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.....

Environmental, Engineering and Legal
Aspects for Sustainable Living

Programm Abstracts

euro-eco hannover2017.

2 DECEMBER 2017

INTERNATIONAL SYMPOSIUM

“ENVIRONMENTAL AND ENGINEERING ASPECTS FOR SUSTAINABLE LIVING”

Programm Abstracts

Europäische Akademie für Naturwissenschaften, e.V. Hannover
Europäische Wissenschaftliche Gesellschaft e.V Hannover

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ISBN 978-3-00-032886-2

Publisher:

Europäische Wissenschaftliche Gesellschaft e.V. (EWG e.V.)

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L.I. Auzina
A.V. Parshin

OIL-AND-GAS FIELDS HYDROGEOLOGICAL CONDITIONS ESTIMATED WITH GIS-BASED APPROACH (EASTERN SIBERIA, RUSSIA)

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At present in the territory of Eastern Siberia hydrocarbon fields with low reservoir pressure and temperature (6-20°C) are being developed and planned to be developed, which, in turn, implies significant expenditures with less economic benefits than, for instance, in Western Siberia. Hence, the issues of investment optimization at different stages of exploration is more topical than ever before.

One of the most urgent problems faced by production engineers in the oil and gas fields is groundwater prospecting for multi-purpose water supply and optimization of water well location.

The maximum geological and economic effect is possible to achieve by means of developing the estimating system of the most perspective water sites that would be applied at the early stages of exploration. To solve the geological problem, such an estimating system should include minimal amount of field information due to maximum use of prior information or information provided by archives and literature sources as well as the Earth remote sensing data. In this case, the estimate of water resources perspectives of study areas should be scientifically based on the used data.

Now at the early stages of exploration the pre-survey information analysis is performed, however, cartography developed at this stage is not used for complete forecast information to full extent. At the contemporary stage of studying perspective oil fields in Eastern Siberia, the information obtained at the pre-survey stage cannot be directly used for exploration due to the lack of information on study areas. Thus, identification of high water abundance zones for subsequent drilling with the help of direct hydrogeological parameters is virtually impossible.

The purpose of the given investigation is to determine a number of indirect parameters that are possible to estimate at the initial exploration stage and to develop integrated index of water abundance, which is a basis for exploration optimization involving groundwater reserve estimates, that is collectively defined as a system-integrated approach.

Development of the described technique was performed within the exploration project at oil and gas condensate fields (OGCF) of Chonsk group (Eastern Siberia) located in the extremely complex geological-structural and permafrost-hydrogeological conditions. The geological structure of the study area is defined by Archean, Proterozoic, Paleozoic formations, Mesozoic and Cenozoic deposits, as well as trias intrusions.

The initial database was generated consisting of more than 50 predictors. They were

independent vector layers in the general geoinformation project “Hydropoisk”. As is known, a large number of GIS-project layers is not convenient for visual analysis, therefore, it is appropriate to generalize it to a less number of informative integrated indexes by means of GIS mapping. Reduction in information size without loss of information was performed by means of development of integrated index of water abundance (IIWA). To identify the key factors concerned with water abundance, the factor analysis was used for geodata of the analogous site by means of robust principal components method. As a result, among the whole set of primary and designed indexes a number of parameters were distinguished that reflected water abundance of the perspective sites and, at the same time, did not involve any difficulty to obtain them at the early exploration stage. Despite the significant difference in geological-hydrogeological and permafrost conditions of the license areas, the list of universal and efficient parameters included fracture index, proximity to water stream crossing of the 3-d and 4-th orders, height above the main and nearest drain, distance to the nearest drain, terrain ruggedness index, seldom - downward gradient, elevation of target point, distance to fault zones of definite types.

The values of indexes were brought to uniform dimension by means of normalizing, scaling, and/or classification by Delphi method, after that corresponding raster layers were developed with unified grid step. The potential hydrogeological significance of every parameter and, consequently, the raster values were ranged within the interval from 0 to 1, where the least values reflected unproductive sites from the point of view of water exploration. Integrated index of water abundance means a sum of all significant parameters. It was plotted in conditional units from minimum to maximum values, where the latter denoted the most perspective sites. All calculations can be performed both in rasters (as in the above example) and in tables of database. The suggested technique is based on open GIS technology, mostly DBMS PostgreSQL/PostGIS and QuantumGIS system.

In some sites, the drilling results have shown that, on the whole, the suggested mapping reliably determines the expected hydrogeological conditions. Depending on the task and a set of available geodata, the integrated index can be calculated with different detail level.

The technique was tested in the some license sites of Chonsk group deposits. The initial results of implementation of suggested approach has proved its high efficiency: more reliable forecasting allowed solving geological problem, having reduced the number of exploration wells by 30%, in this case the possibility of well inclusion into perspective ones increased 60-80%. At the moment, testing of its efficiency is underway at other license sites.

The suggested approach is universal to a great extent. Depending on the set target and exploration scale, one can only change a number of parameters, but the basic indexes of geodata processing technique remain the same.

V.A. Burkovskaya

**TOPICAL ISSUES IN THE SPHERE OF LEGAL REGULATION
ON THE USE OF NATURAL RESOURCES**

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Russia*

One of the institutes of environmental law is represented by the law for the use of natural resources embracing the sum total and system of norms, rights and duties arising in the course of the use of natural objects for specific purposes.

The ecological situation which is taking shape at the present time pushes to the foreground in the law for the use of natural resources the problems dealing with circulation capability of natural resources, the use of minerals, the use of waters, the use of forests, etc.

Urgent does remain the problem of preventive measures concerning ecologically harmful activities as well as compulsory suspension, limitation and stopping of the right to use natural resources.

The range of infringements of the law in the sphere of the use of natural resources includes, on the one hand, non-submission, distortion or concealment of information about the natural resources, on the other hand, - violation of confidentiality of such information.

Quite often are to be registered infringements of the law connected with the destruction or damage of natural resources as well as failure to preserve the places of their location, unauthorized building of the areas on the territories with minerals deposited.

Violated are technological standing orders and standards of performing the works connected with the use of natural resources. There takes place selective, irrational mining of natural resources, which causes, as a rule, unfounded reduction of their reserves.

Another infringement of the law in the field is considered to be the destruction or damage of the system of marking, which makes it possible to use the natural resources in an unauthorized way.

The problems of legal regulation of the use of natural resources concern the infringements of the law by both individuals and judicial bodies: violated are the norms of giving licenses, the requirements of anti-monopoly regulation when ensuring the right to the use of resources, concluded are the contracts for the use of resources bypassing the points of the law in question, etc.

The responsibility for the infringements of the law in the sphere of the use of natural resources can be criminal (if the infringement poses the utmost public danger), administrative (established by the Code of the Russian Federation about administrative infringements of the law), civil (with the purpose of compensation for the damage brought about), material (the damage is restricted to direct real damage and according to the common rule is not to exceed the sum of monthly earnings of the employee), disciplinary

(when causing damage to natural resources due to careless execution of local normative legal acts).

One of the tasks of the law for the use of natural resources should be also education, molding of the public opinion, the raise of the level of legal culture and social responsibility in relation to the use of natural resources, prevention of the infringements of the law in the sphere to be considered.

V.D. Burkovsky

ENVIRONMENTAL EDUCATION AND TRAINING OF COLLEGE STUDENTS

Yelets Branch of the Russian New University, Yelets, Lipetsk Region, Russia

The fundamentals of environmental training and education are laid among the students during the school period, at college there are implemented the principles of continuity, extension and deepening of knowledge in the field of ecology, in the development of appropriate competences.

The formation of social and personal development is inseparable from active participation in environmental activities, from the development of skills to build harmonious relationships with the environment, to take responsibility for their own health and the health of society as a whole, to carry out effective care of the preservation and restoration of natural resources.

Environmental education, in fact, begins with the formation of ecological culture, carried out as part of the educational process or research projects, and extracurricular, leisure activities.

Theoretical knowledge of the field of ecology should find realization in the everyday behaviour of young people. Of great educational value are environmental visits, participation in national and regional projects "In harmony with nature", "The breath of the planet", "A pure country", "Learning at nature", "Green Russia", the ecological action "A real job", the volunteer environmental movements, ecological landings and monitoring activities in the framework of the program dedicated to the Year of ecology in Russia, etc.

An important component of environmental education is the development of ecological and legal competence, i.e. the ability to apply environmental and legal knowledge in a comprehensive way for preventing and finding solution to environmental conflict situations.

The ultimate goal of environmental education and training is the formation of a moral environmental attitude, which the creation of ecological and educational atmosphere at the college contributes to. The goal can be achieved by organizing different types, styles, forms of educational work: labour landings under the motto "Save our common home",

environmental actions “Monuments of nature of the small homeland”, “Forest is our wealth”, “The springs of Russia should be kept clean!”, environmental forums, “round tables”, seminars, conferences, competitions, festivals.

Ecological education is closely linked with the development of aesthetic values, artistic perception of the beauty of the world that can be realized in conducting exhibitions of painted and photo landscapes, floral designs, organization of the landscape design contests united by the idea “Author’s flower garden”, competitions of propaganda posters “Ecological boomerang”, environmental decades, environmental watch actions, etc.

There can be a great many forms and pedagogical approaches in environmental education, the main thing is to apply them in an informal, creative and effective way.

A.A. Garashchenko

SIMPLE AND GENERALLY ACCESSIBLE SMART HOME DEVELOPMENT

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Smart home systems allow people to automate the management of various systems in the home, including heating, electricity and water supply systems. Moreover it is possible to organize an interaction system for everyday objects through which these objects will be able to exchange the necessary data among themselves (the so-called Internet of things, IoT).

At present, smart houses have not yet become widespread due to the high complexity of creating a secure, stable monitoring and management system for the home. In addition, the use of some ready-made solution, in which the household appliances of one company interact, makes difficult the addition of objects from another company to the existing system. This difficulty is caused by the difference in software and hardware used in these everyday objects.

One of the possible solutions to this difficulty may be the use of a single software and hardware platform. For example, the hardware unity can be solved by using a platform that is architecturally structured similar to the Arduino platform. It is even possible to use the Arduino itself after performing the required corrections.

The issue of using a single software platform is more difficult to solve. Even if Arduino microcontrollers can be connected to each other over the network, there is a need for some main supervisor computer that will monitor and manage all components of the smart house and this supervisor should be able to integrate with all components used in the system. Also the question of the supervisor security from hacker attacks from outside the network and other attacks within the network arises. It is possible that the current operating systems may not provide such a level of protection. In this regard, it becomes urgent to create protection programs, firewalls or even operating systems intended for use in a smart home system.

Currently, this direction is still developing, but in spite of this, some companies managed to achieve considerable success in this subject area.

N.E. Garashchenko

CRISPR/CAS SYSTEM SEARCH IN CORYNEBACTERIUM

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Introduction. CRISPR/Cas system (Clustered Regularly Interspaced Short Palindromic Repeats/CRISPR-associated proteins) is specific adaptive system which protects bacterium from alien genetic elements. Modern genomic and bioinformational technologies allow purposefully modeling the selection of the highly specific and virulent phages against the pathogenic microorganisms based of their genomic structures and antagonistic interaction mechanisms through the systems CRISPR / Cas in bacteria. Corynebacterium – claviform microorganisms, some of which are obligate pathogens for humans: Corynebacterium diphtheria is the causative agent of an acute infectious disease - diphtheria. Many Corynebacterium are related to opportunistic microorganisms that can cause inflammatory reactions and lead to serious complications.

Aim: define presence CRISPR/Cas system in Corynebacterium by methods of bioinformation analysis.

Tasks:

1. Define a group for searching CRISPR/Cas systems.
2. Search CRISPR/Cas in the group.
3. Detect strains, which has CRISPR/Cas systems.

Materials and methods

For searching CRISPR/Cas system the following program was used:

Program modeling methods MacSyFinder for searching the Cas genes in the bacterial DNA. Cas genes visualization methods of MacSyView. For searching and identification of the CRISPR- arrays, obtaining information on the structure of spacer sequences as well as the structure of the repeats was used the CRISPRDetect, the CRISPRFinder, the CRISPROne.

Results. A CRISPR/Cas system was searched in the studied organisms. Out of the 40 presented strains, the systems were detected only in the 13. In these strains were searched Cas-genes, visualized structures, defined the location in the genome with type identification, determined the CRISPR arrays structure with detection of the spacer sites nucleotide sequence with their localization in the genome, and a repeats structure was obtained. During the program, erroneously identified Cas-genes were not detected in the absence of the CRISPR system.

Conclusions

Corynebacterium has a structure of protection against phage aggression, including one of the most dangerous representatives - the causative agent of diphtheria.

V.V.Gavrilenko

THE GEOLOGICAL ENVIRONMENTS AS AN IMPORTANT FACTOR FOR DEVELOPMENT OF ARCHITECTURE AND PRESERVATION OF THE HISTORICAL MEMORY OF A SOCIETY (ON THE EXAMPLE OF FRANCE AND RUSSIA)

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The history of architecture is normally limited to analysis of social-historical factors of its development; however emergence and development of schools of sculpture and architecture in various countries is determined first of all by the presence of available, aesthetic and appropriate for processing stone, otherwise by geological conditions.

Diversity of geological structures of territories and petrographic inhomogeneity of stone material determined that emergency of new architectural styles took place in regions with resources of favourable for construction stone. Later when new styles spread in different geological conditions they were assimilated in accordance with specific geographical conditions.

