МІНІСТЕРСТВО НАУКИ І ОСВІТИ, МОЛОДІ ТА СПОРТУ УКРАЇНИ
ДНІПРОПЕТРОВЬКИЙ НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ ІМЕНІ ОЛЕСЯ ГОНЧАРА
ФАКУЛЬТЕТ УКРАЇНСЬКОЇ Й ІНОЗЕМНОЇ ФІЛОЛОГІЇ ТА МИСТЕЦТВОЗНАВСТВА
КАФЕДРА ІНОЗЕМНИХ МОВ ДЛЯ СОЦІАЛЬНО-ЕКОНОМІЧНИХ СПЕЦІАЛЬНОСТЕЙ
КАФЕДРА ІНОЗЕМНИХ МОВ ДЛЯ ІНЖЕНЕРНО-ТЕХНІЧНИХ
ТА ПРИРОДНИЧИХ СПЕЦІАЛЬНОСТЕЙ

АКТУАЛЬНІ ДОСЛІДЖЕННЯ В СФЕРІ СОЦІАЛЬНО-ЕКОНОМІЧНИХ, ТЕХНІЧНИХ І ПРИРОДНИЧИХ НАУК ТА НОВІТНІХ ТЕХНОЛОГІЙ

Матеріали Регіональної студентської
науково-практичної конференції

Дніпропетровськ • 4–5 квітня 2013 р.

У трьох томах

Том 3. Сучасні дослідження в сфері технічних і природничих наук

Дніпропетровськ
Видавець Біла К.О.
2013

УДК 30+62
ББК 65
А 43

ОРГАНІЗАЦІЙНИЙ КОМІТЕТ

А 43 Актуальні дослідження в сфері соціально-економічних, технічних і природничих наук та новітніх технологій : матеріали Регіон. студ. наук.-практ. конф., 4–5 квіт. 2013 р. : у 3 т. – Дніпропетровськ : Біла К. О., 2013.

ISBN 978-617-645-114-3

Т. 3 : Сучасні дослідження в сфері технічних і природничих наук. – 2013. – 96 с.

ISBN 978-617-645-117-4

У збірнику надруковано матеріали регіональної студентської науково-практичної конференції «Актуальні дослідження в сфері соціально-економічних, технічних і природничих наук та новітніх технологій», яка відбулася 4–5 квітня 2013 року в Дніпропетровському національному університеті ім. О.Гончара.

Для студентів, аспірантів, викладачів ВНЗів та наукових закладів.

УДК 30+62
ББК 65

ISBN 978-617-645-114-3

ISBN 978-617-645-117-4 (Т. 3)

Babkin V.

Oles Honchar Dnipropetrovsk National University

OPTICAL BUILDER

While studying the «Geometrical optics» of the school course of physics, I noticed the absence of some optical objects demonstration (e.g. thick lenses and balls). That's how the idea of "Optical Builder" program appeared. The aim is to create a piece of software, which can build path of rays inside an optical system, consisting of such objects, automatically. Having conducted the review of existing software programs, I found that some similar ones already exist. But none of them include thick lenses or prisms, for example. We cannot take into consideration the professional software for physical modeling, because, on one hand hardly anyone can afford it because of its price and complexity. On the other hand it requires quite a powerful computer or, more precisely, powerful hardware. That's the reason for writing some software with the same aim, but which works with slightly different objects, than existing programs do. And, one of the objectives was to make it user-friendly and easy to use, so that people, who are not familiar with the optics very much, can use it. Also, the program should not require powerful hardware.

Target audience is the people, who start to learn optics, and those, who need to visualize their own optical systems:

- Pupils, who study optics at school
- Teachers of physics and astronomy (e.g., possibility to show simplified model of a telescope on the astronomy lesson make this program useful)
- and others

Benefits of using the virtual environment are obvious: there is no need to keep lenses, prisms and other objects, no need to fill the room with dust, the greater visibility of the experiment (it is not that easy to make a thin ray. Also, it can hardly be seen). To use it is enough to have at least one computer and not necessarily a powerful one by today's standards (the description follows).

Resulting software requires installed Microsoft .NET 2.0, OS Microsoft Windows XP or later (there is a theoretical possibility to launch this application on Windows 98, but this was not checked), OpenGL-compatible video card, installed Adobe Reader 9 (not necessary). Required operative memory varies according to used OS. Program uses approximately 60-80 megabytes of operative memory for system consisting of 10 optical objects and 10 rays (which is enough for its main aims, because larger system is hard to percept). Thus, 512 megabytes should be enough for any operating system (if its requirements do not set other limits). As one can see, this application will work on the most of the nowadays computers.

