into the same yarn. Prior to that alum or sour plum mixed with alum included the solution which prepared from lavashana. If they were not anylavashana in that case rub or buttermilk has been used instead of lavashana. Dyeing process was carried out in specially designated places. Local people called these places as dye-works or kupxana. It is necessary to mention that dye-works and kupxana differed from each other.

7. For the first time has been investigated the basic features of historic-cultural and architectural heritage of Ganja on the basis of scientific sources and materials as the multiculturalism sample. The article examines of multiculturalism in the context of the contemporary globalizing world. The authors believe that the future of global society is impossible without the coexistence of different cultures, and tolerance and multiculturalism are the main principles of the new global society [22, 133].

8. Also based on different historical sources, archive materials, manuscripts samples, various arguments and springs have been researched the main characteristics of historical development process of ancient cultural values of this old urban civilization center in Ganja.

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CREATING NEW BASELINES OF ALFALFA WITH THE GENOTYPE OF HIGH NITROGEN FIXATION

Abstract: *This article describes a study on the development of methods of intensifying the process of symbiotic nitrogen fixation of alfalfa, by expanding the product range, introducing new varieties of legumes and creating conditions for the formation and effective functioning of their symbiosis with the relevant species of root nodule bacteria.*

Key words: *alfalfa, nodule bacteria, symbiotic nitrogen fixation, biological nitrogen sortomikrobnye system.*

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СОЗДАНИЕ НОВЫХ ИСХОДНЫХ ЛИНИЙ ЛЮЦЕРНЫ С ГЕНОТИПОМ ВЫСОКОЙ АЗОТФИКСАЦИИ

Аннотация: *В данной статье приведены исследования по разработке приемов интенсификации процесса симбиотической азотфиксации люцерны, за счет расширения ассортимента, введения новых сортов бобовых культур и создания условий для формирования и эффективного функционирования их симбиоза с соответствующими видами клубеньковых бактерий.*

Ключевые слова: *люцерна, клубеньковые бактерии, симбиотическая азотфиксация, биологический азот, сортомикробные системы.*

ВВЕДЕНИЕ

Бобовые травы в Казахстане занимают более 20% площадей пашни под производство кормовых трав. Однако в существующих сортах недостаточно реализовано одно из главных преимуществ культуры - высокая эффективность симбиотической азотфиксации [1, 2]. Длительное время работы по изучению проблемы растительно-микробных симбиозов оставались

монополией микробиологических институтов, создающих высокоэффективные микробные препараты. В результате роль растения-хозяина, наиболее генетически стабильного партнера растительно-микробной системы, в формировании симбиозов недооценивалась, а целенаправленная селекция бобовых на этот признак практически не проводилась[3, 4]. В этой связи исследования, направленные на разработку методов создания и получение нового исходного материала, сочетающего высокую продуктивность с повышенной способностью фиксации атмосферного азота, является актуальной задачей при создании стрессоустойчивой пермокультуры [5, 6].

У люцерны часть генов, детерминирующих симбиоз с клубеньковыми бактериями, участвует в контроле развития и функционирования арбускулярной эндомикоризы, а взаимодействие растений с микоризными грибами и клубеньковыми бактериями рассматривается как тройная симбиотическая система [7]. Поэтому исследования, направленные на создание высокопродуктивных ассоциаций люцерны с обоими эндо-симбионтами, являются перспективными с точки зрения повышения биологической азотфиксации и симбиотического потенциала в целом, снижения степени затратности и повышения экологической ориентированности сельского хозяйства. Создание высокоэффективных растительно-микробных систем в агроценозах путем селекции сортов люцерны с высоким симбиотическим потенциалом является новаторским направлением, открывающим возможности расширения адаптивных свойств растений, придания им новых метаболических функций и на основе этого - получения высококачественной и экологически чистой сельскохозяйственной продукции [8, 9, 10].

Методы создания высокоэффективных растительно-микробных систем в агроценозах путем селекции сортов люцерны с высоким симбиотическим потенциалом.

Свойством фиксации азота из атмосферного воздуха и синтеза органических азотсодержащих соединений обладают клубеньковые бактерии рода *Rhizobium,* которые образуют на корнях бобовых трав клубеньки, вступая в симбиоз. Причем разные виды бактерий развиваются на корневой системе определенных высших растений. Так у люцерны это бактерии *Rhizobium meliloti.* После проникновения в корневой волосок эти бактерии вызывают интенсивное деление клеток корня, в результате чего появляется клубенек. Сами бактерии развиваются в этих клубеньках на корнях, участвуя в ассимиляции азота. Там они трансформируются в разветвленные формы – бактероиды, поглощающие молекулярный азот, аммонийные соли, аминокислоты, нитраты. В качестве источника углерода клубеньковые бактерии используют моносахариды, дисахариды, спирты, органические кислоты. Если корни бобовых отмирают, а клубеньки разрушаются, клубеньковые бактерии не погибают, а ведут образ жизни сапрофитов. Для исследований в период цветения люцерны из микоризы различных сортов и сложногибридных популяций были отобраны сформированные клубеньки. С помощью микробиологических манипуляций их этих клубеньков, методом посева на агаризованную бобовую среду были выделены клубеньковые бактерии. В результате ряда пассажей, получены чистые культуры *Rhizobium meliloti*, которые и стали объектами исследований. Клубеньковые бактерии имеют размеры от 0,5 до 3 мкм. Они не образуют спор, подвижны, грамотрицательны. Для нормального протекания обменных процессов они нуждаются в доступе кислорода. В лабораторных условиях колонии клубеньковых бактерий хорошо растут при температуре 25ºС на плотных средах. Они имеют характерную округлую форму, слизистой консистенции, прозрачные. Из клубеньков люцерны были выделены бактерии. Для определения родовой и видовой принадлежности была проведена молекулярно-генетическая экспертиза на основании анализа нуклеотидной последовательности *16S rRNA* гена. Всего проанализировано 20 штаммов бактерий, выделенных из клубеньков различных сортов и СГП люцерны. На рисунке 1 представлена морфология клеток бактерии, выделенных из клубеньков люцерны.

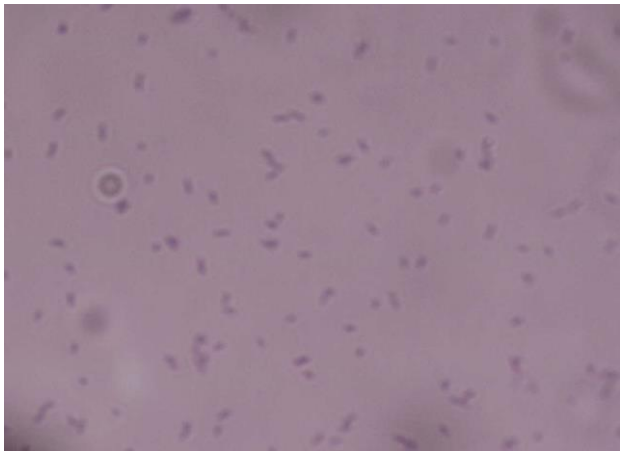

Рисунок 1 - Бактерии, выделенные из клубеньков люцерны, х1500

Идентификация штаммов была осуществлена методом определения прямой нуклеотидной последовательности фрагмента *16SrRNA*гена, с последующим определением нуклеотидной идентичности с последовательностями, депонированными в международной базе данных GeneBank, а также построением филогенетических деревьев с нуклеотидными последовательностями референтных штаммов.