More distinctly this was displayed while contemplating gothic cathedrals in France and comparing them with the architecture of equally splendid architecture of famous church monuments erected in the same period of time in Russia.

Incredibly beautiful churches later called “gothic” were built in Northern France on the territories with widely excavated supplies of massive limestone. Cathedrals in Reims, Rouen, Paris, Chartres, Amiens and other towns, as a rule, pale-coloured, of grey-yellow or yellow-grey colour decorated with marvellous carving. In other part of France, in its East in Strasbourg the gothic cathedral with elements of roman style is different and amazing with its warm pink colour and wonderful carving on Triassic rose sandstone. They were mined not far from the city in the mountain chain the Vosges that in considerable degree contain large beds of this dense rose deposit. And at last on this background is sharply stands out the “wonder of France “ Mont Saint Michel, the monastery completely built on the island at the mouth of la Manche from granites and granitic gneiss of Armorican Massif. Since these sedimentary rocks are very solid and difficult for processing especially in terms of gothic accuracy of performing the details is amazing, however the carving on stone is not much present. And as for South of France, in Provence there is practically no gothic architecture because in this region are insufficient deposits of appropriate for this style rocks. Therefore even the walls of Pope Residence in Avignon are made from arenaceous and cavernous limestone, which was not good for gothic

In European part of Russia there are practically no sedimentary rock that are appropriate for carving. Therefore for a long period of time building material for

churches were abated soft limestone and plinthite concretions. The architectural school had developed specifically basing on these materials. And only in XII century during establishing of Prince Vladimir Russia the mining of white limestone, which in relatively modest deposits could be found on the banks of Volga River and other rivers, took place. Nevertheless, already by the end of XIIth century such masterpieces as Dmitrievsky Cathedral were erected. They possess similar architectural features as earlier churches of Novgorod and Ladoga but are decorated with a stone carving.

The history of the civilization is greatly determined by the relation of man to stone as one of the most important factor of the historic memory. The visual image of each building alongside with social conditions is predisposed by the geological situation or by a stone it was made from. To safeguard this legacy it is necessary to take care of all features of the stone as construction and restoration material for historic purposes and the application of its traditional types.

Aybeniz Guliyeva
Arif Heydarov
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APPLYING BY MODIFIED NATURAL ZEOLITES FOR EXTRACTION NON-FERROUS METALS

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Currently, there are large accumulations of man-caused waste in the territory of the Dashkesen Ore Mining and Processing Enterprise which pollute the environment¹. These wastes are also a potential raw material for the recovery of certain valuable metals.

Earlier we demonstrated the possibility of extracting Co, Cu, and Zn from tailings by heap leaching with a dilute solution of sulfuric acid. . Solutions of heap leaching of dumps should be considered as an additional source for obtaining a number of valuable metals. Therefore, the development of sorption methods for extraction of non-ferrous metals in solution is of great importance. .

One of the ways to improve the process of sorption extraction of non-ferrous metals from solutions and pulps is the choice of ionite exchanger, which has a high capacity for the target component and a high rate of ion exchange reaction. To this end, the usage of natural zeolite class sorbents possessing high sorption capacity is very promising. As an effective sorbent, we tested the natural zeolite - clinoptilolite from the Aydaghsy deposit (Azerbaijan).

In order to increase the sorption capacity of the zeolite, it was modified by various amines (monoethanolamine, triethanolamine, methy-lamine hydrochloric acid, hydroxylamine hydrochloric acid). The sorption capacity of the tested sorbents was compared with the capacity of high-acid ionite KU-2x8. It was shown that the zeolite modified with monoethanolamine (MEA) is superior to other modification in its

selectivity to the nonferrous metal in the system. Moreover, the modified MEA-zeolite does not adsorb alkaline earth elements from sulfuric acid solutions. The results showed that the recovery of cobalt, copper and zinc increases with the pH of the solution. In a strongly acidic medium (1 N H₂SO₄), metal sorption does not occur, that indicates the possibility of desorption of metal ions from ionites by acidic solutions. Using the modified MEA zeolite, sharply increases the degree of sorption of copper, zinc and cobalt in the pH range 4.4-5 and is 99.95%, 100%, 96%, respectively.

V.I. Ilin

TOPICAL PROBLEMS OF REGIONAL ENVIRONMENTAL POLICY IN LIPETSK REGION

Yelets Branch of the Russian New University, Yelets, Lipetsk Region, Russia

In the recent years much greater attention is paid in the Russian Federation to the issues of environmental policy, not only at the federal but at the regional level as well. The year of 2017 declared in the country the Year of Ecology has made urgent the task of development of complex programmes to preserve nature in the RF regions, the realization of which can be possible only by way of interaction of the state bodies, nature preservation structures and regional public organizations. The Lipetsk region is no exception in this context. Among the major tasks set by the regional authorities in the sphere of nature preservation and use of natural resources are the reduction of emission rates and decrease of discharge of polluted drainage water into water basins.

At present the environmental situation in the Lipetsk region cannot be described as satisfactory, which is to be proved by repeatedly stated throughout 2015-2016 facts of exceeding permitted concentration rates of polluted substances in the air in the largest cities of Lipetsk Region and, first of all, in the regional center. For this reason particular attention is given to organization of monitoring research and measures aimed at reducing the amount of polluted substances emitted by the plants and factories located in the region. One of the ways to improve the environmental situation is the realization of the programme for planting trees in smaller towns of the Lipetsk region.

Highly effective are considered water protection measures taken within the state programme "Preservation of the environment, reproduction and rational use of natural resources of Lipetsk Region" realized on the territory. For the current three years there has been realized the ecological rehabilitation of the rivers which flow in the Lipetsk region: the Voronezh, the Stanovaya Ryasa, the Yagodnaya Ryasa as well as a mass action for cleaning the bed of the ponds in the Krasninsky, Lipetsk, Dobrovsky, Dolgorukovsky, Dankovsky, Yelets, Usmansky and Chlevensky municipal districts.

Quite acute does remain for the Lipetsk region the problem of reclamation of both

industrial and solid domestic waste. The work in the sector is jointly realized by the Lipetsk authorities and the federal center. Thus in the framework of the target programme “The national system of chemical and biological security of the RF (2015-2016)” Minpromtorg (The Ministry of Industry and Trade) has been engaged, since 2016, in the realization of the plan for the elimination of the burial ground of pesticides “Bolshiye Isbishcha”; in accordance with the latter 1402 tons of highly toxic poisonous chemicals and pesticides are to be eliminated and possible threat of chemical pollution of underground waters is to be neutralized.

Another important direction of the environmental policy implemented in the Lipetsk Region is to expand the net of specially preserved territories of wild life of regional and local significance. In the year of 2016 the area of OOPTs (=specially preserved territories of wild life) has been increased in the Lipetsk region by 450 hectares. Besides, in 2016 the Lipetsk region was one of the first subjects of the RF to have the cadastral map completed for all the territories of regional significance specially preserved.

Specific and no less important for the regional environmental policy is ecological education. Regional TV and radio companies, regional and local printed mass media as well as the Internet information-reference portals contribute to the course of educating the population of the Lipetsk region with regard to the state of the environment at the present stage. Annual actions held on the territory of Lipetsk Region include the regional actions “Give paper resources a second life!”, “Escaping ecological danger”, etc.

In general, the main directions of environmental policy implemented in different regions of Russia are similar, however, the degree of attention to the problems outlined above can differ considerably, which causes the necessity of regular exchange of experience in the sphere of nature preservation activities aimed at securing the rights of the citizens to safe environment.

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EFFECTIVE CATALYST FOR STEAM CONVERSION OF NATURAL GAS

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Receiving hydrogenous technological gas from the natural gas consisting of methane and its homologs serves as initial raw materials for production of many chemical and petrochemical products and is widely used as a reducer in metallurgy. Technological gas on the recovery potential practically doesn't concede to technical hydrogen, besides, its receiving manages much cheaper, than receiving hydrogen.

Earlier we investigated optimum conditions and parameters of receiving the technological gases containing hydrogen and monoxide of carbon in various ratios, formed

at steam, steam-oxygen, oxygen and carbon dioxide catalytic conversion of natural gas. Results of the conducted researches showed the most expedient application as gas reducer of products of steam conversion of natural gas.

Objective of this research was receiving hydrogenous technological gas by methane conversion by water vapor with use of the modified catalysts on the basis of cheap and available natural raw materials of zeolites.

Natural zeolites and their modified are for the first time systematically studied ions of some transitional metals of a form for process the steam methane conversion, high activity of the offered is established catalyst. Recommendations about a way of preparation of the catalyst are made. The interrelation of activity of the catalyst with concentration of the entered is revealed cautions of metals, heat treatment and activation conditions, change zeolite structures.

The maximum conversion of methane is reached at 450 h^{-1} in 120 min. and makes 79,30%. After certain time at all volume speeds of supply of gas mix the size of extent of conversion decreases, and, than more volume speed, especially sharply occurs change of catalytic activity.

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APPLICATION OF WASTE OF PHOSPHORUS INDUSTRY FOR CONSTRUCTION OF FOUNDATION PITS

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On the territory of the industrial zone of the phosphorus factory in Shymkent, production wastes of the 1st, 2nd and 4th class of danger in the form of phosphorus slag, electrothermophosphor slag, small phosphorus slurry and arsenic containing sludge. According to the National Report on the State of the Environment and the Use of Natural Resources for 2015, the volume of the 1st class of dangerous waste (arsenic containing sludge) is 60.0 weights; 2- dangers class (phosphorus-containing sludge) - 378.8 thousand weights; 4- dangers class (electrothermophosphor slag) - 2 069.415 thousand weights.

The aim of the research is to study the possibility of using phosphor industry wastes in the construction of foundations in tamped pits. Experimental studies were carried out on the models of foundations. A comprehensive research program was researches, which included work on the construction of trenches with tampon models, broadenings from various materials, and also conducting static tests of foundation models in situ conditions.

The excavation of foundation pits was carried out with the aid of a canopy equipment to the MEMZ-1A forestry hoist, which moved along the experimental platform along the rails. The hinged equipment consisted of a set of rams, a guide rail of 6.0 m long, which ensures the tamper drop into a strictly fixed place, and the roll with which the slipping of

the ram along the steering was achieved. Lifting and dropping of the ram was carried out using a friction electric winch.

The principle of foundations in the rammed boilers was as follows. Corresponding tampering rammed the foundation pit to the required depth, which was then filled with a concrete solution of the vials. When constructing foundations with a broadened base, material (crushed stone, phosphorus slag, loam) was filled in the foundation pit with portions of 0.05 m³, which was tamped down into the bottom of the excavation. As a result, a broadening was created at the base of the cat.

In accordance with the tasks of experimental research, which envisaged the study of the regularity of the effect of the broadening device on the formation of a compacted zone and on the bearing capacity of foundations, excavation was carried out and static tests of foundation models for the effect of vertical loads were carried out.

Excavation of trenches was carried out to a depth of 2 - 3 m along the axis passing through the center. The density of the compacted soil in the dry state was determined by sampling the soil using the cutting ring method 10 cm down and to the sides at the level of the lower part of the excavation and widening according to GOST 5180-75.

The test results showed that the load-bearing capacity of foundations with slag broadening is greater than that of a crushed stone pillow. This is due to the fact that with a decrease in the fraction of the material to be compressed, a better compaction occurs under the action of the dynamic load.

The researches have shown the possibility of using electrothermophosphorus slag when preparing the base of foundations in subsidence grounds. The use of waste products from the phosphorus industry, in particular electrothermophosphorus slag, for construction of foundations in tamped pits makes it possible to increase the load-bearing capacity of foundations as compared with the use of crushed stone as a broadening. Replacing rubble for waste of the phosphorus industry will save natural resources and improve the environmental safety of the region.

G.S. Lonshakov
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METHOD OF INTEGRAL GEOECOLOGICAL EVALUATION OF THE UNDERGROUND HYDROSPHERE SUSTAINABILITY WITHIN THE TERRITORY OF IRKUTSK CITY

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Key words: geological hazard, underflooding, subsoil erosion, urbanization, groundwater quality

According to the UNESCO, global urbanization, set in the second part of XX century, resulted in a situation when more than 60% of world population lives in the urban areas.

Engineering infrastructure, building and deployment of the underground space leads to the radical changes of natural ecosystems and geological environment.

The most sensitive part of geological media is the underground hydrosphere, which is the first to encounter with anthropogenic transformation in various kinds of ways. Transformation results in changing of groundwater surface regime (most typically increasing of groundwater level and forming of artificial aquifers), changing of groundwater flow structures and degradation of water quality (chemical, biological and heat contamination). First two factors lead to intensification of natural and man-caused geological hazards related with groundwater. As for city of Irkutsk, these are underflooding and subsoil erosion. Percentage of urban territory, subjected to these hazards, increased significantly for the last decades.

Leading anthropogenic factors, affecting on urban area groundwater are:

- Artificial recharge of upper aquifers due to leakages from underground pipeline and storm water drains;
- Deeply embedded pile foundations, basements and underground constructions, which cause damming effect;
- Development of road network, which disimprove conditions of precipitation runoff;
- Building and coating with asphalt, which results in disimprove of natural groundwater recharge.

Whereas, the geological environment sustainability to the mentioned man-made load is determined with:

- Geological aspects and flow properties of the shallow part of cross section (zone, within interaction of geological media and engineering infrastructure occurs);
- Drainage conditions of the urban territory;
- Conditions of water exchange of the first aquifer.