Conclusion: A software product which allows demonstrations of optical systems was written. It does not demand fast hardware, any special knowledge to be used, and thus can be applied in most of the schools and universities to conduct experiments in virtual environment.

Baboshkin I. I., Kuzmenko V. I., Atanova M. Y.

Oles Honchar Dnipropetrovsk National University

COMPUTER MODELING OF MASSIVE STRUCTURES BEHAVIOR ON HETEROGENEOUS BASES

Nowadays building must be carried out on heterogeneous bases. That is why it is very important to carry out a research of non-uniform settlings which appears as the result of bases' heterogeneity. Important results were received for elastoplastic multilayer bases in work [1].

Plane deformation of heterogeneous band is being researched. The properties of the band are described by Lamé parameters λ and μ in each point of the band. The band is being deformed under the influence of the massive stamp with a flat foundation. As a result of the band deformation the stamp receives vertical shift (settling) Δ and rotation φ, that are considered to be given (Fig. 1).

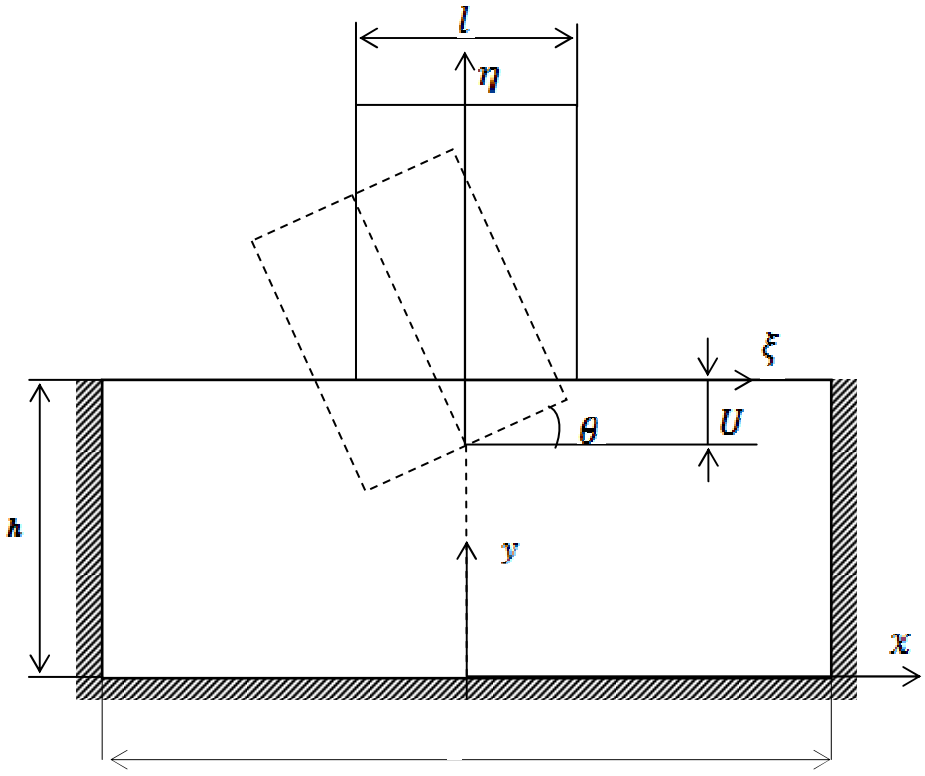

Fig. 1. Rotation and shift of the stamp

The problem is to find components of displacement vector $\mathbf{u_i(x,y)}$, small deformation tensor $\boldsymbol{\varepsilon_{ij}(x,y)}$ and stress tensor $\boldsymbol{\sigma_{ij}(x,y)}$. Mentioned characteristics have to satisfy equations of equilibrium, Cauchy relations and determinative relations. Moreover, conditions

$$u_y(x,y) = -(\Delta - \varphi\xi); u_\tau(x,y) = 0.$$

must be satisfied on contact area of the stamp and the band.

Extremal variational problem for the specified problem was received using typical method given in [2]:

$$\inf_{u_i^* \in V} \left\{ J(u_i^*) = \int_\Omega W(\varepsilon_{ij}^*) d\Omega \right\}.$$

For discretization of the problem was used finite-element mesh. We received a linear system of equations that was solved using method of successive over-relaxation (SOR). To get stamp's settlings by its weight we solve nonlinear equation

$$P(\Delta) = \int_k \sigma_y dx = P^*.$$

Built model also takes into consideration creep [4].

We got the following results:

1. The numerical solution of given problem was received. The practical convergence of approximated solutions was shown.

2. The relation between settlings and creep properties of the band was shown. The relation between contact stresses and band thickness.