На бобовой среде была наработана биомасса ризобиальных бактерий люцерны на основе штамма В1-2013. Инокуляцию люцерны проводили перед посевом из расчета 200 мл инокулята на гектарную норму высева семян. Всего было обработано 20 образцов люцерны. Контролем служили варианты без обработки ризобиальными бактериями, также по 20 номеров каждой культуры. В период цветения люцерны был проведен отбор 10 растений с каждой делянки на контроле (без инокуляции) и с инокуляцией ризобиальными бактериями для учета клубеньков на корнях растений. Важную роль в азотфиксации играет температурный фактор и влага. В условиях 2014-2015 гг. формирование клубеньков было отмечено лишь у нескольких образцов люцерны. В первый год жизни люцерны на корнях клубеньков не образовывалось, в силу своих биологических особенностей. На корнях люцерны второго года жизни, были выделены клубеньки у люцерны изменчивой, сорт Надёжная - 9 штук, люцерны синей, сорт Canauto -16 штук, люцерны синей, сорт Радуга -18 штук, люцерны изменчивой, сорт Карабалыкская радуга – 22 штуки (табл. 1). Известно, что клубеньковые бактерии поглощают из атмосферного воздуха до 300 кг азота на 1 га, при этом в ходе их жизнедеятельности в почве остается более 50 кг азотсодержащих соединений. При оценке азотфиксирующей активности методом сравнения с не бобовой культурой, было установлено, что максимальное усвоение атмосферного азота отмечено у Люцерны синей сорта Canauto и достигало 89,2%. У остальных образцов фиксация азота была в пределах от 83,7 до 88%.

Таблица 1

Фиксация атмосферного азота растениями люцерны, инокулированной ризобиальными бактериями.

Вариант	Количество клубеньков, шт.	Сухая масса растений, г	Белок растительной массы, %	Усвоено азота, мг		
				всего	в т.ч. атмосферного	%
Люцерна синяя сорт Canauto	16	28,9	3,48	1005,7	897,5	89,2
Люцерна синяя, сорт Радуга	18	25,2	3,58	902,2	794,0	88,0
Люцерна изменчивая, сорт Надёжная	9	20,6	3,31	681,8	573,6	84,1
Люцерна изменчивая, сорт Карабалыкская радуга	22	18,5	3,58	662,3	554,1	83,7
Житняк		4,6	2,35	108,1		

Важным фактором при активной азотфиксирующей деятельности люцерны является содержание белка в растениях. Накопление белка в растительной массе люцерны, определяли только в образцах, где было отмечено формирование клубеньков.

Результаты биохимической оценки показали, что накопление азота у четырех выделенных образцов люцерны, сформировавшей на корнях клубеньки, в растительной массе было в пределах одного порядка и варьировало от 3,31 до 3,58 %.

Рост и развитие растений неразрывно связаны с постоянным потреблением элементов питания. В зависимости от биологических особенностей сельскохозяйственных культур и их продуктивности, почвенного плодородия и уровня применения удобрений, климатических и погодных условий потребление питательных веществ растениями на формирование урожая может варьировать в довольно широком диапазоне.

Размер использования азота почвы растениями зависит от содержания в ней гумуса и интенсивности его минерализации, определяемой широким спектром внешних факторов. Большая часть азота почвы (97-99%) сосредоточена органической форме, в основном в гумусе и телах микроорганизмов и недоступна для растений. По мере минерализации гумуса и растительных остатков органический азот переходит в доступные для растений минеральные соединения.

Проведенные агрохимические исследования показали, что содержание азота нитратов в почве под посевами различных сортов и СГП люцерны в период цветения колебалось в среднем от 1,72 до 6,55 мг/кг.

В посевах люцерны изменчивой Карабалыкская радуга содержание азота нитратов в почве составляло 2,28 мг/кг, что относится к низкой обеспеченности по градации О.В. Сдобниковой (табл. 2).

Почвенные пробы, отобранные в посевах люцерны изменчивой и синей, разделялись на две группы по обеспеченности почв азотом нитратов – низкой и средней (градация Сдобниковой О.В.). Высокое содержание азота нитратов в средней группе обеспеченности 6,53 и 6,55 мг/кг отмечено в образцах люцерны сорта Лазурной и образца Л-1316. Низкое содержание азота нитратов в почве отмечено в образцах Л-1331, Л-1333, Л-1334 (1,74, 1,94, 1,94 мг/кг соответственно). Остальные образцы, относящиеся к низкой обеспеченности, имеют среднее содержание 3,20 мг/кг (Л-1330, Л-1332, Л-1336, Л-1326, Л-1318, Л-1323, Л-1324, Л-1341). Почвенные пробы, накопившие больше азота нитратов со средним содержанием 4,81 мг/кг, относятся к средней группе по градации. К ним относятся образцы Л-1321, Л-1317, Л-1319.

Фосфор, как и азот, играет в жизни растений важное значение, поскольку принимает непосредственное участие во всех биохимических процессах обусловливающих рост и развитие растений. К недостатку фосфора особенно чувствительны растения в первые 10-15 дней после всходов. Содержание фосфора под посевами различных сортов и сложно-гибридных популяций люцерны в период цветения находилось от очень низкого 3,8 мг/кг, до повышенного 39,4 мг/кг по шкале обеспеченности почв, включая и низкое и среднее содержание.

Таблица 2

Содержание элементов питания в почве под посевами различных сортов и СГП люцерны в период цветения

Вариант	$N\text{-}NO_3$, мг/кг	P_2O_5, мг/кг
Люцерна изменчивая		
Лазурная (st.)	6,53	11,8
Л-1316	6,55	27,2
Л-1327	3,16	5,4
Л-1330	2,87	14,1
Л-1331	1,72	28,8
Л-1332	2,17	23,4
Л-1333	1,94	17,7
Л-1336	3,73	9,7
Л-1321, сорт Надежная	5,49	34,8
Л-1326, сорт Семиреченская местная	3,96	34,4

Л-1329	2,26	16,3
Карабалыкская радуга (st)	2,28	28,4
Л-1334	1,94	18,9
Л-1317, сорт Карабалыкская жемчужина	4,23	39,4
Люцерна синяя		
Л-1318 Conanto	3,80	22,4
Л-1319 Радуга	4,72	15,9
Л-1323 Планет	2,71	3,8
Л-1324 Кевсала	3,98	10,3
Л-1341 Уральская синяя	3,32	19,6

В почвенных образцах Л-1317, Л-1321, Л-1326 наблюдалась тенденция увеличения фосфора, которая составляла 39,4, 34,8, 34,4 мг/кг соответственно. Заметное снижение фосфора в почве происходило у образцов Л-1323, Л-1336, Л-1327 и составляло в среднем 6,3 мг/кг. На остальных образцах содержание фосфора находилось на среднем уровне согласно шкалы обеспеченности, и было в пределах от 15,9 до 28,8 мг/кг. Интенсификация процесса симбиотической азотфиксации у люцерны влияет и на продуктивность культуры. Проведенные исследования показали, что при инокуляции семян люцерны и донника отмечалась прибавка урожая сухого вещества и семян в сравнение с контролем (табл.3).

Таблица 3

Урожайность сухого вещества и семян различных сортов люцерны

Варианты	Урожайность, ц/га			
	сухого вещества	прибавка	семян	прибавка
Люцерна синяя сорт, Canauto (без инокуляции)	62,4		1,9	
Люцерна синяя, сорт Canauto (инокуляция ризобиальными бактериями)	67,4	+5	2,1	+0,1
Люцерна синяя, сорт Радуга (без инокуляции)	67,9		2,0	
Люцерна синяя, сорт Радуга (инокуляция ризобиальными бактериями)	72,7	+4,8	2,1	+0,1
Люцерна изменчивая, сорт Надёжная (без инокуляции)	66,4		2,1	
Люцерна изменчивая, сорт Надёжная (инокуляция ризобиальными бактериями)	70,4	+4	2,2	+0,1
Люцерна изменчивая, сорт Карабалыкская радуга (без инокуляции)	63,8		2,2	
Люцерна изменчивая, сорт Карабалыкская радуга (инокуляция ризобиальными бактериями)	70,2	+6,4	2,4	+0,2

В целом, урожайность сухого вещества люцерны на всех вариантах с инокуляцией колебалась в среднем от 54,6 до 68,4 ц/га, на контроле от 50,4 до 62,5 ц/га. Урожайность семян люцерны с инокуляцией варьировала от 1,8 до 2,3 ц/га, без инокуляции от 1,6 до 2,1 ц/га.