One of the most urgent problems to solve nowadays is the designing of method for integral evaluation of underground hydrosphere sustainability and determining of maximum level of anthropogenic influence within zones of different hydrogeological aspects. This method should be followed up with zoning of territory for further forecasting of geological hazards and designing of rational solutions for urban development projects, focused on declining of negative effects of urbanization.

Authors come up with the following solution: assuming, that the contemporary state of underground hydrosphere is a result of long-term interaction of forecited factors, it is reasonable that territories subjected to the man-caused geological hazards are under the exposure limit of anthropogenic influence. Sustainability of underground hydrosphere can be defined by numerical indexes, relied on spatial statistics data, as well as critical level of man load. This investigation should be carried out with relation to areas with different types of hydrogeological cross-section and drainage level. Thus, supposed solution is based on the analysis of high volume of spatial information, which cannot be proceeded without qualitative database.

Modern geoinformational technologies gives us a brand-new approach to solve this issue. As a database, which include necessary information about geological media, existing within its limits man-made load and its effects, authors designed a GIS-project comprised with recent maps, DEM, hydrological model and urban infrastructure plans of Irkutsk and peri-urban area. Database, containing information collected by field investigations (including geotechnical surveys and hydrogeological monitoring), is an additional component of the project and is intended as a source of geological and hydrogeological information for geospatial analysis.

Man-made impact rate is numerically estimated by designed indexes of pipeline communications and road network density, percentage of asphalt-coated and building area, while territories with deeply embedded foundations and underground constructions are depicted with polygons.

Final aim of presented investigation is the design of statistically valid integral index of underground hydrosphere sustainability (HSI) for the purposes of geo-hazard forecasting and urban plan development, based on modern environmental impact approach.

V.N. Lozhkin
O.V. Lozhkina

NEURAL NETWORK MODEL FOR FORECASTING OF HAZARD AIR POLLUTION BY CO AND PM EMITTED FROM PEAT FIRE AND ITS EFFECT ON ROAD TRAFFIC

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Abstract The present paper describes an original neural network model for the forecasting of hazard air pollution by CO and PM emitted from a peat fire and its effect on the road traffic. The model was developed for a real road transport emergency occurred on the Federal Highway M-255 "Siberia". The model is able to self-learning using experimental and simulated data.

Introduction

The development and the implementation of physical and chemical transportation models is one of the most rapidly developing sections of the modern computational meteorology and atmospheric chemistry and physics.

Main results

There was developed a neural network technique for the modeling of pollutants dispersion in the air on meso- and regional scale. The originality of the design of the computational process is determined by the specificity of the object of the investigation - the influence of a peat fire on a busy highway at extreme meteorological conditions. The model predicts transportation of CO, suspended particles $PM_{2.5}$ and PM_{10} of the smoke from a peat fire in the vicinity of a highway and involves the estimation of health

and traffic risks. The developed functional parametric models allowed us to carry out numerical investigations of emergency situations under different scenarios with different sets of input data, in particular, wind speed and direction, heterogeneous experimental and simulated information on the emission intensity of pollutants from peat fire and the concentrations of CO, PM_{2.5} and PM₁₀. The model was trained using the data of a real transport collapse that occurred in the Irkutsk Region (Russian Federation) in winter 2015-2016 during the burning of the peat near the Federal Highway "Siberia". The transport of particles in the stratified atmosphere is modeled using the differential equation of turbulent diffusion air pollution by CO including the sedimentation of PM. The approximate solution of the constructed parametric models was sought in the form of a heterogeneous neural network function, which parameters were found by minimizing the error of functional.

Conclusions

Some variants of approaches for constructing a neural network model of CO and PM diffusion from a peat bog were developed and tested. The method is recommended for the development of air quality control and forecasting systems.

Acknowledgements

We would like thank Prof. A. Vasilyev and Prof. D. Tarkhov from Peter the Great St. Petersburg Polytechnic University and V. Timofeev from St. Petersburg University of State Fire Service of EMERCOM of Russia for fruitful collaboration while realizing the present investigations.

Keywords : Neural network model; differential equation; peat fire; CO and PM (Particulate matter); road transport; emergency.

Olga V. Lysikova

TOURISM IN RUSSIA AND REPUBLIC OF KOREA: LOCAL PRACTICES TOWARDS SUSTAINABLE DEVELOPMENT

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I studied the specifics of tourism in Russia and Republic of Korea in the context of spatial mobility of citizens in these two countries. Local cultural tourism practices between Russia and the Republic of Korea have good prospects, which are provided by the mutual interest of the peoples of both countries, as well as by sustainable economic, political and cultural relationships. There are important prerequisites for the tourist flow growth and the dynamics of cultural exchanges between the two countries: Korean diasporas in the Russian regions, active cultural dialogue, sustainable economic contacts, simplification of the visa regime, and regular airplane flights. The effective brand management becomes an important tool for promoting tourism between Russia and the Republic of Korea. Popularization of ethno-cultural heritage contributes to the preservation of ethnic self-awareness, language

practices and traditional rituals. All of these constitute the components of sustainable tourism development.

Years 2014 and 2015 were announced as the Years of Exchange Visits between Russia and the Republic of Korea in order to strengthen the cooperation between two countries in the fields of tourism, culture and sports. According to the Memorandum of Understanding, such visits are aimed at encouraging the initiatives to increase tourist flows, paying special attention to business, medical, gastronomic, natural and cultural varieties of tourism. The memorandum was designed to provide exchange of experiences, statistical information and professional staff in terms of their further training for tourism industry. It stated the facilitation of the interrelations among tourism and cultural, artistic and sports activities; maximum use of the logo and the slogan of the years of mutual visits between the Russian Federation and the Republic of Korea, as well as tourist attractions of both countries.

The United Nations General Assembly proclaimed year 2017 to be an International Year of Tourism for Sustainable Development. This step was taken to raise awareness of the general public and decision-makers in the public and private sectors about the contribution of sustainable tourism to economic development, to bring together all interested social institutions and actors with the goal of working together in order to make tourism the catalyst of change for the better. My analysis demonstrated the interdependence of global trends and local modes of social change in the cultural matrix of contemporary tourism, which is manifested in the local practices of the cultural tourism between Russia and the Republic of Korea.

Contemporary tourism reflects historically determined and anthropologically limitless multiplicity of ways to build local experiences and identities. Modern practices of tourism presume thoughtful and constructive message of organizing travel. Today, «an intent look of a tourist» becomes a universal notion. Analysis of modern sociological theories allows determining the concepts of post-tourist and co-tourist, and classifying the practices of characteristics, symbols, destinations, which become more and more unified. In the era of global instability, the role of cultural heritage in the process of creating the images of national identity becomes the sphere of intense research interest. In the focus of this interest, there are the following matters: tourist participation in the processes of globalization and cultural exchange, consumption and construction of cultural identities by means of tourism practices, along with production and construction of images and symbols of «one's own» and «alien» cultures.

Thus, in modern tourism, there are pluralistic life-styles, that are reflected in the evolutionary transition from a discourse of equality to the value of dissimilarity. Currently, we are seeing stable economic, political and cultural relations between Russia and Republic of Korea. Particular attention is paid to the presence of important conditions required for the growth of tourist flow and dynamics of cultural exchanges between the two countries. Such conditions include all of the following: major Korean

diaspora in the Russian regions, geographical proximity of two countries, active cultural dialogue and introduction of regular airplane flights.

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IMPROVING THE TECHNOLOGY FOR RECOVERY OF ZINC ELECTROLYTES FROM TRAMP IRON

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Traditional application of sulphuric acid leaching in order to recover compound raw polymetal zinc and copper-zinc as well as byproducts is accompanied by emergence of compound sulfate solutions. The proportion of some undesirable tramps in the end product increases so dramatically that existed technologies either do not provide the necessary extent of purification or make the cost of the product much higher.

An actual task of the complex treatment of zinc leach solutions for further outcome of qualitative cathode metal consists of extracting impurities, first of all iron, the concentration of which reaches up to 20-25gr/dm³.

As the most widely used and cheapest mode of iron extraction from solutions the oxidation in trivalent state followed by a hydrolytic precipitation is normally considered. However, it should be noticed that this method turns out not always effective in practice. This may be accounted by presence of electropositive cations, copper, in particular, coprecipitation of other valuable components of the solution; as well as difficulties with filtration of obtained pulps.

As an improving measure we propose a new technological phase, consisting of preliminary electrooxidation of ferrous iron in a flow-through electrolyzer.

To precipitate iron (III) a new complex reagent-precipitator Amino tris(methylene phosphonic acid) - ATMP was used, which under acidic conditions forms with iron a durable insoluble complexation, described with the formula $\text{Fe}_3\text{H}_3(\text{ATMP})_2 \cdot 6\text{H}_2\text{O}$. Its solubility under room temperature ranges from $5,5 \cdot 10^{-5} \text{g/}$ in 100 ml of water or $9,85 \cdot 10^{-5} \text{mol/dm}^3$. Residual equilibrium concentration of iron in the solution after the segregation of the solid fraction is 0,056 mg/dm³, which is within the norm for further electrowinning of zinc. The yielding residue has a crystal structure, can be easily filtrated and after drying can be used as a semi-product to produce valuable iron-phosphorus ligature at metallurgical plants.

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ALTERNATIVE TECHNOLOGY FOR RECYCLING SECONDARY LEAD

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At the department of non-ferrous metallurgy of Ural Federal University an approach to a new technological phase for complex processing of lead industrial products of zinc industry based on application of a complexing solvent - disodium salt of ethylenediaminetetraacetic acid (EDTA) has been developed. Basing on the results of laboratory studies the possibility of selective Pb leaching from lead cakes show that optimal leaching parameters are: pH 7, the liquid-solid correlation =7-8, at 20-25°C. The leaching is used as a head operation of the new technology for recovery of Pb cakes from zinc industry (including accumulated in technogenic spoil heaps). Optimal conditions are chosen basing on analysis of the equitation of regression obtained at realization of matrix of the pre-planned experiment.

The composition of solutions obtained from the first stage – the leach of raw material in a complexing solvent under optimal conditions, g/dm³: 22,3 Pb, 4,5 Zn, 1,0 Fe, 0,5 Cu. Separation of cations of non-ferrous metals and lead is carried out under oxidation of the solution with sulfuric acid. Lead and complexon yield a joint residue of lead-sulfate H₄EDTA, which is not soluble in acidic environment. pH of residue yielding ranges is 2 - 1,5, maximal fastening occurs at pH 1,5. Cations of non-ferrous metals and iron do not precipitate at neutralization of the solution; the filtrate contains sulfates of zinc, copper and iron, the concentration of which is similar to their concentration in the initial solution.

The results of following laboratory and technological studies confirmed the possibility of complex recovery of lead-containing industrial products and obtaining Pb cathode and productive zinc solutions, ready to be returned in zinc production. The experimental data, models and technological operations can be used for processing other types of lead-containing material and technogenic wastes.

N.N. Matinyan

ARABLE LAND OF NORTH-WEST OF RUSSIA

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The territory of Northwest Russia is characterized by rather various natural and ecological conditions. Total area of the region is more than 20 thousand hectares. Considerable areas are occupied by the industrial sector, transportation, residential construction. A complicated relief, diversity of soil-forming sedimentary rocks, considerable waterlogging and a variety of soil covers make it difficult to develop the land and account for small agricultural units and fragmentary of agricultural grounds. A large proportion of agricultural grounds has a

poor quality: scrubland, wetland, outcrops. In Northern part of the region the arable land occupies from 5 to 17 %, in Southern parts - up to 35 %. The largest part of the territory is covered with forests.

Soils of the agricultural grounds can be divided into 6 soil agro-groups, differentiating on lithology and geomorphology.

The first soil agro-group is formed by lacustrine-glacial and outwash plains and kames. It consists of sand podzols, soddy-podzols with a different degree of podsolization and soil gleying as well as from podburs and rgavozem. Sand lands have a low natural productivity due to a high acidity, a limited volume of absorption, deficiency of nutritional elements and a low content of microelements. Such soils feature a contrast thermal mode, which is explained by its low heat capacity and high thermal conductivity of sands. Sandy soils possess a number of favorable properties – early readiness to field labors, easy to work with.

The second soil agro-group lies down on binomial sediments: sandy loams on clayey soil and comprises podzol and soddy-podzol soils with a bleached horizon on the contact of sediments. Periodical accumulation of liquid at the border of the layer-break is typical for these soils. Fast discharge of moisture is characteristic of upper sand layers. In lower sandy loam horizons intensified humidification and development of processes of contact gleying are observed. The soils on the binomial sediments have a higher productivity than sandy soils. They are richer with the elements of mineral nutrition and warmth. However, their essential disadvantage is a low absorption volume and they are insignificantly buffered, which is typical for upper sandy soil horizons.

The third soil agro-group is formed on acid glacial clayey sediments and consists of burozems, light clayey podzolic and soddy-podzolic soils with a different degree of podsolization. They are widely spread on glacial plains of the region (up to 32% of the total area) and present the main arable land reserve in a number of sub-areas. Podzol clayey soils have a sharply differentiated composition of the profile, acid reaction, insignificant content of humus and microelements, especially of copper and cobalt.