3. The results can be applied for evaluation of buildings' settlings and rotations on heterogeneous bases.

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Boot V., Tsvetayeva O.

Oles Honchar Dnipropetrovsk National University

DESERTIFICATION

Nowadays desertification is one of the most important global problems.

Desertification – is a process of irreversible changes in soil and vegetation, reducing the biological productivity, which in extreme cases can lead to complete destruction of the capacity of the biosphere and transformation of the territory into the desert.

In the issue of human activity more than 9 million square kilometers of deserts appeared in the last quarter of XX century and altogether they have already covered an around 43 % of the total land area. This process spreads so widely that became the subject of an international program «Desertification».

The process of desertification is usually caused by the combined effect of nature and people. The destruction of sparse vegetation due to over-grazing, felling of trees and shrubs, plowing land unsuitable for agriculture and other economic activities, the fragile balance of nature, multiply the effects of wind erosion, desiccation topsoil. Because of this water balance greatly disturbed, the level of ground water reduced and dry wells. The soil structure was destroyed and its saturation with mineral salts is increasing. Due to excessive economic burden complexly organized basin-river systems become organized primitive desert landscapes.

The consequences of desertification include:

• diminished food production and reduction of fertility of soils and the land's natural ability to recover;

• intensification of floods in down streams, degradation of water quality, sedimentation in rivers and lakes, siltation of reservoirs and navigation channels;

• worsening of people’s health because of wind-blown dust;

• violation of habitual way of life of affected people that forced to migrate to other areas.

This problem became threaten to 3.6 million hectares of arid land in the nineties. It’s 70 % of potentially productive dry lands and, what is more, these figures do not include the area of natural deserts. An around sixth of world population suffers from this process.

Desertification can take place in different weather conditions, but it occurs mostly in hot and dry parts of word. There are third of all arid regions of our planet are in Africa; they also are widespread in Asia, Latin America and Australia. 6 million hectares of cultivated agricultural areas are affected by desertifications, that damage them absolutely; and over 20 million hectares of them reduce their product ability. This is the speed of the moving forward the line of unrecoverable damages.

UN experts say, today's loss of productive land will lead to the end of the century the world could lose almost one third of its arable land. Such a loss in a period of unprecedented population growth and increasing demand for food can be truly disastrous.

We should try to solve this problem by a consolidation of our forces, first of all, because this process only in some measure due to natural factors. Mostly, desertification is a consequence of anthropogenic factors and it becomes so dangerous mainly because of irrational, and sometimes even haughty, people's attitude to nature. That is why The General Assembly of the United Nations decided to declare the period from January 2010 to December 2020 the UN Decade that dedicated to deserts and combating desertification. The decade will become a good opportunity for realization of changes which are required for dry lands. It will be benefit for people for a long time.

Bordunos K., Golodok L., Bondar O.

Oles Honchar Dnipropetrovsk National University

BIOLOGICAL FEATURES OF BACILLUS BACTERIA

In recent decades, the growth of dysbiotic intestinal diseases have been noted. Changes in the ecological state of the environment, poor nutrition, acute intestinal infections, chronic diseases and dysfunction of the gastrointestinal tract, the widespread use of antibiotics, decreased immune reactivity may be the causes of disturbed equilibrium between the resident microflora and of intestinal dysbiosis. The need to monitor the intestine microbicenosis of infants and children during the first years of life is of particular importance, as initially formed microbial set, determines microbiological status a child throughout a life. At significant deviations of the normal flora of the body it is necessary to correcti it by introducing products based on microbial cultures – probiotics.

The research on creating more sophisticated and active drugs on the basis of various groups of obligate microflora microorganisms are conducted worldwide. The mportant role in these experiments is occupied by *Bacillus* bacteria, forming the basis of many well-known probiotics (Biosporin, baktosubtilin, subalin, enterohermin, biosubtilin).

These microorganisms, due to high adaptive capacity, are widely spread in nature, especially in those objects with which people contact as closely as possible (air, water, food, etc.). Therefore bacilli enter the human body continuously and in large quantities, preserving activity throughout the gastrointestinal tract. Furthermore, *Bacillus* bacteria are an important component of the exogenous microflora and areconsidered to be the most effective to create biological products.

One of the conditions of any strain of bacteria of the genus *Bacillus* to create a biological product is its antagonistic action against the conditionally and pathogenic and pathogenic microorganisms, and also display of different types of activity, which resulted into the aim of work.