В частности, среди изучаемых сортов и СГП люцерны по урожайности сухого вещества и семян выделились 4 образца (табл. 2).

Как видно из таблицы 3 наибольшая прибавка (+6,3 ц/га) по урожаю сухого вещества среди представленных образцов была у люцерны изменчивой сорта Карабалыкская радуга, инокулированной ризобиальными бактериями и составляла 70,2 ц/га. Наименьшая (+4 ц/га) у люцерны изменчивой, сорта Надёжная (инокуляция ризобиальными бактериями).

ЗАКЛЮЧЕНИЕ

Таким образом, в результате идентификации 20 штаммов бактерий, выделенных из клубеньков люцерны методом анализа фрагмента *16SrRNA* гена, была получена молекулярно-биологическая характеристика штамма.

При оценке азотфиксирующей активности методом сравнения с не бобовой культурой, было установлено, что максимальное усвоение атмосферного азота было отмечено у образца люцерны синей Л-1318 и достигало 89,2%. У остальных образцов фиксация азота варьировала в пределах от 83,7 до 88%.

В результате исследований было установлено, что содержание азота нитратов в почве под посевами различных сортов и СГП люцерны в период цветения колебалось в среднем от 1,72 до 6,55 мг/кг, и в целом, все образцы по градации О.В. Сдобниковой можно было отнести к низкой и средней обеспеченности. Высокое содержание азота нитратов в средней группе обеспеченности (6,53 и 6,55 мг/кг почвы) отмечалось в посевах люцерны сорта Лазурной и образца Л-1316. Низкое содержание азота нитратов в почве отмечено в посевах образцов Л-1331, Л-1333, Л-1334 (1,74, 1,94, 1,94 мг/кг соответственно). Остальные образцы, относящиеся к низкой обеспеченности, имели среднее содержание 3,20 мг/кг.

Заметное снижение фосфора в почве под посевами различных сортов и СГП люцерны наблюдалось у образцов Л-1323, Л-1336, Л-1327 и составляло в среднем 6,3 мг/кг. На остальных образцах содержание фосфора находилось на среднем уровне согласно шкалы обеспеченности, и было в пределах от 15,9 до 28,8 мг/кг.

Инокуляция семян люцерны ризобиальными бактериями, в большей степени оказала влияние на урожайность сухого вещества, нежели семян. Из всех изучаемых сортов и сложно-гибридных популяций люцерны, следует выделить образцы, инокулированные ризобиальными бактериями, которые дали прибавку урожая сухой массы – это люцерна синяя образец Л-1318 и Л-1319 и люцерна изменчивая образец Л-1321 и Л-1316.

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SECTION 2. Applied mathematics. Mathematical modeling.

ANALYTICAL MODELS OF THE TURBULENT FLUID FLOW IN A CIRCULAR PIPE

Abstract: *The article is discussed the character of the fluid flow (water) on the cylindrical section of the circular pipe. The formulas for calculating the parameters of the vortex flow of a fluid on the basis of the k-ε turbulence model are presented.*

Key words: *turbulent flow, formula, k-ε model, component, pipe, fluid.*

Language: *Russian*

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АНАЛИТИЧЕСКИЕ МОДЕЛИ ТУРБУЛЕНТНОГО ТЕЧЕНИЯ ЖИДКОСТИ В КРУГЛОЙ ТРУБЕ

Аннотация: *В статье рассматривается характер течения жидкости (воды) на цилиндрическом участке круглой трубы. Представлены формулы для расчета параметров вихревого течения жидкости на основании k-ε модели турбулентности.*

Ключевые слова: *турбулентное течение, формула, k-ε модель, составляющая, труба, жидкость.*

ВВЕДЕНИЕ

Турбулентное течение характеризуется интенсивным перемешиванием жидкости с изменением величин скоростей и давлений. Описание процесса турбулентного течения жидкости можно представить различными моделями, которые отличаются между собой сложностью и точностью решения [1]. Различают модели турбулентности нулевого уравнения (модель вихревой вязкости во внутренних слоях жидкости; модель Себеси-Смита; модель Болдуина-Ломакса; модель турбулентных струй; модель Буссинеска), с одним уравнением (модель Спаларта-Аллмараса), с двумя уравнениями (*k-ε* модели – стандартная, низкорейнольдсовая и нелинейная; *k-ω* модели; модель Ментера; модель RNG) и гибридные модели турбулентности RANS/LES. Модели нулевого уравнения являются наиболее простыми моделями, которые дают явные алгебраические выражения для турбулентной вязкости. Гибридные модели турбулентности RANS/LES представляются осредненными по Рейнольдсу уравнениями Навье-Стокса [2] в условиях моделирования крупных вихрей. Модели турбулентности с двумя уравнениями в полном объеме описывают характер турбулентного течения жидкости при средних объемах моделирования. Рассмотрим одну из моделей турбулентности с двумя уравнениями и дадим математическое описание процесса течения жидкости в круглой трубе.

Компьютерное моделирование процесса турбулентного течения воды в круглой трубе реализовывалось в модуле CFD программного комплекса COMSOL Multiphysics 5.1 [3, 4]. Твердотельная объемная модель фрагмента круглой трубы импортировалась из программной среды SolidWorks посредством модуля LiveLink™ for SOLIDWORKS®. Внутренний диаметр модели стальной трубы принимался 14 мм, длина – 30 мм.

Во вкладке «Физика» были установлены параметры ламинарного течения воды при температуре *T* 293.14 К (однофазный поток). Дискретизация потока жидкости принималась по умолчанию P1+P1 (линейные элементы и компоненты поля давлений).

Моделирование турбулентного течения осуществлялось методом уравнений Навье-Стокса, осреднённых по Рейнольдсу (RANS).

Данный метод используется для описания турбулентных течений жидкости, при замене случайно изменяющихся характеристик потока суммами осреднённых и пульсационных составляющих.

Расчет производился по *k-ε* модели турбулентности для несжимаемого потока жидкости [5]. *k-ε* модель относится к классу дифференциальных моделей турбулентности с двумя уравнениями для описания сдвиговой несжимаемой турбулентности.

Параметр сглаживания σ_w и закон стенки трубы *B* (для гладких труб) задавались универсальными постоянными величинами 0.2 и 5.2 соответственно. Пористость ε_p для принятой жидкости установлена величиной 1. Давление воды в круглой трубе принималось величиной 50 кПа при коэффициенте изотермической сжимаемости [6] β_T равном 0 1/Па. Поле скоростей течения жидкости раскладывается на 3 составляющие (по координатным осям). Для составляющих поля скоростей течения воды были установлены следующие значения: по оси *x* = 0 м/с, по оси *y* = 0 м/с и по оси *z* = 3 м/с.

Параметры разбиения модели фрагмента круглой трубы на конечные элементы [7] представлены в табл. 1.

Таблица 1

Статистика и размеры сетки.