The fourth soil agro-group is formed on glacial plain, made from carbonate clayey soils (limestones and dolomits). They come close to surface or might lie on the surface. For the given territory a wide range of soil types is observed: litozems, carbolitozems, dark humus, soddy-podzolic residual calciferous soil. They occupy 7-16 % of the total area. All types of soils on the carbonate sediments have a higher natural fertility and are best suitable for intensive agriculture. Their disadvantage: they are low powered, gravel, arid and contain few accessible forms of phosphorus and potassium.

The fifth soil agro-group includes clay soddy-eluvial-metamorphic soils, which formed on bandy clays. These soils are subject to surficial waterlogging and are characterized by a large supply of humus, nitrogen, a high content of absorbed substratum, nutritional elements and microelements. A weak differentiation of silt according to the profile, richness of nutritional substances and microelements put forward these soils into the category of high-potential and fertile soils. Yet, a noticeable acidity, dominance of

restoration conditions, a higher humidity and considerable density of soil profile affect the productivity of these soils.

The sixth soil agro-group comprises high bog soils and fen bog peat-gleyed soils or peat soils. Wetland soils can be used for plowing mainly on the south of the region (17% of the total area). Fen bog soils are considered the most valuable for agriculture. They have a high content of ash, nitrogen and favorable PH-value. The most wetland soils contain little phosphorus, potassium, microelements, especially copper. They have a reduced water absorption, weak thermal conductivity, deep frosting, slow melting and weak mineralization of the organic substance.

Thus, the specifics and diversity of natural conditions of the Russian North-West demand a differential approach for conducting any measures on the use and protection of the land fund.

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ABOUT MEASUREMENTS OF GREENHOUSE GASES CONCENTRATIONS IN THE ATMOSPHERIC AIR OF RUSSIAN ARCTIC

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Since 2015, the Institute of Industrial Ecology UB RAS (IIE UB RAS) in conjunction with the Nonprofit Partnership "Russian Center for Arctic Development" (Salekhard, Yamalo-Nenets Autonomous Okrug) in the framework of the summer expeditionary campaign performs high-frequency precision measurements of greenhouse gases concentrations in the atmosphere of the Russian Arctic on the Island Belyi. The island is located in the Kara Sea, 10 km to the north from the Yamal Peninsula. The measurement station is located in the area of the polar meteorological station of Roshydromet, on the northwestern shore of the island (73.32 ° N, 70.05 ° E). The island belongs to the bioclimatic subzone B (Walker et al., 2005). The island ecosystem is represented by the Arctic tundra.

The measurements are carried out by the Picarro Model G2401 laser gas analyzer (Picarro Inc, USA), which provides simultaneous measurement of concentrations in the atmosphere of greenhouse gases (GHG) CH_4 , CO_2 , CO , H_2O with precision of units parts per million and low drift, in fully automatic mode. Information on the research is presented below (period, duration, height of the sampler):

- 2015: July 15 - August 17, 765 hours (34 days), 6.7 m;
- 2016: July 8 - August 30, 1269 hours (53 days), 1.0 m and 6.7 m.

During the measurement period, the average concentrations of GHG were (ppm):

- 2015: CO_2 - 388.3 ± 4.4 ; CH_4 - 1.94 ± 0.042 ;
- 2016: CO_2 - 392.5 ± 2.5 ; CH_4 - 1.94 ± 0.046 .

The global background for the summer season 2015-2016 was (on the literature data): CO_2 - 396-400 ppm, CH_4 - 1,845-1,855 ppm.

According to the measurements results, the average annual increase in CO_2 concentration is fixed at 3.1 ppm, which is 1.5 times higher than the average annual growth of this gas on the planet. The content of the other GHGs in 2016 compared to 2015 has not changed.

On the basis of 2015-2016 measurements, a qualitative description of emission / absorption sources of GHGs was made: local sources, the radius of 0 -10 km (based on a statistical analysis of measured impurity concentrations and concomitant meteorological conditions - wind directions and velocities); remote sources, the radius of 10 - 1000 km (using the methods of Inverse Trajectories and Fluid Location of the atmosphere).

The method of Statistics of Inverse Trajectories (L.L. Ashbaugh, 1983) is an effective tool for analyzing the transport of pollutants and determining their possible sources. It ensures the establishment of the connection between the fact of the increased content of the impurity in the site of its registration and the trajectory of the motion of the air masses on the results of long-term observations.

The method of Fluid Location of the atmosphere (V.A. Poddubny, etc., 2013) developed in IIE UB RAS is an Euler-Lagrange hybrid variant of the Statistics of Inverse Trajectories method. The proposed approach is a statistical-hydrodynamic method of joint analysis of measurement results and the information on atmospheric dynamics.

The analysis showed that in summer the island ecosystem is a local source of CH_4 . The surface concentration levels formed over the island are, on average, 0.04-0.07 ppm higher than those due to wind transport from the sea. The greatest contribution of the island was noted in the conditions of the anomalous heat of 2016 (air temperature up to 25-26 ° C), which caused an intensification of methane emission processes from permafrost. At the same time, the intensity of carbon dioxide absorption by the island ecosystem significantly reduced compared to 2015.

The calculations of the reverse trajectories of airflows were made in order to determine the location area of possible emission sources influencing the greenhouse gases monitoring point on the Island Beliy.

It was obtained that the area of influence covers a considerable area beyond the Arctic Circle, including the North Pole. It is mainly located above the sea surface, the islands of the Northern Earth, Spitsbergen, the Franz Josef Land Archipelago, and to a much lesser extent - over the northern territories of Eurasia. It was noted that in July and August 2016 the nature of the airflows was significantly different. In August, the east pollution transfer was practically absent.

Since July 2017, the GHG monitoring station on the Island Beliy has been running in continuous mode. This will provide getting of more reliable and detailed information on sources of GHG emission and absorption in different seasons.

O. V. Mezinova

THE ROLE OF REGIONAL STUDIES IN THE FORMATION OF ECOLOGICAL CULTURE

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Ecological culture is a notion of many dimensions embracing the system of environmental knowledge, skills and habits, and a number of moral-ethic qualities of the individual and his ecological responsibility.

The formation and development of ecological culture implies the awakening of interest to nature, first of all, to the nature of the native place, the state of its soils, water basins, the air, to realization of nature protection activities in the region, to developing of different kinds of initiatives to arrange protection of the environment of the place.

Ecological culture should not be limited to studying theoretical postulates; it should be efficacious, reveal itself not only in a careful attitude to every living being, but also in pursuing particular ecological perception of the world and spreading the respective ecological outlook among the people in contact.

All the people of a certain locality, who cannot remain indifferent, irrespective of their age, education, occupation, etc., are involved in regional studies. Moreover, these studies are thematically open, i.e. an expert in the field can focus his attention on the peculiarities of the local landscape, protected natural objects, specific character of the flora and fauna of the region, cultural and art monuments, historical heritage.

One of the directions of the native land studies is ecological regional studies. Ecological training should start, without doubt, at the nursery school stage. In the course of interaction with nature in the form of playing children develop emotional responsiveness, the skill and wish to preserve and protect the nature of the native place in an active way, follow consciously the rules of behaviour which do no harm to the environment.

In the framework of school education ecological regional studies are realized, as a rule, in the activities of ecological regional studies circles. The programme of such a circle includes the study of nature of the region in different aspects: biological, historical, geographical, anthropogenic, aesthetic, hygienic. Learners acquire not only theoretical knowledge, but also perform practical, research, creative and project tasks.

While studying at college or higher educational institution students take part in the work of scientific problem-study groups "Ecology of the native land", carry out ecological monitoring, collect statistical information with reference to ecology, summarize the data received, prepare reports to deliver them at scientific-practical conferences, participate in volunteer ecological movements, nature protection events at different levels: from municipal to all-Russian.

An essential constituent of the activities in a scientific problem-study group, researching the problems of the environment of the native region, are innovation projects submitted for

regional competitions, the most successful projects are not only honoured with diplomas, but are also recommended for practical use.

Generally speaking, realization of the unique value of one's region as part of the wealth of the whole world contributes to the formation of a responsible attitude to the environment.

One of the kernel tasks of the education with reference to ecological regional studies is the formation of readiness to use natural resources of one's region in a reasonable way.

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THERMOGRAVIMETRIC RESEARCH ON DEHYDRATION OF TITANIUM DIOXIDE

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Abstract. The primary method of the titanium dioxide production is thermal hydrolysis of solutions of titanium sulphate or titanium hydrochloride and calcination of the derived hydrated titanium dioxide.

Not only the conditions of thermohydrolysis, but also the conditions for opening the feedstock, the separation of titanium from the impurities, have a significant affect to the temperature regime of the calcination of hydrated titanium oxide, and therefore the phase transformations in the dehydration of hydrated titanium oxide were studied.

The work contains the results of thermal and X-ray diffraction analysis of the hydrated titanium oxide dewatering product obtained by processing low-titanium slags in an acidiferous manner.

Thermal analysis showed that while calcining of the hydrated product in an rare gas atmosphere, the elimination of crystallization water occurs in the temperature range of 235-264 °C at the first stage, anatase appears at 475.9 °C, which react to form of rutile at 797 °C. It is noted that the transformation of brookite into rutile occurs at 1012.5 °C.

The presence of titanium oxides of lower valence was found during the thermal analysis. A dark-purple oxide Ti_2O_3 occurred at 181 °C, and yellow titanium oxide TiO at 981.9 °C, which significantly reduces the quality of the pigment. Visual examination of the cinder showed that the surface layer is painted in lilaceous color, then a strip of yellow color is observed. The main color is white which is specific to rutile. Undoubtedly, variously colored impurities reduce the quality of pigmentary titanium dioxide.

The hydrated titanium oxide dewatering product study in an oxidizing atmosphere by X-ray diffraction analysis method showed that at 500 °C a partial dehydration of the

initial slightly crystallized product occurs. The increase of calcination temperature up to 900 °C leads to the formation of crystalline rutile.

Keywords: hydrated titanium dioxide, dehydration, thermal analysis, X-ray diffraction analysis, calcination, rutil

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EFFECTIVE USE OF DUST OF DOMAIN MELTING DUE TO JOINT PROCESSING WITH OXIDIZED ZINC ORE

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Abstract: One of the resource in the production of non-ferrous metals is use of waste iron and steel industry, in which the content of non-ferrous metals up to industrial conditions. Thus, in dusts of gas purification of some plants of ferrous metallurgy the zinc content as high as 15%. The results of the study of the binder agent effect during the briquetting of charge, the type of the carbonaceous reducing agent, the consumption of reducing agent, fineness of charge components on the process of carbothermal reduction of zinc from oxidized zinc ore with the addition of stale dust of gas cleaning of blast furnace smelting. Bentonite, hydrated lime and treacle were tested as binding agent when briquetting of charge. It is established that optimum binding agent is treacle in an amount of 4.5-5.0% by weight of the weight of the ore.

It is shown that the residual zinc content in a product of the reduction roasting when using the special coke received from coal of Shubarkol deposit is 1.9 times less, than when using anthracite and 3.3 times less, than when using metallurgical coke, i.e. special coke is the most fissile reducing agent. The carbon consumption during carbothermal reduction of zinc from oxide ore with the addition of dust is 22-24% lower than in case of zinc recovery from ore. It was found that crushing of charge to class + 0.071-0.04 microns reduces the degree of zinc sublimation. If the size of charge is 1.0 microns, then the residual zinc content is increased in the cinder. High recovery efficiency is achieved with the following composition of charge, wt. %, oxidized zinc ore is 53.8; dust of gas purification of blast furnace smelting is 26.9; special coke is 21.0; treacle is 5.3.

Key words: zinc, charge, oxidized zinc ore, dust of gas purification of blast furnace smelting, binding agent, carbothermic reduction

Conclusions. The treacle in an amount of 4.5-5.0 wt. % is the best binder during the briquetting of charge consisting of oxidized zinc ore, dust of gas purification of blast furnace smelting and solid reducing agent. %.

It is found that the solid reducing agent expense of 38-39% of the oxidized zinc ore amount in the charge is optimal.

Studies of the effect of charge particle size have shown that the presence of dust reduces the gas permeability of charge, increases the probability of sintering of material, which has a negative impact on the performance of high temperature zinc reduction and necessitates briquetting.

Study of zinc reduction from various types of reducing agents showed prospects of special coke derived from brown coal of Shubarkol deposit for the high reduction of zinc oxide ore from the charge and dust of blast gas purification of furnace smelting gas.

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CLUSTERS AS INTEGRATION OF ENTERPRISES WITHIN THE FRAMEWORK OF UNIVERSITY-INDUSTRIAL RELATIONS

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Clusters in modern Russia, as well as territorial production complexes in the USSR, are integrated structures and provide modern regional cooperation in production.

Clusters were first characterized and analyzed as a result of research into the concentration of capital, horizontal and vertical integration, and the emergence of monopolies by Alfred Marshall in the 90s of the nineteenth century.

In the 90 years of the twentieth century American Michael Porter was analyzed of the qualitative side of clusters as group of interrelated enterprises in the certain area, and this area may be a region, country, several countries.

Integrated Russian companies are formed in areas where major investments are needed. Factors of this formation are:

- the state policy in the field of economic development
- investment attractiveness of the industry or territory
- the payback period of the investment
- transport and service infrastructure,
- availability of qualified personnel, etc.