Making preparations for the correction of dysbiotic violations is very important nowadays. We have identified strains of Bacillus bacteria, investigated the enzymatic activity of these strains and have shown that they exhibit antagonistic, cellulolytic, xylanaselytic activies and some of them can show pektynase and polihalakturonase activity. Out of 12 identified strains of aerobic spore-forming bacilli – 83.3% showed antagonistic activity to *C. albicans*, and 75% showed activity to S. aureus. To *S. flexnery* antagonistic activity has not been identified. All strains of the investigated bacilli are producers of cellulase, 80% are capable of xylanaselytic activity and only in some strains polihalakturonase and pectin esterase have been. This indicates that the identifed strains can be used as probiotic preparations for correction of dysbiotic disorders of the human gastrointestinal tract.

Derkachova V. V., Vareh N. V., Atanova M. Y.

Oles Honchar Dnipropetrovsk National University

RESEARCH OF THE SYSTEMS WITH THE EVEN AMOUNT OF DIFFERENTIAL EQUATIONS WITH DEVIATING ARGUMENT

This work deals with the research of the systems of differential equations with deviations of arguments with the even amount of equations.

Let us consider the following system:

$$\begin{cases} y_i'(t) = a_i(t) y_{i+1}^{\alpha_{i+1}}(\tau_{i+1}(t)), i = 1,2,3 \\ y_4'(t) = a_4(t) y_1^{\alpha}(\tau_1(t)), \alpha = \alpha_1 \end{cases} \quad (1)$$

where α_i – is relation of odd numbers,

$$\tau_i(t) \in C[t_0, \infty), \ \tau_i(t) \le t, \ \lim_{t\to\infty} \tau_i(t) = \infty, \ (i = \overline{1,4}).$$

The results of research of solutions of the system (1) ($\tau_i(t) \equiv t$, i=1, n-1), when $\alpha_i = 1$, i = 1,2,3; $0 < \alpha < 1$ have been presented in the paper [1]. Unlike of that work the delays of arguments are included in every equation in this one. We'll adduce one of the got results.

Theorem 1. Let the conditions be executed: $\int_{t_0}^{\infty} a_1(t)dt = \int_{t_0}^{\infty} a_2(t)dt = \int_{t_0}^{\infty} a_3(t)dt = \int_{t_0}^{\infty} a_4(t) = \infty$, then every solution of the system (1) either oscillates strongly, or each its component tends to zero or to infinity at $t \to \infty$.

The condition $\int_{t_0}^{\infty} a_4(t) = \infty$ is very severe, that's why we improved it with additional conditions $0 < \alpha_1\alpha_2\alpha_3\alpha_4 < 1$.

Theorem2. Let the conditions be executed:

1) $0 < \alpha_1\alpha_2\alpha_3\alpha_4 < 1$,

3) $$\int_{t_0}^{\infty} a_1(t)dt = \int_{t_0}^{\infty} a_2(t)dt = \int_{t_0}^{\infty} a_3(t)dt = \infty, \quad (2)$$

4) $$\int_{t_0}^{\infty} a_4(t)\left[\int_{t_0}^{\tau_1(t)} a_1(z)\left(\int_{t_0}^{\tau_2(z)} a_2(s)\left(\int_{t_0}^{\tau_3(s)} a_3(x)dx\right)^{\alpha_3} ds\right)^{\alpha_2} dz\right]^{\alpha_1} dt = \infty, \quad (3)$$

5) $$\int_{t_0}^{\infty} a_1(t)\left(\int_{x}^{2x} a_2(z)\left(\int_{z}^{2z} a_3(p)\left(\int_{p}^{2p} a_4(s)ds\right)^{\alpha_4} dp\right)^{\alpha_3} dz\right)^{\alpha_2} dx = \infty. \quad (4)$$

6) $$\int_{t_0}^{t} a_4(t)\left(\int_{t_0}^{\tau_1(t)/2} a_1(z)\left(\int_{t_0}^{\tau_2(z)} a_2(x)\left(\int_{x}^{2x} a_3(s)ds\right)^{\alpha_3} dx\right)^{\alpha_2} dz\right)^{\alpha_1} dt = \infty \quad (5)$$

Then every solution of the system (1) either oscillates strongly, or each its component tends to zero or to infinity as $t \to \infty$.

The formulated result relates to researches on finite interval.

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Dolgoborodova S., Tsvetaeva E.

Oles Honchar Dnipropetrovsk National University

PROBLEMS OF SOLID WASTE DISPOSAL

Ukraine has huge reserves of black soil – the best soil in the world. However, the current situation with the ground is handling. Domestic waste disposal is an issue that is important to the management of any urban area. Cities without a functioning waste-disposal plan face risks of disease running rampant and economic activity grinding to a halt.