Наименование	Величина
Минимальное качество элемента	0.02121
Среднее качество элемента	0.5031
Тетраэдральные элементы	458917
Призматические элементы	224760
Треугольные элементы	44952
Граничные элементы	780
Вершины	8
Максимальный размер элемента	0.954
Минимальный размер элемента	0.18
Коэффициент кривизны	0.5
Минимальное количество элементов по самой короткой границе	0.8
Максимальный темп роста элемента	1.13

Запишем уравнение количества движения для несжимаемого потока жидкости при незначительном изменении величины плотности и температуры (1)

$$\rho(u\cdot\nabla)\cdot u=\nabla\cdot\left[-pI+(\mu+\mu_t)\left(\nabla u+(\nabla u)^T\right)\right]+F, \quad (1)$$

где ρ – плотность, кг/м^3; u – поле скоростей, м/с; ∇ – оператор Гамильтона; p – давление, Па; I – единичный тензор; μ – динамическая вязкость, Па · с; μ_t – турбулентная динамическая вязкость, Па · с; ∇u – градиент u, м/с; T – абсолютная температура, К; F – объемная сила, Н/м^3.

Турбулентная динамическая вязкость μ_t определяется по формуле (2)

$$\mu_t=\rho\cdot C_\mu\frac{k^2}{\varepsilon}, \quad (2)$$

где C_μ – параметр *k-ε* модели турбулентности (константа) [8], C_μ = 0.09; k –кинетическая энергия турбулентности, м^2/с^2; ε – скорость вязкой диссипации кинетической энергии турбулентности, м^2/с^3.

При этом должно выполняться условие (3)

$$\rho\nabla\cdot(u)=0 \quad (3)$$

Для *k-ε* модели турбулентности запишем уравнение (первое) баланса кинетической энергии турбулентности (4). k – это энергия соответствующая пульсационным скоростям турбулентного движения в жидкости и отнесенная к ее массе.

$$\rho(u\cdot\nabla)\cdot k=\nabla\cdot\left[\left(\mu+\frac{\mu_t}{\sigma_k}\right)\nabla k\right]+P_k-\rho\varepsilon, \quad (4)$$

где σ_k – параметр *k-ε* модели турбулентности (константа), σ_k = 1.0; ∇k – градиент k, м^2/с^2; P_k – генерация кинетической энергии турбулентности, Вт/м^3.

Генерация кинетической энергии турбулентности P_k определяется по формуле (5)

$$P_k = \mu_t \left[\nabla u : \left(\nabla u + (\nabla u)^T\right)\right], \quad (5)$$

где : – оператор «отношение между градиентами». Запишем уравнение (второе) баланса скорости вязкой диссипации кинетической энергии турбулентности (6). ε – скорость, с которой k превращается в тепло вследствие вязкого трения.

$$\rho(u \cdot \nabla) \cdot \varepsilon = \nabla \cdot \left[\left(\mu + \frac{\mu_t}{\sigma_\varepsilon}\right)\nabla\varepsilon\right] + C_{\varepsilon 1}\frac{\varepsilon}{k}P_k - C_{\varepsilon 2}\rho\frac{\varepsilon^2}{k}, \quad (6)$$

где σ_ε – параметр k-ε модели турбулентности (константа), σ_ε = 1.3; $\nabla\varepsilon$ – градиент ε, м^2/с^3; $C_{\varepsilon 1}$ – параметр k-ε модели турбулентности (константа), $C_{\varepsilon 1}$ = 1.44; $C_{\varepsilon 2}$ – параметр k-ε модели турбулентности (константа), $C_{\varepsilon 2}$ = 1.92. Граничные условия для стенки круглой трубы представлены в формулах (7), (8) и (9)

$$u \cdot n = 0, \quad (7)$$

где n – нормаль к границе (вектор всегда направлен внутрь расчетной области). Жидкость скользит по внутренней стенке круглой трубы. Скорость течения воды у стенки трубы равна нулю.

$$\nabla k \cdot n = 0 \quad (8)$$

$$\left[(\mu + \mu_t)\left(\nabla u + (\nabla u)^T\right)\right] \cdot n = -\rho\frac{u_\tau}{\delta_w^+}u_{tang.}, \quad (9)$$

где u_τ – динамическая (сдвиговая) скорость, м/с; δ_w^+ – расстояние от внутренней поверхности круглой трубы до границы течения жидкости с учетом вязкости, мм; $u_{tang.}$ – тангенциальная скорость, м/с.

$u_{tang.}$ определяется по формуле (10)

$$u_{tang.} = u - (u \cdot n) \cdot n \quad (10)$$

Для развитых турбулентных потоков скорость вязкой диссипации кинетической энергии турбулентности ε определяется по формуле (11)

$$\varepsilon = \rho\frac{C_\mu k^2}{k_v \delta_w^+ \mu}, \quad (11)$$

где k_v – параметр k-ε модели турбулентности (константа), k_v = 0.41.

Величина абсолютного давления $p_{abs.}$ жидкости определяется по формуле (12)

$$p_{abs.} = p + p_{ref.}, \quad (12)$$

где $p_{ref.}$ – стандартное атмосферное давление, $p_{ref.}$ = 101.325 кПа.

Упорядоченная кинетическая энергия турбулентности потока жидкости $k_{reg.}$ (м^2/с^2) равна максимальному значению двух аргументов.

$$k_{reg.} = max(k, 0) \quad (13)$$

Упорядоченная скорость вязкой диссипации кинетической энергии турбулентности потока жидкости $\varepsilon_{reg.}$ (м^2/с^3) равна максимальному значению двух аргументов.

$$\varepsilon_{reg.} = max(\varepsilon, 0) \quad (14)$$

Предельная длина смешивания $L_{mix.lim.}$ (м) жидкости на цилиндрическом участке круглой трубы при турбулентном режиме определяется по формуле (15)

$$L_{mix.lim.} = 2 \cdot L_{ref.}, \quad (15)$$

где $L_{ref.}$ – базовая длина,
$L_{ref.}$ = 0.008999999999999994 м.

По формулам (16) и (17) находят расчетные кинетическую энергию турбулентности $k_{cal.}$ (м^2/с^2) и скорость вязкой диссипации кинетической энергии турбулентности $\varepsilon_{cal.}$ (м^2/с^3).

$$k_{cal.} = \left[\frac{100\mu}{\rho \cdot L_{mixlim.}}\right]^2 \quad (16)$$

$$\varepsilon_{cal.} = \frac{10 \cdot C_\mu \cdot \sqrt{k^3}}{L_{mixlim.}} \quad (17)$$

k-уравнение, линейный коэффициент C_k (кг/(м^3 · с)) будет равен произведению двух переменных ρ и γ_t (18). Плотность воды в формуле – отрицательное значение.

$$C_k = -\rho \cdot \gamma_t, \quad (18)$$

где γ_t – вспомогательная переменная, (1/с).

Составляющие скорости деформации S представлены в системе уравнений (19)

$$\begin{cases} S_{xx} = ux \\ S_{yx} = 0.5(vx + uy) \\ S_{zx} = 0.5(wx + uz) \\ S_{xy} = 0.5(uy + vx) \\ S_{yy} = vy \\ S_{zy} = 0.5(wy + vz) \\ S_{xz} = 0.5(uz + wx) \\ S_{yz} = 0.5(vz + wy) \\ S_{zz} = wz \end{cases}, \quad (19)$$

где S – скорость деформации, 1/с; xx, yx, zx, xy, yy, zy, xz, yz, zz – составляющие; u, v, w – проекции вектора скорости соответственно на оси x, y, z.