However, for integration in Russia can be called reasons: the stabilization of the competitiveness of enterprises, one of the ways the survival of small structures in the context of global processes, the mergers and the acquisitions monopolistic nature. In addition, the state considered it necessary to maintain some structure that is incompatible with a market economy, ensuring economic safety of the country

Clusters actively research in three schools – in American, British and Scandinavian. In Russia, the cluster was initially associated with the creation and commercialization of innovations. Innovative clusters are part of University-industrial linkages.

In accordance with the innovation policy of Russia on the territory of 20 regions formed 25 clusters on branches, corresponding to the priority directions of development of science, technology and engineering in the Russian Federation.

In forecasts of productivity regional clusters in 2017 in Russia, the number of employees will amount to almost 1 million people, the number of high-performance seats exceeds 55 thousand, the volume of investments from the budget will exceed 600 billion rubles, and the volume of goods and works will be about 145 billion rubles.

University-industry relationships affect the innovation development of economic systems and, consequently, on the innovative development of the territories in which these systems formed. Close and intensive communication allow the system to evolve more rapidly and, on the contrary, weak ties impede the development of the system.

So, in the Voronezh region on the basis of universities formed such clusters, as the cluster of aviation, IT-cluster, a cluster of manufacturers of oil and gas and chemical equipment, the cluster of building materials and technologies, furniture, electronic clusters, cluster "Voronezh electrician", cluster "Beef cattle in the Voronezh region", transport-logistics cluster.

The efficiency of cluster integration is justified not only by the cooperation of a range of cluster enterprises, but also infrastructure, and also state policies in the sphere of innovation development.

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DEVELOPMENT OF RESOURCE AND ENERGY SAVING TECHNOLOGIES BASED ON RECYCLING OF TECHNOGENIC WASTES OF METALLURGICAL PRODUCTION

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The metallurgy is one of the main factors of economic growth and social development in a number of rich in natural resources of the countries, including in Russia. The industry in our country is competitive due to the availability of rich raw and energy base, practical experience of delivering complex projects.

Any metallurgical production is accompanied by formation of significant quantities of waste, of which currently only 15-30% recycled for recovery of valuable components, about 20-30% used in the construction industry. The main part of the waste material is stored in waste dumps and slurry fields.

The main part of the waste of the aluminium raw production is made up the solid fraction formed during production of secondary (flotation and regeneration) cryolite from the solutions of "wet" gas cleaning. The waste-based carbon containing fluorides are placed on sludge fields, which occupy large areas.

One of way the directions of the General development of Russia's largest enterprises for

obtaining primary aluminium PJSC "RUSAL Bratsk" (the city of Bratsk, Irkutsk region) is the transition to non-waste production and the possibility of extracting profits from the utilization of industrial waste.

In JSC "RUSAL Bratsk" the technology for obtaining calcium fluoride from saturated solutions of gas purification was developed and implemented. It allowed to reduce expenses on the production of costly secondary cryolite and purchase of calcium fluoride at 17%.

The joint flotation of coal foam and sludge gas cleaning equipment with additional phase of the control flotation of tailings was implemented to reduce waste generation. The output of the flotation cryolite was increased, the volume of accumulation of solid waste in slurry field was reduced to 1500 t/year, the consumption of flotation agents (pine oil and kerosene) decreased by 40%.

One of the promising directions of fluorocarbons disposal of solid waste (tailings flotation, electrostatic dust, sludge gas purification, carbon foam, spent cell lining) is their briquetting. the possibility of their use as a reducing agent, for example, in ferrous metallurgy is confirm by the results of their qualitative and quantitative composition of this industrial waste and the presence in significant amounts of carbon.

The scheme for washing regenerative cryolite in automatic mode has been introduced in order to reduce the formation of SO_2 in the gaseous phase of gas cleaning plants, to reduce the consumption of soda ash during the purification of anode gases and the cryolite ratio (KO). The quality of secondary products was improved: the content of sulfur decreased by 70%, KO - to 2.85-2.9, the consumption of Na_2CO_3 decreased to 250 kg per 1 ton of cryolite. The introduction of closed water circulation allowed to reduce the consumption of technical water; clarified water from the slurry field is transported for the preparation of the gas cleaning solution and the flotation process

The gas cleaning solutions are saturated not only with fluorine but also with sulfur in the form of sulfate, which must be removed from the process when preparing solutions for the purification of anode gases and crystallization of cryolite. The company has developed a method of crystallization of sodium sulfate by lowering the temperature of the solution; the resulting product contains an average of 98% of the basic substance.

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CRITERION-FACTOR APPROACH FOR RANKING OF OIL-CONTAMINATED LAND REMEDIATION TECHNOLOGIES

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Environmental compliance when managing oily waste sand disturbed lands is considered as a background for applying and engineering efficient methods for remediation of oil-contaminated land.

In common practice of remediation of oil-contaminated land, both in Russia and

abroad, these methods are classified according to ex-situ and in-situ.

Ex-situ techniques imply soil excavation, transportation and treatment at special technological sites.

To identify a technology as an “efficient technology” various criteria should be considered.

In the present work factor-criterion algorithmic approaches are introduced for ranking remediation technologies when managing industrial oil-contaminated land.

When planning remediation works it's beneficial to rank objects according to priority criteria.

Today development of new scientific approaches towards minimization of environmental impact by industry is one of the mainstream issues in Russia. At the same time best available techniques (BAT) as being most efficient up-to-date operating processes and methods enable to prevent or mitigate environmental impact to allowable and therefore are considered as most significant tools for motivation of industries to foster modern technologies.

With that, the following technologies may also be considered as BAT:

- Conventional technical and bio remediation;
- Complementary remediation technologies for biodiversity rehabilitation.

According to results of data pre-processing various sites are outlined: sites that are most appropriate for technologies being applied, and sites with insufficient information to evaluate.

Additionally, present situation is taken into account together with forecast of disturbed land at the moment of remediation start (area, shape of the site, level of self-regeneration of vegetation, presence of fertile soil layer, its potential, erosion processes, and level of contamination).

Total combination of quantitative ranking indexes should be considered as criteria for applicability of a certain technology.

Comparison is made by score system, which implies scores for each criteria (environmental, economic, technological, resource saving, and resource efficient) depending on their priority. Each criterion is divided into sub paragraphs that are also scored depending on particular gradation.

When ranking technologies by their applicability for oil-contaminated land remediation, the key factor should be an evaluation of ability to minimize environmental impact in real conditions (reducing time period of rehabilitation)

In case of multiple alternative engineering and technological options the choice should be made according to minimum negative environmental impact.

The following directions will benefit to evaluating applicability of a technology:

1. Performing quality standards (environmental, public health, construction, water management, forest management, etc.) with minimum costs;
2. Individual characteristics of contaminated sites condition as environmental-anthropogenic objects (climate, lithological, orographic, etc.);

3. Use of materials which are both safe and available on Russian market;
4. Feasibility of operation with regard to economic, social and public health conditions of the site;
5. Manageability of remediation sites according to indexes that determine operation and process parameters, including:
 - operation parameters in various climate conditions;
 - nomenclature, recommended brands and quantities of organic and mineral amendments;
 - nomenclature, recommended brands and types of technical tools;
 - operation parameters with regard to scale and type of contaminated land.

The authors have analyzed environmental technologies classified as ex-situ and in-situ considering requirements listed above. Also it was assumed that it's more efficient for experts to evaluate alternative technologies by pairs with each other, and then rank by most significant criterion.

Such an analysis is not fully comprehensive; however ranking of technologies based on ascending economic efficiency has appeared to be quite useful, first to exclude options that are extremely expensive when compared to achieved environmental results.

Applying suggested logic-based factor-criterion approach enables to compare alternative methods even when data is obtained from different organizations and regions. This approach is applicable with limited primary data on technological and economical parameters which influence potential risks when performing remediation projects.

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ENVIRONMENTAL EDUCATION IN METROPOLITAN HELSINKI

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The system of environmental education in Helsinki metropolitan area includes comprehensive coverage of various interactive pedagogical technologies. Numerous educational events, extracurricular activities, as well as school and university curricular lessons, are conducted regularly on the basis of local protected natural areas, environmental enterprises, museums, zoo, aquarium, and botanical gardens. Interactive educational technologies, such as science education conducted through field work with subsequent laboratory study, field trips into the natural environment, to the museums, botanical gardens, and environmental management enterprises; interactive lectures and discussions organized on their basis, have an unarguable advantage over routine school lessons and university lectures, since they are much more efficient at achieving the goal of forming an environmental awareness, environmentally conscious behavior and sustainable living at the current stage of societal development.

The Association of Biology and Geography Teachers in Finland takes active participation in environmental education of the primary and secondary school students, along with university students and residents of local communities. For a number of years, it conducts and coordinates various interactive educational activities on the basis and with cooperation of protected natural areas' facilities, environmental enterprises, museums and historical complexes. International Gulf of Finland Summer Camps are organized annually in July-August for the student groups and their teachers and professors from Baltic countries, including Estonia, Finland and Russia.

The Harakka Nature Center operates on Harakka Island, a short distance off the Helsinki harbor. Island ecosystems feature extraordinarily rich flora and avifauna. This educational facility offers its visitors encounters with local nature along the nature trail, various educational activities, and information on the Baltic Sea, maritime nature and sustainable living. The summertime program includes nature excursions, island adventures, public events, exhibitions, information on utilization of renewable energy and demonstration of renewable energy forms, specifically solar energy on the example of the solar collector and solar-powered fan, and wind energy on the example of a single-family house wind turbine. The Nature Center is the case study of the shift to renewable energy, which cut the buildings' electricity use and carbon footprint by 60 percent. The Art House has scientific laboratory facility fully equipped for conducting hydrochemistry research in student groups under the supervision of the facility specialists. Water samples are taken at the pier during the field portion of the research activity. Water transparency is estimated by using the Secchi disc, and temperature is measured at this stage as well. The lab portion of the research includes conducting analytical testing of the water samples for 11 compounds and physical characteristics, and the conclusions about the water quality are made. The students are expected to propose explanations about the sources of detected Gulf of Finland water contamination.

Nature House Villa Elfvik is suburban environmental education center. It promotes a sustainable lifestyle by offering student groups and life-long education groups ideas on how to behave in natural environment in a more sustainable manner. The historical art nouveau villa has the auditorium for hosting lectures, seminars and round-table discussions, Long Live Espoo exhibition and Badger's Forest, an adventure area for minors. It stands on the edge of the Laajalahti Nature Reserve, where student groups can be taken for bird watching or on a field trip to the wetlands to bring along water samples for studying contamination, crustaceans and microorganisms of the brackish waters in laboratory conditions.

Environmental education department at the Viikinmäki Wastewater Treatment Plant, the largest of the kind in Finland, conducts regular educational activities aimed at student groups and life-long education groups. The visitors are given talks about the specifics of the plant functioning, followed by the comprehensive excursions through the facility, demonstrating all stages of the wastewater treatment technology up to resulting high quality water condition, suitable for further residential use.

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THE TRENDS OF MODERN LANGUAGE AND ECOLOGY OF SPEECH COMMUNICATION

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The processes of globalization in the twenty-first century have considerably influenced the language picture of the world; extra-linguistic factors have determined the major trends in the language development, which include:

- the so-called “linguistic globalization”, which manifests itself in the ubiquitous spread of the English language, the wide use of anglicisms denoting the peculiarities of political, economic, scientific and technical spheres of society’s life (a trend, the Establishment, the Ombudsman, developer, retailer, branding, gadget, blogger, online, offline, spam, etc.);
- the democratization of language, expressed in the unjustified frequency of the use of colloquial vocabulary items and phraseology in official spheres of communication (“sotsialka” in the meaning of “social services”, “communalka” in the meaning of “communal sphere”, “pensionka” in the meaning of “payments to the pension fund”, “neftyanka” in the meaning of “oil industry”, “oboronka” in the meaning of “defense industry”, the political “tusovka” (the party), financial “bardak”(mess), bureaucratic “bespredel” (boundless violation of norms and rules, etc.);
- the active use of neologisms, as well as the development of the new meanings of the words (piaritsya, googlit’, chatitsya, trolit’, fleshka, esemeska, dvushka, treshka in the meaning of “two- or three- room apartment”, etc.);
- the so-called “mediation of language”, reflected in the emergence of the Internet languages (sociolects), in which the evaluative vocabulary with negative connotation and colloquial words are used on a large scale, the syntax of the phrase is simplified at most, spelling norms are violated;
- saving linguistic resources, which manifests itself in the search for a more economical, brief and compact form of utterance (there are new abbreviations, reduced vocabulary items – profi from “a professional”, comment from the “commentary”, desa from “disinformation”; there are used compact borrowings - gastarbeiter instead of “a migrant worker “, diving instead of “underwater swimming”, weekend instead of “days off”, etc.).

These trends can be attributed to a natural language dynamics, variability in time of the structure of a language, although some of the above linguistic phenomena and facts are obviously not lasting, do not constitute a stable lexical layer to raise the alarm and speak about the threat to the purity of the language.

Of much greater concern is the growth of intolerance in the course of speech interaction. At present the process of communication is characterized by increased tension between the

participants of communication, the growth of behavioral and verbal aggression, which can be traced in the choice of linguistic means and speech patterns.

Intolerance in speech and language is expressed primarily through the active use of stylistically lowered, colloquial, jargon, rude, vulgar patterns of speech, — all that lowers the overall cultural status of the individual opponent and forms an attitude of dislike towards him. This growing trend violates one of the basic laws of effective communication – the law of equal security, leads to disharmonized communication and has a negative impact on the ecology of language and speech environment.