Prior to the Industrial Revolution, what was considered waste was mostly vegetable matter, bones, wood, fire ash and dead bodies. This material was buried in the ground to act as compost. People repaired and continued to use whatever they could, so recycling was the norm. Waste disposal systems were developed as a result of increased populations in city environments and increased types of waste. At the beginning of the twentieth century, paper cups and towels began adding to the debris, and by 1953, TV dinners were created, resulting in more disposable packaging waste [1].

About 500 years BC in Athens was issued the first known edict banning throw garbage on the streets, providing for the organization of special landfills and dump the waste scavengers prescriptive no closer than a mile from the city. Since the garbage deposited in different places in rural areas. As a result of urban growth vacant space in their neighborhood declined, were unpleasant odors, increased the number of rats, caused by landfills, became intolerable. Freestanding dumps were replaced wells for storage of garbage.

A landfill may offer a cheap solution to large amounts of trash, but incineration can quickly reduce the volume. An efficient and environmentally sound incinerator does not simply burn whatever trash there is lying around. Scrubbers and filters prevent acidic gases from release and prevent ash from burning into the air. Some incinerators recycle and reuse refuse as fuel to burn non-recyclable materials.

Incineration reduces waste materials into their base components by burning them. This process generates heat, which is then used for energy. The by-products of this disposal method include various gases and inert ash. Incineration produces various levels of pollution depending on the incinerator design and the waste material being burned [2]. Filters can minimize the pollution. Incineration has a higher financial value. However, it is more expensive than disposing in a landfill. Incineration reduces waste volume by up to 90 percent of the original refuse. The resulting ash can provide nutrients for hydroponic solutions. It is the preferred method for disposing of toxic chemicals and hazardous wastes.

Open burning of solid waste greatly reduces its volume, thereby decreasing the stress on a dumpsite. Open burning releases toxic gases directly into the atmosphere and has many negative effects on our environment. The poisonous gases that are released into the atmosphere are harmful for humans as well as other animals. Many cities that have used these stoves, soon abandoned them because of the deterioration of the air. The dumping of wastes remains one of the most popular methods for solving this problem.

Making a new product requires a lot of materials and energy: raw materials must be extracted from the earth, and the product must be fabricated and then transported to wherever it will be sold. Reduction and reuse are the most effective ways you can save natural resources, protect the environment, and save money. Recycling has two main benefits for the environment:

- It reduces energy wastage due to the burning of harmful fossil fuels during production.

• It reduces the amount of waste that is either incinerated (which itself produces harmful fumes) or placed a landfill site.

Recycling is the most environmentally friendly method to dispose of waste because it does not add any waste material. The downside of recycling is that only certain items can be recycled, and processing plants are expensive to operate and maintain.

Of course, the experience of each country is unique in its kind. In each case, the solution of problems related to the disposal of solid waste, must comply with the specific region. It is important to take into account the situation in the economy of the state, the state of the existing infrastructure for the collection and disposal of solid waste, and, in the end, the ability and willingness of society to embody the political decisions in real life.

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Dorogan V., Posudiyevs'ka O. R., Tsokur N. I.

Oles Honchar Dnipropetrovsk National University

THE CURRENT RESEARCH IN THE FIELD OF TECHNICAL AND NATURAL SCIENCES

The chemical industry provides the national economy a large variety of products. The life of modern society would be impossible without them. As a result of chemical processing of fossil fuels (coal, oil, shale and turf) the national economy receives such important products as coke, engine fuels, oils, flammable gases and other organic substances. The bases of chemical technology are also used in the rocket –building and in the military field (manufacturing of weapons,

bullet-proof vests, means of protection against radiation, armor for tanks). Due to chemistry, modern metallurgical industry and mechanical engineering, space technologies, air and motor transport, manufacturing of construction materials and of the majority of consumer goods developed very rapidly. Modern investigations in the technical sphere are aimed at the improvement of the quality of products, creation of new materials with certain properties, development of manufacturing with the purpose of production of goods for electronics, medicine, high-quality plastics and biotechnological products.

The problems of chemical industry include the increase of prices for raw materials and energy, pollution of environment, necessity of purification equipment, costs for large-scale scientific research as well as design engineering being necessary to ensure a high technical and economic level of new manufacturing. The most part of toxic waste is created in Donetsk, Dnepropetrovsk, Lugansk, Zaporozhye and Kirovograd regions.

Modern technologies allow to obtain synthetic rubber with better properties. Much attention is paid to the development of composite materials consisting of components with different properties. These materials include the basis with the distributed reinforcing elements: fiber and the pieces of glass, metal, wood, plastic, etc. A large number of possible combinations of components allow to obtain various composite materials. As a result of combination of poly- and monocrystalline nanowires (polyester, phenol and epoxy resins) we receive materials which are not inferior to steel by strength, but they are easier 4-5 times.