Абсолютная скорость деформации $S_{abs.}$ (1/с) определяется по формуле (20)

$$S_{abs.} = \sqrt{(S_{xx})^2 + (S_{xy})^2 + (S_{xz})^2 + (S_{yx})^2 + (S_{yy})^2 + (S_{yz})^2 + (S_{zx})^2 + (S_{zy})^2 + (S_{zz})^2} \quad (20)$$

Источник действия кинетической энергии турбулентности k_s (1/с^2) и скорость сдвига e (1/с) движущихся слоев жидкости в круглой трубе определяются по формулам (21) и (22)

$$k_s = 2\cdot(ux)^2 + uy(uy+vx) + uz(uz+wx) + vx(uy+vx) + 2\cdot(vy)^2 + vz(vz+wy) + wx(uz+wx) + wy(vz+wy) + 2\cdot(wz)^2 \quad (21)$$

$$e = \sqrt{0.5\left(4\cdot(ux)^2 + 2\cdot(uy+vx)^2 + 2\cdot(uz+wx)^2 + 4\cdot(vy)^2 + 2\cdot(vz+wy)^2 + 4\cdot(wz)^2\right) + eps} \quad (22)$$

Дивергенция [9] $div\ u$ (1/с) равна сумме полей скоростей турбулентного течения жидкости действующих по координатным осям (23)

$$div\ u = ux + vy + wz \quad (23)$$

Величина скорости потока жидкости U (м/с) в турбулентном режиме определяется по формуле (24). При турбулентном движении (неустановившемся) жидкости с заданными граничными условиями, величины осреднённых скоростей меняются во времени.

$$U = \sqrt{u^2 + v^2 + w^2} \quad (24)$$

Составляющие вихревого поля потока жидкости Ω (1/с) [10] в турбулентном режиме представлены в системе, состоящей из трех уравнений (25)

$$\begin{cases} \Omega_x = wy - vz \\ \Omega_y = -wx + uz, \\ \Omega_z = vx - uy \end{cases} \quad (25)$$

где $\Omega_x, \Omega_y, \Omega_z$ – составляющие вихревого поля потока Ω.

Величина Ω равна

$$\Omega = \sqrt{\Omega_x^2 + \Omega_y^2 + \Omega_z^2} \quad (26)$$

Величина кинематической вязкости ν (м^2/с) жидкости равна отношению μ к ρ. Вязкость характеризует степень текучести воды и подвижности ее частиц.

$$\nu = \frac{\mu}{\rho} \quad (27)$$

Вязкостное напряжение – сила вязкости, приходящаяся на единицу площади поверхности раздела двух слоев. Составляющие вязкостного напряжения σ_η (Н/м^2) находятся по формулам (28)

$$\begin{cases} \sigma_{\eta x} = \mu\cdot\left(2\cdot ux\cdot n_{xmesh} + (uy+vx)\cdot n_{ymesh} + (uz+wx)\cdot n_{zmesh}\right) \\ \sigma_{\eta y} = \mu\cdot\left((vx+uy)\cdot n_{xmesh} + 2\cdot vy\cdot n_{ymesh} + (vz+wy)\cdot n_{zmesh}\right) \\ \sigma_{\eta z} = \mu\cdot\left((wx+uz)\cdot n_{xmesh} + (wy+vz)\cdot n_{ymesh} + 2\cdot wz\cdot n_{zmesh}\right) \end{cases}, \quad (28)$$

где n_{xmesh}, n_{ymesh}, n_{zmesh} – составляющие нормального вектора.

Составляющие полного напряжения $\sigma_{tot.}$ (Н/м^2) представлены в системе уравнений (29)

$$\begin{cases} \sigma_{totx} = \sigma_{\eta x} - p\cdot n_{xmesh} \\ \sigma_{toty} = \sigma_{\eta y} - p\cdot n_{ymesh}, \\ \sigma_{totz} = \sigma_{\eta z} - p\cdot n_{zmesh} \end{cases} \quad (29)$$

где σ_{totx}, σ_{toty}, σ_{totz} – составляющие полного напряжения $\sigma_{tot.}$.

Составляющие скорости напряжения сдвига τ_{vd} (Па) слоев жидкости определяются по формулам (30)

$$\begin{cases} \tau_{vdxx} = 2 \cdot \mu \cdot ux \\ \tau_{vdyx} = \mu \cdot (vx + uy) \\ \tau_{vdzx} = \mu \cdot (wx + uz) \\ \tau_{vdxy} = \mu \cdot (uy + vx) \\ \tau_{vdyy} = 2 \cdot \mu \cdot vy \\ \tau_{vdzy} = \mu \cdot (wy + vz) \\ \tau_{vdxz} = \mu \cdot (uz + wx) \\ \tau_{vdyz} = \mu \cdot (vz + wy) \\ \tau_{vdzz} = 2 \cdot \mu \cdot wz \end{cases}, \quad (30)$$

где τ_{vdxx}, τ_{vdyx}, τ_{vdzx}, τ_{vdxy}, τ_{vdyy}, τ_{vdzy}, τ_{vdxz}, τ_{vdyz}, τ_{vdzz} – составляющие скорости напряжения сдвига τ_{vd}.

Вязкое рассеяние или вязкостная диссипация (преобразование кинетической энергии во внутреннюю энергию) Q_η (Вт/м^3) рассчитывается по формуле (31)

$$Q_\eta = \tau_{vdxx} \cdot ux + \tau_{vdxy} \cdot uy + \tau_{vdxz} \cdot uz + \tau_{vdyx} \cdot vx + \tau_{vdyy} \cdot vy + \tau_{vdyz} \cdot vz + \tau_{vdzx} \cdot wx + \tau_{vdzy} \cdot wy + \tau_{vdzz} \cdot wz + \rho + \varepsilon_{reg.} \quad (31)$$

Разностные уравнения для кинетической энергии турбулентности $k_{res.}$ (Вт/м^3) и скорости вязкой диссипации кинетической энергии турбулентности $\varepsilon_{res.}$ (Па/с^2) будут иметь следующий вид (32) и (33)

$$k_{res.} = -\left(\mu + \frac{\mu_t}{\sigma_k}\right) \cdot (k_{xx} + k_{yy} + k_{zz}) - C_k \cdot k - P_k + \rho \cdot u \cdot k_x + \rho \cdot v \cdot k_y + \rho \cdot w \cdot k_z \quad (32)$$

$$\varepsilon_{res.} = -\left(\mu + \frac{\mu_t}{\sigma_\varepsilon}\right) \cdot (\varepsilon_{xx} + \varepsilon_{yy} + \varepsilon_{zz}) - C_{\varepsilon lin.} \cdot \varepsilon - P_\varepsilon + \rho \cdot u \cdot \varepsilon_x + \rho \cdot v \cdot \varepsilon_y + \rho \cdot w \cdot \varepsilon_z, \quad (33)$$

где $C_{\varepsilon lin.}$ – линейный коэффициент (кг/(м^3 · с)), определяется по формуле (34). P_ε равен максимальному значению двух приведенных аргументов.

$$C_{\varepsilon lin.} = -\rho \cdot C_{\varepsilon 2} \cdot y_t \quad (34)$$

$$P_\varepsilon = max(C_{\varepsilon 1} \cdot y_t \cdot \mu_t \cdot k_s, 0) \quad (35)$$

Разностное уравнение для поля скоростей $u_{res.}$ (Н/м^3) турбулентного течения жидкости с учетом действия объемной силы будет иметь следующий вид

$$u_{res.} = px + \rho \cdot u \cdot ux + \rho \cdot v \cdot uy + \rho \cdot w \cdot uz - \left(\frac{\partial(2 \cdot ux)}{\partial x} + \frac{\partial(uy + vx)}{\partial y} + \frac{\partial(uz + wx)}{\partial z}\right) \cdot (\mu + \mu_t) - F_x, \quad (36)$$

где F_x – составляющая объемной силы (Н/м^3).

Разностное уравнение для поля скоростей $v_{res.}$ (Н/м^3) турбулентного течения жидкости с учетом действия объемной силы будет иметь следующий вид

$$v_{res.} = \rho \cdot u \cdot vx + py + \rho \cdot v \cdot vy + \rho \cdot w \cdot vz - \left(\frac{\partial(vx + uy)}{\partial x} + \frac{\partial(2 \cdot vy)}{\partial y} + \frac{\partial(vz + wy)}{\partial z}\right) \cdot (\mu + \mu_t) - F_y, \quad (37)$$

где F_y – составляющая объемной силы (Н/м^3).