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DAS MODERNE HERANGEHEN AN DIE FRAGEN DES MONITORINGS DER WASSEROBJEKTE (AUF DEM BEISPIEL GEBIETES WORONESCH)

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Eines der globalen Probleme der Gegenwart ist die Verschmutzung der Hydrosphäre. Die ständig wachsende Anthropogenbelastung auf die oberflächlichen Wasserbecken fordert das deutlich organisierte Überwachung ihrer Wasserqualität. In der Russischen Föderation bleibt das System des staatlichen Monitorings der oberflächlichen Wasserobjekte die auf die Bestimmung vorzugsweise ausgerichtete Konzentration der verschmutzenden Stoffe und ihr Vergleich mit den äusserst zulässigen Konzentrationen, während in den Ländern Westeuropas und Nordamerikas für die objektive Einschätzung des ökologischen Zustandes der Wasserbecken die biologische Kontrolle verwendet wird, die auf dem System der Bioindikation gegründet ist. Laut Angaben des Staatlichen Vortrags "Über den Zustand und die Nutzung der Wasserressourcen der Russischen Föderation in 2015", wurde die Beobachtung des Zustandes Oberflächengewässer nach den hydrobiologischen Kennziffern nur in 1885 Subjekten der Russischen Föderation, einschließlich auf 9 Gebieten (Astrachaner, Irkutsker, Leningrader, Pskower, Murmansk, Nischegoroder, Rostower, Samar, das Jüdische Autonome Gebiet), in den Republiken Burjatien, Tatarstan, Jakutien Sacha, Karelien, sowie in Amurisch, Krasnojarsk, Chabarowsk und Transbaikalisch die Ränder und in der Stadt Sankt-Petersburg geführt. Das Obenernannte leitete die Suche von uns der optimalen Kennwerte der Kontrolle ein, erlaubend ist es objektiv, den Einfluss der lokalen Verschmutzungen auf die Qualität der oberflächlichen Wasserbecken Gebietes Voronesch zu bewerten. Die Forschungen wurden auf dem Fluss dem Mädchen durchgeführt, das nach den Territorien drei administrativer Bezirke des Gebietes verläuft. Die Analyse der hydrochemischen Kennziffern der Qualität des Wassers führten nach den attestierten Methodiken, unter Ausnutzung fotometrisch, spektrometrisch, titrimetrisch, potentiometrisch und der

Waagemethoden durch. Als Anzeigegruppe Hydrobionten waren die Organismen Aufwuchs, genauer widerspiegelnd die Qualität des Wassers im Vergleich zu Zoobenthos, zeigend die bedeutende Toleranz zu den Verschmutzungen wegen des Einflusses Bodensedimente. Aufwuchs der künstlichen Substrate des Flusses des Mädchens wurde genug hoch taxonomisch mit der Vielfältigkeit charakterisiert: im Laufe der Forschung sind 245 Arten enthüllt. Die Einschätzung des ökologischen Zustandes des Flusses des Mädchens nach den hydrobiologischen und hydrochemischen Kennziffern lässt zu, darüber zu sagen, dass, ungeachtet der intensiven Anthropogeneinwirkung, die Qualität des Wassers im Fluss befriedigend (3 Klasse der Sauberkeit des Wassers), der Prozesse Eutrophierung nicht geschieht. So sind für die optimale Kontrolle über die Verschmutzung des Festlands die gemeinsamen Forschungen der Oberflächengewässer hydrochemischen und hydrobiologischen Kennziffern notwendig.

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MIKROFILTRATION DER MOLKE FÜR DEREN VERWERTUNG IN DEN APFELMOLKEGETRÄNKEN

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Die bis jetzt von vielen Betrieben zu praktizierende Molkenableitung ins Abwasser stellt eine ernsthafte Umweltbedrohung dar. Das häufig anzuwendende Verarbeitungsverfahren von Molke – die Trocknung – führt aber zum großen Energieaufwand. Aussichtsreich scheint die Verwertung von Molke in den Fruchtgetränken, beispielsweise in den Apfelmolkegetränken. Für den Verbraucher sind klare Getränke am attraktivsten. Wenn man in diese die Molke hinzufügt, soll sie geklärt werden. Eines der vielversprechenden Verfahren der Klärung ist die Mikrofiltration. Die Leistung der Anlagen für Mikrofiltration ist aber durch die Eiweißfällung auf der Membranoberfläche sowie durch die Eiweißablagerung an den Porenwänden eingeschränkt. Dies kommt besonders deutlich beim Betrieb von Keramikmembranen vor, die eine komplexe und stark gekrümmte Porenform haben. In der vorliegenden Studie untersuchten wir die Möglichkeit, die Mikrofiltration von Quarkmolke mit Hilfe von Filteranlage mit dem Impulsgegendruck von Filtrat durchzuführen. Als die Filtrationsparameter, insbesondere die Leistungskapazität, verbessernde Agent dient dabei die im Homogenisator feingemahlene Rübenfasersuspension.

Wenn eine Suspension von Nahrungsfasern im destillierten Wasser filtriert wird, so entsteht eine Polarisierungsschicht aus Ballaststoffen auf der Membranoberfläche. Wenn dann reines Wasser durch diese Membran geleitet wird, so begrenzt diese Polarisierungsschicht die Wasserdurchlaufgeschwindigkeit. Die anschließende Kombination von Filtratgegendruck und Membranauswaschen beschleunigt die Filtrationsgeschwindigkeit, weil die Polarisierungsschicht teilweise zerstört wird. Eine ähnliche Situation entsteht bei der

Molkefiltration durch die Faserschicht sowie bei der Filtration von Fasergemisch in der Molke. Es wurde das optimale Faser-Molke-Verhältnis gefunden: 150 g von dreiprozentiger Fasersuspension zu 1 Liter Molke.

Die zyklische Prozessführung (ein Zyklus besteht aus der Filtration von Faser-Molke-Gemisch und dem Wasserwaschen und dauert 7 Min.) hat gezeigt, dass die maximale Filtrationsgeschwindigkeit in einem Zyklus (60 ml/min) etwa konstant bleibt und von der Anzahl der Zyklen nicht abhängt. Dies ist auf die Tatsache zurückzuführen, dass die Faserschicht das Eindringen von Eiweiß in die Membranporen verhindert. Somit hat unsere Untersuchung die Zweckmäßigkeit von den beschriebenen Techniken bestätigt. Die eiweißangereicherte Ballaststoffesuspension, die nach der Mikrofiltration bleibt, kann bei der Herstellung von Nahrungsmitteln verwendet werden, beispielsweise als Verdickungsmittel bei der Yoghurtherstellung.

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STIMULATION OF PART-TIME EMPLOYEES IN RUSSIA

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In the industrial era, unemployment could be countered by full employment. However, unemployment today, in the era of permanent crisis, is only a form of the state of employment of the population. There are new forms that have become decisive in the developed countries and now firmly enter our Russian life.

In modern Russia, the values of the active part of the population are constantly transformed, and such employment factors as full-time, stability, dynasty become irrelevant and subject to replacement.

Not only in Russia, but also abroad, a large number of workers consider it necessary to free up their own time for self-development, feel the need to spend more time with their families, and try to find time for traveling. The number of people who would like to give up a full day's work reaches great values and is constantly increasing. So, according to the data of the state statistics of the Russian Federation in 2014, the number of persons who are not part of the labor force in the able-bodied age by categories, sex and age groups was 16878 thousand people.

This group included students of daytime departments of educational institutions, old age pensioners (including early ones), disability and persons leading households. Most of these categories somehow participate in part-time employment, as students acquire work experience while they are studying, pensioners are forced to work extra or at home due to very low pensions, householders often sell part of the crop from their site or are hired to work for neighbors for a small income. These data are supplemented by studies conducted in 2014 for the site Fl.ru Strebkov DO, Shevchuk AV, who based

on the survey of respondents determined the number of freelancers of all categories in Russia in the number of 4621 people.

The results of part-time employment are ambiguous and affect the increase in competitiveness in the labor market, the ability of certain groups of people to combine work with study or childcare, to ensure an adapted output of workers to retire, to curb unemployment growth, and help the organization survive in crisis periods.

Part-time employment is employment, which has a regular character and has its distinctive feature a significantly shortened working time, well below the established standard. In the postindustrial society, the so-called “non-standard types of employment” are becoming increasingly popular, which are opposed to certain foundations on the labor market and are included in the concept of “part-time employment”.

Stimulation of labor activity is similar to stimulating the growth of human capital occurs on several levels: state, corporate, family.

The stimulation of the work of partially employed workers is associated with their personal values and requires careful study. The problem of material interest in Russia is at the forefront of most workers who have a family. Given the low rates of full-time work, the discrepancy between wages and qualifications and labor efforts of employees, the material interest in several workplaces with an irregular working day and workplace remains relevant.

Consider the modern stimulation of part-time workers at the state level. An important function of the state is fisk, including, from the side of taxation of labor remuneration.

At the level of corporate (employers), incentives are taking on new forms. First of all, we are talking about the production training of new employees, even if they work part-time. Increasing and changing qualifications is one of the incentives for working for part-time workers. For remote work, Internet technologies, gaming technologies are used. That is, the process of work is gaming. It is common knowledge that gaming processes contribute to the rapid learning of staff, and Internet technologies also involve sensory organs of trainees, which effectively affects the memorization of the material.

Family stimulation of part-time employment is associated with numerous duties of the employee to their families: caring for elderly parents, caring for young children, the presence of family forms of family business: beekeeping, growing flowers and mushrooms, and so on. In such cases, workers fall out of the sphere of social production, remaining in the household for the time or for the season of intra-family activities. In the Russian tradition of low wages for young people in the public sector, some professionally trained young people prefer to stay in the family circle, believing that full-time work for little money is not effective. Thus, the received professional education does not mean further work on the specialty.

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MODERN APPROACH TO THE PROCESSING OF DRILLING WASTE

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Drilling for oil and gas is environmentally hazardous. Distinctive features of the impact of the drilling process are high intensity and short duration of the formation of considerable technogenic load on the objects of hydro - and lithosphere, which often exceeds the threshold load and thereby lead to negative consequences.

Drilling waste represent a heterogeneous chemical composition of complex multicomponent mixtures of substances with diverse physico-chemical and toxicological properties. Elevated compared to the background content of heavy metals occurs as a result of the introduction of drilling fluids barite with admixtures of metals and some of the components containing iron and chromium. Environmental pollution occurs as a result of migration of harmful substances.

Due to the complex composition of the drilling mud as the choice of method of treatment is difficult.

The drilling waste management system should take into account the legal requirements for the storage and disposal of drilling waste. This is to reduce the level of environmental pollution and improve the health of regions and cities with an unfavorable environmental situation through technical re-equipment and the requirements for the introduction of the best available and promising technologies for the disposal of drilling waste.

Waste generated during the drilling process, accumulate and are stored directly in earthen pit (mud-settling sump) arranged in the mine-real or artificial soil, or disposed of in specialized landfills.

Often enterprises are forced to accumulate waste and to pay for storage on its territory because of the short of landfills intended to receive waste under consideration, and the deficiency of installations for their utilization.

All of the methods and technologies of disposal/recycling have certain advantages and disadvantages. When choosing a methodological approach is required to objectively consider a number of factors:

- the level of oil pollution and other environmental factors;
- climatic conditions;
- the time required for the implementation of the technology;
- the availability and cost of special equipment and the total cost method.
- reliability and maintenance;
- the data required for full recovery;
- security;
- public opinion.

The choice of method of disposal of drilling waste is produced in each case depending on the extent of hazardous waste and regional climatic features.

The main areas of waste drilling include: burial, thermal, biological, chemical and physicochemical neutralization.

Currently in production sphere penetrates thermal technologies of waste disposal. Thermal disposal of drill cuttings requires expensive equipment, especially when it comes to foreign models.

The use of waste is an activity connected with waste management, including waste appearing at the last stage of the life cycle of any object aimed at the production of a secondary marketable products, works (services) or receipt of energy, taking into account material and energy efficiency, environmental requirements and security.

The choice of method of disposal of drilling waste is produced in each case depending on the extent of hazardous waste and regional climatic features.

Preference technologies for the disposal of drill cuttings shall be based on the review and evaluation of technological alternatives and selecting the most suitable variant for a given project or investment strategy, as well as socio-economic and environmental conditions.

The choice of methods of treating waste drilling should be determined by the classifier drilling waste subject to the handling of drilling waste. The task of processing drilling waste must be comprehensive basis using the best available technologies.

On the basis of the analysis of the results of multi-criteria evaluation of technologies and managerial solutions we have proposed organizational and technological model for waste management drilling.

The model itself algorithmic approach is the basis for the development of organizational and technical solutions to minimize environmental charges and costs for the construction and operation of wells and increase efficiency applicable for managerial decision-making.