Specialists of various chemical institutions in Ukraine carry out intensive investigations on the improvement of production of technical materials. For example, The State Foundation for Fundamental Research and the State Agency for Science, Innovation and Informatization of Ukraine hold competitions for young scientists who contribute to the development of science. In particular, in projects of last year the focus was on the new methods of manufacturing electrodes; the study of the activation of environmentally hazardous substances, as well as of the air pollutants in order to attract them as valuable reagents; the

development of scientific principles of isolation and purification of substances in order to create innovational functional materials. On the basis of the investigation of some elements in electrochemical reactions new modern methods were created for improvement of environmental monitoring of Ukrainian water basins, as well as for determination of toxic forms of metals in natural waters. There were proposed new ceramic composite materials providing effective protection of biological and technical objects from exposure to electromagnetic radiation (such composite materials have high physical and mechanical, as well as performance, aesthetic and hygienic properties. They are environmentally friendly and durable).

The members of the sub-department of high-molecular compounds of Dnepropetrovsk National University conduct their own research. One of the types of their activity is the creation of new compositions based on liquid rubbers, the study of physical and chemical properties of these compositions, the investigation of design of manufacturing powerful utility materials (rocket fuel).

According to the above-mentioned facts, we can conclude that chemistry is constantly developing, and it gives us an opportunity to discover new horizons. However, modern chemistry has also given into human hands an effective means of reducing the length of human life. Scientific achievements used for the good of people, not always practical results of scientific discoveries are exactly those as it was expected. Every success in the conquest of nature inevitably entails, along with benefits, the appearance of new challenges – environmental and ethical. Certainly, technological progress is necessary and important for the achievement of sustainable development, but another factor is the system of values of the society, figuratively speaking, its “wisdom” – the ability to use natural resources reasonably and efficiently.

Dreus A. J., Kriachunenko O. L., Stoyanovskiy M. A.

Oles Honchar Dnipropetrovsk National University

TO THE PROBLEM OF DEVELOPMENT OF WIND ENERGY IN UKRAINE

Nowadays the development of world`s resources of power is based on the use of traditional fossil fuels. In the further future the development in this area will be limited by ecological, resource and social factors. Though the demand for energy consumption associated with economic development and population growth will increase. The full range of conventional and renewable energy resources needs to be used to meet this demand. At the result of irrational human activities the mankind has come up to exhaustion of traditional power resources. Moreover, due to fuel utilization, a lot of toxic pollutants waste the atmosphere which has a negative impact on a biosphere state. All these activities cause catastrophic effects that are irreversible. That is why it is necessary to implement alternative power sources. Among them the most perspective is wind power. The foregoing stipulates currently large-scale development of wind energy in industrialized and in developing countries.Wind energy exists in the environment continuously and does not require the cost for its production.

Wind energy is the kinetic energy associated with the movement of atmospheric air. It has been used for hundreds of years for sailing, grinding grain, and for irrigation. Wind energy systems convert this kinetic energy to more useful forms of power. Wind energy systems for irrigation and milling have been in use since ancient times and since the beginning of the 20th century it is being used to generate electric power. Windmills for water pumping have been installed in many countries particularly in the rural areas.

Wind turbines transform the energy of the wind into mechanical power, which can then be used directly for grinding etc., or further converting it into electric power that generates electricity. Wind turbines can be used by themselves or in clusters called ‘wind farms’.

Wind power engineering is also developing in Ukraine. The perspective areas of wind power electrical stations location are mountainous regions of the Carpathians and Crimea, the seaside regions with high wind intensity, the valley of the Dnepr, the surface of the Azov and the Black seas. In Crimea 80 wind power stations were constructed in 2003. Thus the number of such stations in Ukraine is 355 with the total capacity of 39 Megawatt. Especially, Crimean coasts make Ukraine the second country in the world (after Norway) in shallow water areas that are suitable for large wind farms.

There is a great potential for wind power energy in Ukraine. If, for instance, the 2,700 sq.km.of shallow waters in the Black and Azov Seas were used for wind turbines, this would cover the entire electricity consumption of Ukraine.

Wind power engineering is attractive not only because it is environment-friendly and it saves traditional power resources. Wind power stations can be mounted rather quickly in the places where other power resources are not available or there are not enough of them. The analysis of wind power engineering world trends allows making a conclusion that this environment-friendly and resuming power is going to satisfy power demand of the mankind in the near future. And increasing the number of wind power electrical stations will permit to decrease the cost of alternative electrical power and improve power production in case of maximum loading.