Разностное уравнение для поля скоростей $w_{res.}$ (Н/м^3) турбулентного течения жидкости с учетом действия объемной силы будет иметь следующий вид

$$w_{res.} = \rho \cdot u \cdot wx + \rho \cdot v \cdot wy + pz + \rho \cdot w \cdot wz - \left(\frac{\partial(wx+uz)}{\partial x} + \frac{\partial(wy+vz)}{\partial y} + \frac{\partial(2 \cdot wz)}{\partial z} \right) \cdot (\mu + \mu_t) - F_z, \quad (38)$$

где F_z – составляющая объемной силы (Н/м^3).

Разностное уравнение для давления $p_{res.}$ жидкости (кг/(м^3 · с)) будет иметь следующий вид

$$p_{res.} = \rho \cdot div\ u \quad (39)$$

Слабая форма аналитически выводится для моделей, включающих сложные граничные условия с зависимостями от переменных, системы отсчета, времени. Слабая форма для k будет иметь следующий вид

$$-test(k_x) \cdot \left(\mu + \frac{\mu_t}{\sigma_k} \right) \cdot k_x - test(k_y) \cdot \left(\mu + \frac{\mu_t}{\sigma_k} \right) \cdot k_y - test(k_z) \cdot \left(\mu + \frac{\mu_t}{\sigma_k} \right) \cdot k_z - \rho \cdot (u \cdot k_x + v \cdot k_y + w \cdot k_z) \cdot \cdot test(k) + P_k \cdot test(k) + C_k \cdot k \cdot test(k), \quad (40)$$

где – *test* специальный оператор, создает тестовую функцию для переменной.

Слабая форма для ε будет иметь следующий вид

$$-test(\varepsilon_x) \cdot \left(\mu + \frac{\mu_t}{\sigma_\varepsilon} \right) \cdot \varepsilon_x - test(\varepsilon_y) \cdot \left(\mu + \frac{\mu_t}{\sigma_\varepsilon} \right) \cdot \varepsilon_y - test(\varepsilon_z) \cdot \left(\mu + \frac{\mu_t}{\sigma_\varepsilon} \right) \cdot \varepsilon_z - \rho \cdot (u \cdot \varepsilon_x + v \cdot \varepsilon_y + w \cdot \varepsilon_z) \cdot \cdot test(\varepsilon) + P_\varepsilon \cdot test(\varepsilon) + C_{\varepsilon 1\varepsilon} \cdot \varepsilon \cdot test(\varepsilon) \quad (41)$$

Слабые формы для объемной силы, действующей на внутреннюю поверхность трубы и для полей скоростей турбулентного течения жидкости, представлены формулами (42) и (43) соответственно

$$F_x \cdot test(u) + F_y \cdot test(v) + F_z \cdot test(w) \quad (42)$$

$$\rho \cdot \left[-\left(\frac{\partial(u,x)}{\partial x} \cdot u + \frac{\partial(u,y)}{\partial y} \cdot v + \frac{\partial(u,z)}{\partial z} \cdot w \right) \cdot test(u) - \left(\frac{\partial(v,x)}{\partial x} \cdot u + \frac{\partial(v,y)}{\partial y} \cdot v + \frac{\partial(v,z)}{\partial z} \cdot w \right) \cdot \cdot test(v) - \left(\frac{\partial(w,x)}{\partial x} \cdot u + \frac{\partial(w,y)}{\partial y} \cdot v + \frac{\partial(w,z)}{\partial z} \cdot w \right) \cdot test(w) \right] \quad (43)$$

С помощью функций формы выполняется аппроксимация поля неизвестных величин. Функция формы для ε будет иметь следующий вид

$$-\varepsilon + \varepsilon_w \quad (44)$$

Ход расчета величин u, p, k и ε представлен сегрегированными шагами 1 и 2 (первая и седьмая итерации). Решатель – PARDISO (Parallel Direct Sparse Solver for Clusters), работает с общими системами $Ax = B$ и использует методику волнения центра, которая проверяет величину потенциального центра относительно постоянного некоторого порога, что позволяет учитывать особые точки и компенсировать их.

Segregated solver
Number of degrees of freedom solved for: 1203246.

Segregated solver iteration 1.

Segregated Step 1
Nonsymmetric matrix found.
Scales for dependent variables:
Pressure (comp1.p): 5e+004
Velocity field (comp1.u): 6e+002
Orthonormal null-space function used.

Iter	SolEst	Damping	Stepsize	#Res	#Jac	#Sol	LinIt	LinErr	LinRes
1	0.072	0.5	0.072	2	1	1	1	5.2e-5	1

Segregated Step 2
Nonsymmetric matrix found.
Scales for dependent variables:
Turbulent dissipation rate (comp1.ep): 3.2e-005
Turbulent kinetic energy (comp1.k): 3.1e-005
Orthonormal null-space function used.

Iter	SolEst	ResEst	Damping	Stepsize	#Res	#Jac	#Sol	LinIt	LinErr	LinRes
1	1.7	2.3e+4	0.35	1.7	2	1	1	4	0.00065	1
2	2.8	2.4e+4	0.35	2.8	3	2	2	14	0.00089	0.00018
3	2	1.7e+6	0.35	2	4	3	3	26	0.00025	0.00015

Solution error estimates for segregated groups
0.036, 1.8
Residual error estimates for segregated groups
1.7e+004, 3.5e+004
…….

Segregated solver iteration 7.

Segregated Step 1

Iter	SolEst	Damping	Stepsize	#Res	#Jac	#Sol	LinIt	LinErr	LinRes
1	3.7	0.5	3.7	14	7	7	111	0.00072	0.00031

Segregated Step 2
Scales for dependent variables:
Turbulent dissipation rate (comp1.ep): 51
Turbulent kinetic energy (comp1.k): 0.034

Iter	SolEst	ResEst	Damping	Stepsize	#Res	#Jac	#Sol	LinIt	LinErr	LinRes
1	1.1	8.3e+3	0.35	1.1	26	19	19	133	0.00016	2e-7
2	0.84	1e+4	0.35	0.84	27	20	20	136	0.00093	1.1e-6
3	0.58	1.6e+4	0.35	0.58	28	21	21	139	0.00067	9.1e-7

Solution error estimates for segregated groups
1.9, 0.73
Residual error estimates for segregated groups
2.8e+003, 2.4e+008

ЗАКЛЮЧЕНИЕ

Модель процесса турбулентного течения жидкости можно представить в виде законов изменения величины поля скоростей потока на рассматриваемой длине круглой трубы. Это изменение сопровождается увеличением значений k и ε в зависимости от свойств жидкости и, в частности, динамической вязкости. Приведенные аналитические модели турбулентного течения в полной мере определяют характер деформации и напряжения движущихся слоев воды на цилиндрическом участке круглой трубы.

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SECTION 17. World history. History of science and technology.

TO THE QUESTION ON THE RESEARCH OF GANJA GATES

Abstract: *On the basis of historical-cultural materials in this scientific article has been investigated the main moments about ancient Ganja gates. Also was researched the academic problems of its restoration.*

Key words: *Azerbaijan, Ganja, historical-cultural value, ancient gates.*

Language: *English*

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Introduction

Up to the end of Middle Ages, Ganja was one of the most resplendent and well-known scientific and cultural centers of the East throwing down a challenge to Europe from both the economic and cultural point of view. Medieval historians called Ganja the last greatest urban and frontier point ("Sarhad dar al-mulku") in the North of the Moslem world.

The carried archeological digs and historical sources refer the history of Ganja to the VII century B.C. Since the X-XI centuries A.D., the glory of Ganja, the city outliving the period of its economic and cultural development, flourishing and becoming mighty, spread from Kiev Russia to India, China and the whole East. The high-level organization of the defence system of Ganja with 300 thousand people of its population is a proof of rise of a level of its development [1, 35].