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CONCENTRATION OF GALLIUM IN CYCLING ALKALINE SOLUTIONS OF ALUMINA PRODUCTION FROM ALUNITES

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Alunite raw materials used for alumina production are complex. It contains a number of important rare and scattered elements: Ga, V, Rb and etc. Large volumes of aluminium production make the associated extraction of these elements a problem of current concern in complex processing raw material. Considering relatively low concentrations of gallium in technological solutions, we subjected the alunite to a repeated leaching

at 80° C using the same 10% alkali solution. When leaching crude alunite, gallium is fully leached along with aluminium, and with the formation of alkaline solution, concentration of gallium in it increases (from 2,36 mg/l to 92 mg/l)

The liberation of gallium from cycling aluminate solutions was carried out by fractional carbonization. Aluminate mother liquor was subjected to fractional carbonization. 90% of alumina is deposited in the first fraction of carbonization, wherein gallium was hardly deposited. The precipitate was separated by filtration. The solution obtained after the first carbonization is subjected to a secondary carbonization till complete precipitation of the remaining aluminium and total gallium. This mixture of aluminium and gallium hydroxides is dissolved in acid and is directed to the extraction for extracting gallium.

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WATER TREATMENT PROCEDURES AND LUMINESCENT ANALYSIS OF ECO-TOXICANT CONTENT IN AQUATIC ENVIRONMENT: CONTEMPORARY TECHNOLOGIES

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Providing high-quality water purification in water supply and sanitation systems is currently one of the priority issues in the Russian Federation. Pollution adversely affects natural sources of fresh water, which fact, in its turn, has a negative impact on human health.

Currently, many methods are available for cleaning sewage and polluted surface waters. In connection with implementation of circulating water systems, use of physical and chemical methods in sewage treatment significantly increases.

Major techniques of the kind are: flotation; adsorption; centrifugation; ion exchange and electrochemical treatment; hyperfiltration; neutralization; extraction; evaporation; distillation; and crystallization.

However, choice of specific water treatment method requires identification of pollutants in treated wastewater.

Luminescent methods are the most sensitive techniques for substance identification. This is vitally important for trace concentration substance analysis of aqueous solutions. Luminescent methods are very promising for determining such eco-toxicants, as polycyclic aromatic hydrocarbons (PAHs) in aquatic environment.

An effective way for intensification of molecular emissive processes is luminophore immobilization on solid substrate. The solid-substrate luminescence method (SSL) is based on this phenomenon.

Sorption of luminophores is performed on various matrices, and the most widespread of those is represented by cellulose matrix.

The objective of this study was a comparison of different luminescence-based methods used for determining PAHs in aqueous media in order to provide follow-up treatment of wastewaters and natural polluted waters.

Sorption concentration in conjunction with measuring analytical signal on the sorbent surface enables lowering detection limit of the test components by several orders of magnitude. Using modified sorbents allows increasing the efficiency of sorption concentration.

Pyrene sorption from aqueous micellar solutions facilitates concentrating the analyte in sorbent surface layer.

We conducted the analysis of PAHs fluorescence spectra in the surfactant-modified cellulose matrix. Based on our results, PAHs fluorescence intensities versus surfactant concentration values in the solution were plotted.

Maximum PAHs fluorescence signals were observed near critical micelle concentration (CMC) of the surfactant.

We observed linear dependence of PAHs fluorescence intensity from PAHs concentration in solutions.

The solid-substrate luminescence method can be recommended for use in various analytical laboratories for controlling PAH content in aquatic environment.

Our study was supported by the Federal Grant No. 5.3922.2017/AS of the Russian Federation Ministry of Education.

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STRATEGIC PLANNING OF REGION DEVELOPMENT

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The dynamic of institutional structure of state, complicated transformational changes in the economy determine the processes of impact of instability on functioning of social-economic systems of various levels including a regional level. Therefore, the issues of improving the system of administration and management technologies, considering the characteristic of the processes of decentralization, extending the rights of the regions, appearance of qualitative new objects of management has acquired a special actuality.

Regionalization of economy urges search of new approaches to management of economy of a region and an enterprise. Modern state of regional administration do not provide complete implementation of main objectives, meaning also the efficiency of functioning the whole network of social-economic structures, which is dealt, first of all, with a poor scientific compound in the total characteristic of processes of planning and management of regional economy.

A scientific approach to elaborating of regional management suggests realization of principles of systematicity, complexity, development of analytical and normative models

for managing social-economic systems. Depending on how rationally the management process is built up, the effectivity of distribution of human, material, financial and natural is measured.

The effectivity of the system of managing a regional economy is defined by the ability to solve most acute problems of social and economic development. Thus, the task of the management is to consequently remove the causes of crises, at the same time working with the mechanisms for stable and dynamic development. It is impossible to solve this task without scientific analysis of the modern situation and the elements of scientific prognosis,

Therefore, to ensure effective management of social-economic processes in a region it is necessary to develop a longtime plan of activities, which enable to combine different elements of state economic policy with resourcal and financial potentials of the region relying on modern, evidently based methodsand technologies. Among primary conditions determining positive processes in Russian economy there are extending of self-financing and enhancing of the role of regions in the processes of development of an economic complex. In the conditions of transformational processes, that are characteristic of modern stage of economic development, the study of problems of regional administration becomes even more actual.

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TRENDS IN THE DEVELOPMENT OF THE BUILDING MATERIALS INDUSTRY

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The strategy for the building materials industry development for the period until 2020, approved by Order No. 262 of the Ministry of Regional Development of the Russian Federation in 30.05.2011, sets the task of intensifying scientific research in the resource saving, waste processing and the environmentally safe construction products release spheres.

Thus, using environmentally friendly building materials that do not have a negative impact on human health and the environment in the construction and finishing is the most important factor in home environmental safety ensuring.

Almost every day new modern materials appear on the construction market. Most of them are not of natural origin, but products of new technologies and synthetic substances use. In the building materials production chemicals, which serve as additives in the building materials manufacture, giving them new properties, extending the lifetime, improving the appearance, are increasingly used.

According to statistics, 75 - 80% of the time we spend in the premises, so the degree

of safety of everything that surrounds us, is of great importance for the human health preservation.

Any housing is firstly trimmed with building materials, and how safe they will be and how this will affect a person's health depends on the sustainable building materials choice.

Such materials production should not be accompanied by harmful substances emissions for the environment, including for humans. When they are used, they also should not emit harmful substances. Their longevity and reliability can not be doubted, and old material disposal should fit into natural ecosystems.

Materials Improvement in the direction of their biopositivity will be carried out in accordance with modern trends (recyclable materials application, increase in their durability and material consumption reduction) and towards natural reproducible materials fuller utilization, new materials creation with specified properties and bio-like materials.

At present, the construction of high-quality, comfortable and environmentally sound housing, based on environmentally friendly technologies, resource and energy conservation, construction materials safe for human health, should become one of the main priorities of Russia's economic and environmental policy.

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ENVIRONMENTAL SAFETY REQUIREMENTS FOR BUILDING MATERIALS

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A truly ecological building material can be called, if it is produced by using such technologies that do not harm the environment, as well as the company's personnel, if a minimum of energy is spent for manufacturing, if the material can be recycled and reused, the material does not emit toxins and has a radioactivity minimum, if after the end of life the material is able to completely decompose.

It is clear that such serious requirements can not meet all the building materials that are needed for the house construction and finishing. Completely environmentally friendly, or biopositive, the material can be considered only if it meets the following criteria: raw materials ecological compatibility (resources renewability, minimum energy consumption during raw materials extraction and preparation); environmentally friendly material production technology (minimum energy consumption in the manufacturing process, minimal environmental pollution, minimum waste amount); environmentally friendly material during operation (materials should not release harmful volatile substances into the air, should not be electrified and accumulate static charges on the

surface, should not screen the geomagnetic field of the Earth); environmentally friendly material disposal at the end of its useful life (reused).

These requirements are satisfied not by many manufactured building materials: wool, felts, cork, stone, corals and their derivatives, natural slate, vegetable wallpaper (jute, bamboo, reed), biobeton, ekoteplin - a natural linen insulation.

Those materials that are produced as a result of minerals processing can be called conditionally environmentally friendly. This may also include those materials which, during production, require a minimum of costs: glass, aluminum, clay products.

Such material should be used as raw material for other materials or reused (recycling). An example of recycling is the use of glass cullet and old glass containers for obtaining new glassware. In this case, there is no need for raw materials extraction, transportation and preparation, and the glass making process accompanied by harmful emissions is eliminated.

In the economy industrialization period and the associated growing urbanization, a transition was made to industrial technologies in the construction complex, which had a negative impact on the environment and human health. Therefore, in connection with the environment state deterioration on the planet, there is an urgent need to green the industrial and civil construction in order to maximize the human needs for environmentally safe living, taking into account the limited natural and regions and cities resource potential.

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PROBLEMS OF WASTE DISPOSAL OIL PRODUCTION (SULFUR AND PARAFFINS) IN KAZAKHSTAN

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In connection with the depletion of light oil reserves, interest in hard-to-extract, high-viscosity and paraffinic oils has increased in the world. It is known that in Kazakhstan more than 70% of oil with a high content of paraffins is extracted annually. The collection and transportation of such oils poses a number of complex technical problems for the oil industry. The chemical composition of oil and its physical properties are closely related to the methods of its extraction and transportation. Concentration of paraffins, asphaltenes and resins leads to an increase in the density and viscosity of oil, changes its colloidal structure and rheological characteristics, oil becomes difficult to recover. Paraffin deposits in the downhole zone of the reservoir and on the surface of oilfield equipment are one of the major complications in the operation of wells, systems for collecting and preparing well production. Paraffin deposits reduce the filtration characteristics of the formation, reduce the useful cross-section

of the tubing and, as a result, significantly complicate the extraction and transportation of oil, increase the power consumption with a mechanized method of production, lead to increased wear of the equipment. Determination of the regularities of changes in the physicochemical properties of paraffinic oils can be used to increase the extraction efficiency, to study rheological characteristics, to select the most rational technologies for increasing oil recovery, transportation, processing and storage of such oils. For paraffin, there are oils with a paraffin content of more than 6%. One of the most important factors affecting the conditions of oil production and pumping through oil pipelines and its further storage is the component composition of oil, on which its physicochemical and rheological properties depend. Therefore, the study of the component composition and physical and chemical properties of oil is the basis for optimizing the conditions for the extraction, transportation and storage of oil. Paraffinic oils of Kazakhstan are viscous in average, they belong to the subclass of oils with increased viscosity ($35-100 \cdot 10^{-4} \text{ m}^2 / \text{s}$), average density ($840-880 \text{ kg} / \text{m}^3$), belong to the subclass of high paraffin oil (10-20%), low-sulfur (up to 0.5%), resinous (8-13%), low-asphaltenic (up to 3%), low in the fraction of nc. 200°C (<20%) and the average content of the fraction n.c. 300°C (25-50%).

Another feature of Kazakhstani oil is the high content of sulfur compounds. Oil and associated gas of Tengiz oil contains about 14% of hydrogen sulphide and mercaptans. In Kashagan oil, the extraction of which will start at sea, the content of hydrogen sulphide is even higher - up to 20 percent. Thus, when oil is extracted in Kazakhstan's fields, there are complex environmental problems in storing oil production wastes and their utilization, which adversely affect the health of the population and the environment. Studies have shown that at a distance of up to 70 kilometers the earth became infertile. It is necessary to conduct reclamation, remove the top layer, bring the soil and create a "green belt". The main ways of detrimental impact on the environment with open block storage of Tengiz sulfur are: microbiological oxidation of sulfur with the formation of sulfuric acid; sublimation of sulfur; dust formation of elemental sulfur; separation of residual hydrogen sulphide from the sulfur block.

Thus, the peculiarities of the chemical composition of Kazakhstani oils cause the problem not only for its cleaning from paraffinic compounds and sulfur compounds, but also a problem of their utilization. In our work, it is proposed to use oil production waste in the production of rubber as various ingredients: sulfur in the form of a vulcanizing agent, and paraffins in the form of softeners and plasticizers. Paraffin is used in the production of rubber: tires, gaskets, conveyor belts, hoses, gloves, toys and many other rubber products. Rubber and tire production uses micro and macrocrystalline paraffin with a melting point of 52 to 74°C . Preliminary tests have shown the prospects of using sulfur and paraffins in the manufacture of certain types of rubber tires: rubber filler cord compounds and for insulation of bead rings.

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USE OF MEDICINAL PLANTS FOR OBTAINING BIOLOGICALLY ACTIVE COMPOUNDS

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Medicinal substances prepared from plant raw materials are especially effective in the treatment of chronic diseases, do not cause side effects during their use and are not toxic in comparison with synthetic drugs. Probably, therefore, in recent years in developed countries, the basic components for the production of medicines are natural compounds of plant origin.

In Kazakhstan, there are more than 20,000 plant species, 6,000 of which contain biologically active substances. Of these six thousand 600 species can be used as a semi-finished product for the production of medicinal substances.

Biologically active substances (BAS) are special chemicals that have a low concentration of high biological activity to certain groups of cells. BAS is used in medicine and as a preventive maintenance of diseases, and also for maintenance of high-grade vital activity. Flavones and flavonoids contained in plants are vital substances in the human body, which contribute to stimulation of the human immune system. Quercetin is a plant flavonoid found in many fruits and vegetables. The main advantage of quercetin is that it is a powerful antioxidant that helps fight free radicals that damage cell membranes and DNA and cause cell death. The main properties of quercetin are: antiviral; antimicrobial; anti-inflammatory; antineoplastic; antiallergic. According to studies, quercetin has a strong effect on inflammation caused by an elevated content of leukocytes. Being one of the powerful bioflavonoids, it helps to slow down the aging process and plays an important role in the formation of the human immune system, as it reduces oxidative reactions in the body that are directly related to poor nutrition, stress level, and toxins on the human body. Currently used in the industry, the chemical method of obtaining dihydroquercetin has a number of disadvantages, chief among which are low yields of the final product, insufficient purity and stability of the product obtained. Electrochemical reduction of quercetin allows to obtain a cleaner product with high yield. The mechanism of electroreduction of quercetin at $\varphi_k = -0.95$ is established by methods of capacitive measurements and preparative electrolysis at a controlled potential of the working electrode. Adsorbed quercetin on the lead electrode is reduced to dihydroquercetin.