Actual problem of wind energy development in Ukraine is: first of all it is the monopoly of traditional energy, based on outdated energy flows, the necessary infrastructure, but especially – a whopping percentage of different types of power plants in the nation's capital. Secondly, alternative energy requires a different mentality and a different kind of skills.Third, the impact neglect problems at the national level, so the invasion of Ukrainian producers on the world market of wind power equipment must pass the same bumpy ride as their approval in aircraft or missile technology.

For wind energy development the following stepss should be done:

- to provide a national scale of serial production capacity of wind turbines for the Ukrainian windfarm;

- to eliminate subsidies for environmentally harmful energy production;

- to include to the cost of energy its ecological price;

- to support research, development and dissemination of new techniques and technologies in the area of wind energy.

- to continue the improving of designs and manufacturing wind aggregates;

- creating expert (certification) centers for independent evaluation and quality assurance, as well as to improve the reliability of wind technology.

One more economically efficient and promising direction development of wind energy is the production and operation of the network capacity of wind turbines in the range of 15 – 20 kW. Due to existing serial production of necessary components for these wind turbines, they are cheap and available for consumers such as farming, mining and forestry, etc. Implementation of this direction promises great benefits for the energy of the whole country as it allows significantly reduce the power losses in power lines.

Based on the above, one can conclude that wind energy in Ukraine can not be replaced by traditional energy. It can be only added to it. This requires an a traditional generating capacity, covering the entire load of consumers. Wind power in Ukraine, as well as throughout the world in modern conditions high-cost, and in the short term can not be recommended for implementation in large quantities because of the high unit cost of wind turbines, low capacity factor units (0.15-0.25), the weakness of the economy and other factors. It is hardly expedient in the coming years to receive a substantial government investment in wind power production for the internal market and building large wind farm. The first step is to create the conditions for the introduction of wind energy in the energy system of the country.

At the moment, wind energy is a part of the alternative industry, which is fighting for a place in the sun with the venerable opponent – the energy in fossil fuels.

Dudar K., Bezugly V., Tsvetayeva O.

Oles Honchar Dnipropetrovsk National University

FORECASTS OF TOURIST STREAMS IN THE WORLD

People travel for a long time, but registration of their movement received rather recently. In total thanks to development of such concept as tourism.

According to the WTO forecast, in XXI the real tourist boom is expected: the number travelers in the world by 2020 will come nearer to 1.6 billion (612 million people traveled in 1997).

The largest British tourist publishing house «Travel & Tourism Intelligence» (TTI) entering into «Economist Intelligence Unit» published the research containing long-term, up to 2020, forecasts of development of the international tourism. The analysis of the given 30 largest exit markets submitting to 90% of volume of world tourism was carried out and the forecast concerning number of trips of tourists abroad, number of spending the night and money on foreign trips is made.

The travel market will grow. According to forecasts, the first place will reserve the adventure tourism. There were not so many places not investigated by people in the world. It only warms up the interest of romantics to them (especially travelers – thrill-seekers are attracted by Antarctica). It is necessary to develop the new routes with expansion of requirements.On the second place there are cruises. This sector develops very promptly in comparison with others. Activation of mass cruise tourism began approximately in 1997-2000. Since then its popularity increased. Strangely enough, but the sensational ecotourism took only the third position. Probably, it is caused by that is one of the youngest sectors of tourism. The ecotourism can exist only in the two types. The first includes rounds with visit of national reserves for vacationers in resorts. The second represents itself the thematic round which has been completely devoted to a subject of preservation of environment. The part of profit from ecotours goes on financing of projects on their protection. For this reason the hope of ecologists of improvements of protection of reserved zones increases together with development of ecotourism.

On the fourth position there is a cultural and informative tourism. As the research showed, the most interesting places for travel with the informative purposes there will be Europe, East Asia and the Middle East. Together with human inquisitiveness the need for improvement of protection of monuments increases too. Uncontrollable tourist streams can cause irreparable damage to any of them. Despite danger, the above-mentioned countries continue to welcome hospitably guests, thereby filling up the treasury. On the last place there was a thematic tourism. By which mean travel with studying of the concrete phenomena, for example, climate of the district. In the future the huge share of profit in this sector will belong to thematic parks. The Disneyland – one of the most known examples. Now in the world some new huge similar parks are under construction. Most of all present generation expects opening of «the real lock of Hogvarts» in Japan.

In the future the change of the main tourist streams is predicted. According to the WTO forecast China becomes it first of all. While it takes only the sixth place (22 million arrivals). By 2020 this indicator will reach a point of 137.1 million at an annual gain of number of tourist arrivals in 8%. The USA (102.4 million arrivals), then – France (93.3 million) and Spain (71.0 million) become the tourist directions second for popularity. Great Britain will appear on the seventh place (52.8 million arrivals).