Historical facts show that exactly in this area – in Eastern Georgia, majority of the population consisted of Azeri Turks. One of our most ancient sources "Kitabi - Dada Gorgud" proves this fact.

At the same time, Tiflis Moslem Emirate kept close relations with the State of the Shaddadis existed in Azerbaijan at that time.

Being a Turkish-Islamic Union, the State of the Shaddadis (an ancient Azeri state) including the Seljugs (a Central Asian empire), prevented the conquest of Western Azerbaijan lands by Georgia and its protector – Byzantium for a long time [2].

In 1054, after conquering Azerbaijan, the Seljugs feudalized both the State of the Ravvadis and the State of the Shaddadis. Ganja also became a vassal of the Seljugs. The well-known Ganja Gate was prepared in the period when the State of the Shaddadis was a vassal of the Seljugs.

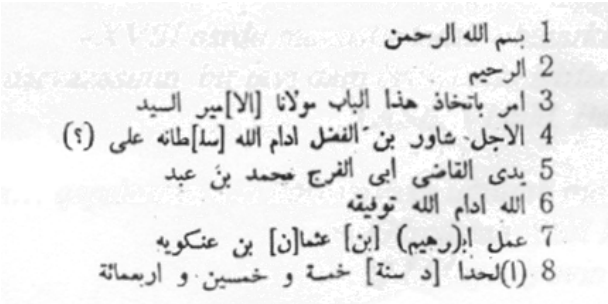
Materials and Methods

Afterwards, as a result of the collapse of the Caliphate, the Tiflis-Moslem Emirate became independent. This emirate existed up to 1122, when David IV (a Georgian tsar) put an end to it. In 1122, after the collapse of the Tiflis-Moslem Emirate, the present Western Georgia practically fell under the government of David IV. After David IV, Demetri I, who came to power, became a ruler of those lands [4].

The most prosperous period of Ganja as a city is the period of governing of the Shaddadis. In 1063, a representative of the Shaddadis' dynasty – Shavur, with a strategic goal built a stable fortress around the city and mounted a two-door gate in it. On the surface of one half of the gate there was an inscription in Arabic written in Kufi handwriting:

Picture 1 - The inscription on the surface of one half of the Ganja Gate, which is kept in the Monastery of Gelaty near Kutaisi, the Republic of Georgia

Picture 2 - A schematic description of the inscription



Picture 3 - A graphic way of writing of the inscription lines

The translation of the inscription is the following:

"In the Name of the Gracious and Merciful Allah! Our great ruler and emir Seyid Shavur ibn Al-Fazl – as the Allah willed, long may he rule - enjoined us to produce this gate in our deep deference and submission to Gazi Abul Faraj Mahammad ibn Abdullah. Long may he also live, as the Great Allah willed!

By the blacksmith Ibrahim ibn Osman Angaveyh – fifth, fiftieth, four hundredth year according to the Hijri

(the beginning of Moslem era from the 16th of June 622)

As it may be seen from the inscription text, in 1063, the iron gate was made by the blacksmith Ibrahim ibn Osman Angaveyh by Ganja ruler Emir Shavur's order. Gazi Abul Faraj Mahammad ibn Abdullah directed the work on preparation of the gate.

But this iron gate did not exist in the history of Ganja for a long time.

A terrible earthquake taken place in 1139 made difficult to defend Ganja, which was subordinate to the Seljugs. Historical sources prove very well that the Georgian Tsar Demetri I took advantage of absence of any defence of the city, attacked it, sacked the tumbledown Ganja without any resistance, and took away its gate to Gelaty monastery near Kutaisi. At present, one half of the gate with the inscription on the surface has been fixed to the wall in front of the grave of David IV in the yard of Gelaty monastery in Georgia [3-5].

All guests and tourists visiting the monastery are given information that the gate was brought to the monastery by the army of Demetri I as if a symbol of victory over Ganja at the time of fighting with it. But in reality it is clear that the Georgians did not have any powerful forces to fight against the Seljugs.

The fate of another half of the gate is unknown. There are many different conjectures from many sources about it:

> *"In XVIII century, one half of the Ganja gate was used in covering the roof of the monastery when repairing it" [5, 84].*

> *"The Arranian ruler Gara Songur rendered assistance to the population of Ganja, took revenge on the Georgians, brought a half of the gate back, founded new Gana and placed the gate there."*
>
> *"Zubdat an-nusra va nuxbat al-usra" by Imadaddin al-Isfahni*

> *The Georgian Tsar Demetri I did not take away both parts of the Ganja gate; he took only one half of it to Georgia. The another half turned out to be brought to Derbend and was fused there" (it is said that it was utilized for moulding bullets)*
>
> *... is taken from the manuscript "History of development of fine arts in Azerbaijan" by Javad bey Rafibeyli*

Historical sources prove that the first of these statements is the most realistic one. Information about utilization of another half of the gate during repair of the monastery in XVIII century is found most often.

Conclusion

The statement about corrosion and decay of one part of the gate is unlikely. In this case another half of the gate would also subject to corroson and decay because both parts of the gate had been made from the same material and at the same time.

Imadaddin al-Isfahni's statement about the restitution of the gate to Ganja people by the Arranian ruler Gara Songur is refuted by other historical documents and presence of the gate itself in Gelaty monastery.

The statement about taking one half of the gate away not to Georgia but to Derbend is also proved to be mistaken and is refuted by many historical facts. The last statement itself shows that both parts of the gate were carried away to Georgia and one of them disappeared in XVIII century.

The gate made by the blacksmith Ibrahim ibn Osman Angaveyh, known in our history as Ganja gate, a symbol of immovability of the city can be included into the row of our metal memorials reflecting elements inherent to the Islamic Culture. Within the framework of our people's medieval craft samples reached our era and adorning many world museums, our artistic metal work and incrustation attracts attention most of all. One of the factors stimulating its development was availability of iron resources, which were abundant around Ganja.

The basis of one half of the Ganja gate kept in Gelaty monastery consists of a big bolted iron frame. The frame is divided into 7 partitions in heught. Each of the partitions has 9 parts in breadth. All the parts are bolted to each other. On the top of the gate, on the II and III partitions there is an inscription. The inscription was enchased on the surface of the gate. It proves the high-level craftsmanship of the blacksmith Ibrahim ibn Osman Angaveyh, and, at the same time, his master's aptitudes towards artistic metal and incrustation work [2-4].

The issue on restitution of the intact half of the Ganja gate to Ganja was raised many times during the past centuries. But because of obscure reasons the negotiations on the issue came to nothing.

Up to present, one part of the Ganja gate still lives its sad life in Gelaty monastery near Kutaisi in Georgia.

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SECTION 30. Philosophy

THE PECULIARITIES OF PASSING TO DEMOCRATIC SOCIETY IN UZBEKISTAN

Abstract: *In the given article evolution of the theory and practice of democratization in Uzbekistan.*
Key words: *modernization, democratization, society, reforming, concept, political system.*
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Introduction

Notion, tasks and problems of political modernization of society, basis and peculiarities of political modernization in the countries of Uzbekistan, models of political modernization of the world and Uzbekistan's experience, it's theoretical basis.

Political-philosophical analysis, learning appearance and development of theory of political modernization in the examples of countries of East and West, comparing the models and experience of political modernization of the Uzbekistan, the problems of it's improving in future.

Scientific learnt it's external and internal factors connected with conceptional solutions. Explore the matter "Uzbekistan model".

Scientific publications and as will be widely used in processes of education, perfecting basis of theories and practices of political modernization.