Our studies have shown the possibility of obtaining quercetin electrochemically using voltammetry with a rotating disk electrode. It has been established that quercetin in aqueous solutions of H₂SO₄ is adsorbed on the surface of lead, platinum and copper electrodes in a wide range of cathode potentials ($\varphi_k = -0.5 - 2.5$ V). Electrochemical measurements: potentiometry, determination of the capacity of the double electrical layer, search experiments on the electrochemical synthesis of dihydroquercetin from

quercetin make it possible to determine the optimal electrodes for electroreduction and electrooxidation, the range of the anode and cathodic current density, pH of the medium, the use of inorganic organic solutions of electrolytes to establish the process electrochemical synthesis of dihydroquercetin.

The molecular weight was determined by the cryoscopic method in glacial acetic acid. The belonging of products to a certain class of connections was revealed in the following way. The content of unsaturated $-C = C-$ bonds was determined by Gorbach's micro-method, carbonyl groups by the method. The quantitative analysis for the methoxy group was carried out using the modified Zeissel-Fibek method. Thin-layer chromatography on a non-anchored layer of aluminum dioxide of the II degree of activity (according to Brockman) was used both for separation and for identification and quantitative determination of substances. The determination of the structure of the obtained substances was carried out by removing the IR, NMR and mass spectra. In carrying out biological tests, it has been proven that quercetin obtained has a high biological activity.

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ELECTROCHEMICAL SYNTHESIS OF BIOLOGICALLY ACTIVE COMPOUNDS FROM PLANTS IN SOUTHERN KAZAKHSTAN

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At the Shymkent chemical plant from the plant raw materials, medicinal substances are obtained by extraction: morphine, codeine, papaverine, etc., and the accompanying alkaloids go to the dump, because some of them show toxicity, others are ineffective, and some do not have any physiological activity. Until now, these by-products are not stored in storage facilities. But the structures of these alkaloids make it possible to obtain on their basis the biologically active substances by modifying their structure by introducing new functional groups $-OH$, $-OCH_3$, $-OC_2H_5$, $-NO_2$.

Flavones and flavonoids, like alkaloids contained in plants, are chemical compounds that are vital for the human body when stimulating the human immune system. Based on biomedical tests, it has been established that biologically active compounds obtained by electrosynthesis have antitumor, platelet, antioxidant properties, as well as P-vitamin activity.

The design is a cylindrical glass vessel with thermostating jacket, drain cock and ground cap with openings for working electrode, electrolytic key and thermometer. The electrode spaces were separated by a glass diaphragm. This design of the electrolytic cell made it possible to conduct preliminary polarization of the working electrode for the purpose of its electrochemical activity in the same solution. All measurements were carried out at a temperature of 25 ± 0.1 °C and an electric speed of ≈ 2000 rpm, which was selected on the basis of preliminary research data.

Platinum, lead and graphite disks with a diameter of $\varphi = 1, 2, 0,8$ and 4 mm were used as the working electrode. The auxiliary electrode was a platinum platinum with a geometric surface of 1 cm^2 . The potentials of the electrode were measured in acidic solutions with respect to mercury-sulfate, and in the alkaline solutions - mercury-oxide comparison electrode. Multiple cathode-anodic polarization was used, leading to activation of the surface. Satisfactory recovery was achieved with prolonged anodic polarization and when combined with preliminary oxidation of the surface of the electrode by chemical oxidants. Satisfactory reproducibility was achieved by empirical selection of the electrode treatment mode for each particular case. This is because the reproducibility of polarization measurements depends on the region of potentials under investigation and, in particular, on the nature of the solvent and the electrolyte.

To carry out polarization measurements in aqueous solutions of electrolytes with alkaloid additives, the following procedure for preparing a platinum electrode was used: immediately before each series of measurements, the electrode was kept for 2 minutes in concentrated sulfuric acid and anodically polarized in $10\% \text{ H}_2\text{SO}_4$ of current density $2 \cdot 10^{-3} \text{ A/cm}^2$ for 38 min. Then, the density was adjusted to the value corresponding to the first measurable point, the electrode was washed and immersed in the test solution. For polarization measurements in an alcohol medium, a technique for preliminary preparation of the surface of a platinum electrode was used: immediately before measurements, the electrode was annealed in the oxidizing flame of a gas burner, kept for five minutes in succession in the concentration of nitric and sulfuric acids. Then, the electrode was anodically polarized in an aqueous solution of H_2SO_4 (IM) for 45 minutes at $i_a = 2,5 \cdot 10^{-3} \text{ A/cm}^2$. At the end of the polarization, the current density was adjusted to the value corresponding to the first measured point, the electrode was washed with fresh portions of the corresponding alcohol and immersed in the test solution. With this technique of preliminary preparation of the working electrode surface, the discrepancies in the potentials in the parallel measurements do not exceed $\pm 10 \text{ mV}$. The removal of each polarization curve was carried out in fresh solution. The belonging of products to a certain class of connections was revealed in the following way. The content of unsaturated $\text{-C}=\text{C-}$ bonds and carbonyl groups was determined by Gorbach's micro-method. The quantitative analysis for the methoxy group was performed according to the modified Zeissel-Fibek method

Thus, based on the results of voltammetric and capacitive studies of the behavior of lead, platinum and graphite electrodes in aqueous sulfuric acid solutions in the presence of biologically active compounds of alkaloid groups in cathode and graphite electrodes and in anode processes, the following conclusion can be drawn: all the alkaloids investigated cause the cathode process to be polarized lead, platinum and graphite electrodes in the region $V_k = -0.15 \div 1.6 \text{ V}$, which is caused by the adsorption of alkaloids on the surface of the electrodes. The effectiveness of the new production method is manifested in the selectivity of the process for obtaining valuable biologically active compounds; when using the usual technology - the yield of alkaloid mecetin is 20-30% of the total amount of raw materials used.

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CHALLENGES FOR UNIVERSITIES IN THE DIGITAL ECONOMY

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Numeric (in other cases, electronic, mobile, digital) economy has become a new part of the global and the national economy of each country.

In 1995, the American architect Nicholas Negroponte made conclusion about the transition from processing atoms to processing bits, and formulated the concept of digital economy. In the e-economy can ignore the cost of maintaining the counter, the contents of the warehouse, remuneration and social security contributions sellers, window dressing - what in trade is called net costs. Plus a very quick movement of goods anywhere in the world. E-Commerce is not only in goods but also with services IT companies and with companies associated with electronic Commerce.

According to the results of the BOC (Boston Consulting Group) survey, Russia still has a low level of digital economy in comparison with the developed countries, but there is every reason to assert that in the near future Russia will become one of the leading countries in this direction.

The report of World Bank has three theses:

- the digital economy is in the making;
- it is based on the rapid (in geometric progression) distribution of the Internet and its programs;
- the digital economy will form the best opportunities for a market economy and to smooth out its crises.

The modern global economy shows that there is an uneven development of the electronic market in different countries.

Expert assessments of the development of countries in the field of digital technologies are provided not only by the World Bank, but also by BCG, and also by Mastercard in cooperation with the Fletcher School of Law and Diplomacy, which build country ratings on the basis of the Digital Evolution Index 2017. The calculation is based on 4 main parameters: consumer demand for digital technologies, the level of supply, the institutional environment for digital business and the innovative climate in the state. According to this rating, Singapore, the United States, Great Britain, New Zealand, Estonia, the United Arab Emirates, Japan, Hong Kong and Israel are recognized as the leading countries among 60 countries of the world.

Lagging and troubled countries - Peru, Egypt, Pakistan, Greece, South Africa. At the same time, Russia, India, China, Malaysia, Kenya, the Philippines, Brazil, Indonesia, Chile, Colombia and Mexico are potential leaders, since the digital economy has good growth rates, and the level of digitalization of society is high.

The digitalization of the world requires research in this area. Still not identified as the

essence and content of the digital economy and methods of its accounting and statistics.

The most general characteristic of the digital economy is the economy based on information and computer technologies (ICT).

Thus, in a digital economy enabled by electronic payments, electronic banking, e-Commerce, online games, online music, online movies, e-books, online tourism, online advertising. From our point of view, this sector should be included and the currency exchange market, Forex, working exclusively on the basis of Internet connections and Internet programs, as well as the institutions of the cryptocurrencies that exist solely in digital form.

Typology of the directions of the digital economy, proposed by RAEC is based on 8 hubs (the hub is the direction of the development of the Internet and its subsystems). Hubs include: Society and the State, Marketing and Advertising, Finance and Commerce, Infrastructure and Communication, Media and Entertainment, Cybersecurity, Education and Human Resources, Start-ups and Investment.

The description of each hub indicates the thoroughness of RAEC researchers. But the content of the analysis of hubs is somewhat different from the economic analysis as such. In other words, there is a need to include subjects related to economic analysis in the curricula of the faculties that prepare personnel in the field of informatics, or to include subjects related to the digitalization of the economy in the training and retraining programs for economists. That is, the time of extensive intersubject communications between informatics and economists has come.

It is necessary to develop disciplines related to the digital economy, taking into account the prospects of Internet technologies for national development.

It is also necessary to agree on research algorithms and the formation of ratings of countries in the field of the digital economy, since none of the compilers of such a rating has yet submitted their methods, showing only the results.

In addition, efforts should be made to develop a national system for assessing the digitalization of society, taking into account Internet users and related areas of ICT. RAEC initiated this process, but university employees cannot stand aside from these tasks.

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SORPTION METHODS IN REHABILITATION OF RADIOACTIVELY CONTAMINATED LANDS USING SURFACE-MODIFIED SORBENTS BASED ON NATURAL ALUMINOSILICATES

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In spite of improved safety measures on nuclear fuel cycle enterprises, infrequent radiation accidents may lead to radioactive contamination of spacious areas, water bodies

and farming lands. According to assessment of Japan Atomic Energy Agency (JAEA) and the Nuclear Safety Commission of Japan, approximately $1.1 \cdot 10^{16}$ Bq of ^{137}Cs and ^{134}Cs were emitted into atmosphere after Fukushima accident in 2011. Density of pollution by ^{134}Cs and ^{137}Cs radionuclides in the most contaminated regions of Japan is from 10 to $1 \cdot 10^4$ kBq m^{-2} . Specific activity of soils varied from 0.1 to 380 kBq kg^{-1} , while those of vegetation were 68 to 968 kBq kg^{-1} . High density of population in Japan and lack of free territories make necessary remediation of radioactively contaminated lands for decreasing of radiation hazard and returning of population to abiding places as well as for returning of low contaminated soils to farming use.

Addition of sorption-active substances may be an effective method of remediation of soils with the aim of their returning to farming use, if used sorbents will possess affinity to natural systems, high selectivity to radionuclides and irreversibility of sorption for strong retention of radionuclides and prevention of their migration and transfer through food chains. A number of publications suggest using natural aluminosilicates and sorbents based on them for remediation of contaminated lands, however, these publications do not contain comparative analysis of using of various materials, questions of selectivity and reversibility of sorption are also not discussed.

The comparative study of selectivity and reversibility of radiocaesium and radiostrontium sorption by natural aluminosilicates (glauconite and clinoptilolite) as well as by modified ferrocyanide sorbents, based on these aluminosilicates, is made. The assessment of possibility of these sorbents using for remediation of radioactively contaminated lands, as a result of radiation accidents (including Fukushima accident), with the aim of their returning to farming use is also made. It is shown that surface modification of aluminosilicates by ferrocyanides allows to increase selectivity of synthesized sorbents to caesium in 100-1000 times, to increase sorption capacity, to make caesium sorption almost irreversible, meanwhile, selectivity of these sorbents to strontium radionuclides remains approximately the same as for natural aluminosilicates. Caesium distribution coefficient for mixed nickel-potassium ferrocyanide on glauconite is $10^{(5.0 \pm 0.6)}$ mL g^{-1} , static exchange capacity (SEC) is 63 mg g^{-1} ; for mixed nickel-potassium ferrocyanide based on clinoptilolite caesium distribution coefficients in various concentration ranges are $10^{(7.0 \pm 1.0)}$, $10^{(5.7 \pm 0.4)}$ and $10^{(3.2 \pm 0.7)}$ mL g^{-1} , total SEC is 500 mg g^{-1} .

Reversibility of sorption of caesium by natural aluminosilicates and ferrocyanide sorbents based on aluminosilicates was determined as caesium leaching degrees and leaching rates from samples, saturated by radionuclides. Caesium leaching by various leachants from saturated mixed nickel-potassium ferrocyanide based on clinoptilolite was lower than 2%, from saturated mixed nickel-potassium ferrocyanide based on glauconite was – 1.5 – 14.6%.

Ferrocyanide sorbents, based on glauconite and clinoptilolite, are recommended for remediation of lands, contaminated by caesium as a result of Fukushima accident in Japan. Using of these sorbents will allow decreasing transfer of caesium to agricultural vegetation in up to 20 times.

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