Solving the passing period problems plays very important role in modernization of society [1, p.277]. "The question is assigning the realizing functions of strategy in passing period, working out their solving mechanisms and determining each country's peculiarities for realizing it into reality, - writes professor S. Otamurodov. - For modernizing a country and passing to democratic society it is necessary to consider not only promotional degree, but in its turn the mentality of people who are living there" [2, p. 236]. So, during passing period we should pay attention will-power, mentality like other factors of the people. It helps doing successful elaborations. For example it's known to everybody that in Japan, China and South Korea developing steps are passing solidly. In its turn, the Japan, the China and the Korean people is getting great profit from these elaborations.

Materials and Methods

Deeply analyzing existing factors of politics, we abovementioned that Uzbekistan worked out traditional evolutional way. Considering the features of the conception which worked out by president Islam Karimov gives an opportunity of preventing from arising difficult situations, social conflicts, and instability in our country. They are, in its turn, played an important role while solving arising social-political and economical difficulties solidly and starting elaborations gave its fruits successfully. The peculiarities of solving strategies of passing period problems of Uzbekistan the whole world public recognized and it is called "uzbek" model.

It's known that liberalization – is first step for democracy of society. Each country's spiritual imagination is bounded with its achieving what kind of ideas and purposes, and founding on what kind of mind. The way which Uzbekistan chose is a forming way of citizen's society protected all human advantages and insured their all rights. It is of course, requires gaining several difficulties, complexities, and conflicts.

Firstly, we should say the conflicts between olds and news. Old constitution's bad habits don't want to leave and want to live for a long until taking out it from root. But new constitution ideas deeply

realizes the necessity of rebuilding society and bounding this necessity to the life-death notion, fate of each citizen, spiritual needs of people, during centuries formed life style and viewpoint, comes to the world as protector idea in any aspect. This idea's life assigned with fighting difficulties even very hard pains of just these old bad habits.

Thirdly, it is an opportunity for presenting their abilities, free life style and human independence. It is social, political, spiritual-mental event which makes us feeling the notion of independence and adding our portion for developing our country.

Fourthly, it is preparing citizens as its active protector and active attendant of just democratic process in the deepening condition of democratic process. It is very difficult and a social event which requires time and condition. Because, for living thinking of the "suffer" how to get rid of the colonial period's bad habits and for overcoming the "obstacle " of earning for living using our mind humanity needs inside will-power, mental will-power.

The level of political cultural, political mind and notions assigns the attendance of human in social life. Where political cultural and political mind is high there people actively and solidly attend to government work. People in meetings, discussions can follow and present their attitudes how the decisions are accepting and how their execution is controlling. And they don't be careless to political-social meetings which belong to their life. And in opposite, they will attend for preparing them, in result for execution of decisions they feel the responsibility for their profit.

There is each nation's applying style to democracy coming from nation's needs, spiritual-mental world, each nation's own life and thinking style, historical traditions, attitude to the life and other properties. In this meaning when our president said: "There are appropriate and proper features of democratic process in east which was formed in ancient times. It is impossible passing carelessly it. Indeed the democratic process in east will develop slowly and conformably. In this sphere the attempts of revolution changes brings very unpleasant, even tragedian results. West scientists also called revolution as "wild and ancient form of social development". Naturally, this way is not for us he meant there is forming uzbek factors of establishing democracy [3, 122].

Uzbekistan after achieving independence learnt several countries' ways of democratic development. And in these countries there are exemplary and worthy experiences of democracy. The president of Uzbekistan saying the necessity of dealing with this question coming from each nation's its own national spirit, persuaded that not considering needs of this ancient, rich traditional nation would bring lot of serious problems: "the degree and promotion of democratic changes depends on the appropriateness with peoples' intelligence and social meditation. Historical experience duly authenticated that copying democratic processes blindly from away doesn't give any work. Otherwise, this way causes confusing and dangerous effects." There is fact in abovementioned suggestion. We can see brightly it in the bloody conflicts and political events which happened in 90s of XX century.

It's known from history; not considering native peoples' feelings leads either leader or whole country, and population into dead end. It is impossible establishing west democracy blindly in east countries, imitating to it causes unexpected tragedies. We are watching its bitter effects in example of Tajikistan and especially in Afghanistan. Being careless to inimicality of free and under mask of religion effected on getting quite weak of government and ruling apparatus, letting ruling power without attention brought unfortunates for thousands of families.

If we take in this viewpoint, accepting stability as a situation of steadiness in Uzbekistan, it realizes the opportunities of reconstructing and fertile development. In this case the stability situation is admitted as the necessity of inside and outside positive effects. However the fertility of these changes is managing by the government basing on the factors of gradual development of Uzbekistan society.

After achieving the independence there was important problems for solving in front of Uzbekistan: absolute redirecting of state and society democratic processes to absolute new way. We have to admit particularly, these processes passed with several conflicts and difficulties. Because though Uzbekistan possess all attributes, signs of stateness (as if other countries) in composition of former union, all of those were exist shapely only. There is no any way except this where managing the country staying from Moscow, as well, being advantage of the statue of only leader "party" from all countries' constitution [4, p. 151-166].

The "right" of being sovereign, and structuring of their own development way was written in the main law of that period but for union republics it was not valid.

The constitution (Main Law) of Uzbekistan Republic which accepted on 8th of December in 1992 serves righteous guarantee for democratic direction of country development. On the one hand this document is the result of people's intellect and political mind, on the second hand depicts future sovereign state, also nation's fate. Human's honor which reflects in itself humanness traditions, historical and cultural inherit of nation and its value was taken as a main theme of Main Law. The great importance of humanity is particularly admitted in the Constitution. The highest righteous resolution of relationship between citizen, society and states

reflects in it and defined main theme of social justice is providing stability in society.

The leader of Uzbekistan often tells the ideas which challenges all people to think about political culture and political activeness which was one of serious problems of democratization of society:"We have to repeat the political activity of our nation doesn't answer to the requirements of world, and still weak. We have to confess that: we can't get rid of from old models. It is getting difficult to apart from bad habits of colonial system and administrative-command system which all important decisions are accepted from "high", we, common people were only obedient executors, sometimes victim of without thinking accepted decision". So, in this case there is a great facility in front of education and political institutions.

If we analyze the society of Uzbekistan in this viewpoint, we can see clearly those political activities of people are not still in the level of democratic factors. There are still advantages of the political ideas and imaginations of old society in our society. In political activities of citizens is getting very difficult being clear from feeling of passiveness, laziness.

The importance of political elaborations is in our country, nowadays there was created good conditions for setting up to the life the important factors of democracy, for developing their political culture, for increasing social-political activity of public people. There is formed featured value of democratization of political processes in Uzbekistan. I. Karimov deeply analyzing the experiences of independence period and the experiences of leader foreign countries put forwardly the democratic factors of citizens' attending to political processes: "It's known that in any society there are minimum three measures which assigns the level of democracy", - said our President Islam Karimov. – These are – people how much being informed from accepting processes of decisions, how much being controlled of government decisions by people, how much attending of people to managing of the state… While we built justice, democratic society we should not forget the reality: one can't establish a democracy and justice by ordering a special decree or order from high. This is very difficult work which realizes by attendance of all people, fist leading wisdoms, different political parties, representatives of public organizations, power, braveness, and cleverness of responsible clerks" [5].

Conclusion

Increasing citizens political activities, while accepting decision from high peoples' attending themselves widely or by means of their groups is main guarantee of establishing citizens society. Especially, its clear dealing with political freedom elaborations would be difficult while former totalitarian society's inherited complications of administrative-command system will not be deleted from peoples' viewpoint, political mind and practical deeds. Our government's leader gives special attention to attendance of citizens to accepting political decisions. In this case there are enough good conditions in our country, only citizens should attend to the organizations which express their will-power and advantages or by no means, should they attend to accepting processes of political decisions.

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