In total by 2020 the number of the international arrivals will make 1.6 billion that by 3 times will exceed indicators of 1995. Daily expenses of tourists, except for funds for air transportation, will increase to 5 billion dollars a day.

According to the WTO forecast, rapid development of exit tourism is expected. Germany, Japan, the USA, China, Great Britain become the largest countries suppliers of tourist streams.

In the largest markets changes as and in structure of exit tourism are expected. The share of interregional trips will increase by a long distance because people will travel more, the traditional directions will cease to arrange them, and they will prefer novelty. Besides, the tendency to further and quite fast depreciation of trips on a long distance, especially with the advent of new high-speed transport is planned. As changes will be connected with that development of the international tourism will cause creation of weight of new workplaces.

Foondova V., Bondar O., Tsvetayeva O.

Oles Honchar Dnipropetrovsk National University

DNIPRO: PAST, PRESENT AND FUTURE

In the past Dnipro was clean and had a stable ecosystem. It functioned well for millennia and fed millions of people. Famous ancient Greek historian and a large geographer of antiquity Herodotus, which lived in the V century BC, wrote about the Borysfen, so then called contemporary Dnipro: “The Borysfen has most beautiful and most luxurious pasture for cattle, excellent fish in large numbers. And water is very tasty and clean…”. He acknowledged that “the biggest and the richest river among of all rivers of the world, except the Egyptian of the Nile”. This was our Dnipro in the past.

However years passed, the world changed, new technologies and inventions have appeared which with every century more and more harm to the environment. And certainly people are changed together with the world. Today, all of the above continues to develop in the better way. Only the nature around us is changing in a completely different direction including Dnipro. It is the main waterway of Ukraine. Its significance in formation and development of the Ukrainian nation, social production and the natural environment of the country can not be overestimated. However, its ecological status is of concern to scientists and the population itself.

The ecologists note that the economic objects increase water use without regard to economic and ecological consequences for Ukraine in the basin of Dnipro for decades. According to scientists using water quality is about 50% for technological needs. Nearly 90% these costs can met through the reuse of water in systems for industrial and communal water supply. Water losses are 10-20% during transportation, improper use of in human life – about 20% in the industry – 20-30%.

But water management is by far not a solitary one and not the most major problem the ecosystem of Dnipro. So the processes of transition Dnipro in lake of

system can be seen now. First of all it is caused by the construction of dams and flooding of thresholds. To date there are six reservoirs of Dnipro cascade that during its existence significantly worsened condition adjoining territories. So level of ground water increased, soil salinization intensified, the volume of underground runoff increased almost to ten times, and with this – the level of contamination of groundwater. The concentration of radionuclides is constantly increasing in the bottom sediments of Dnipro, especially in the Kiev reservoir. The concentration of iron, cyanide, chloride, chromium, cobalt, lead, zinc, phenols, petroleum products increases quickly in waters and mules Dnepropetrovsk and Dneprodzerzhinsk reservoirs. An estimated loss from flooded Dnipro of floodplain is about 18 billion dollars annually, while profit from all six GES Dnipro cascade is only 25-28 million dollars a year. Therefore we need to much strain the imagination so as to explain the fact construction on Dnipro such an abundance of hydroelectric power stations. Also important is not just, what died productive floodplain biocenoses, but also that largely Dnipro lost the ability to clean itself. It was significantly complicated problem of obtaining quality drinking water at water stations.

Also, chemical pollution damages Dnipro basin. This is caused by the intensive development of industry, agriculture, urbanization and the development of the transport network in the river basin. Despite some decline in production, anthropogenic load remains high and water quality is not improving in Dnipro River. 900,000 tons of pollutants arrives with sewage to water basin. Around 5,000 objects of preservation useless pesticides and agrochemicals accrued, which are located preferably in rural areas of Ukraine. 1310 polygons and other places of storage or burial wastes situated in the Ukrainian part of Dnipro basin. There are also 161 objects of placement toxic waste. There bring the materials which contain toxic substances in concentrations which exceed maximum allowed value more than 50 times. State purification communal wastewater is unsatisfactory and increases due to an emergency state of nets and frequent accidents.

Almost all Ukrainian guilty in yet another our painful problem. This is the ecological pollution of Dnipro. It is conveys difficult on the words even how many

today polyethylene packets, bottles, synthetic packs, glasses swims in river water. No matter where people resting in the season, they leave after themselves household and food waste everywhere. Needless to even imagine, that this is on the bottom the river.

Also the situation in Dnipro basin complicated by a significant level of development erosion processes and destruction of the coast. Plowing a catchment area reached 65% and in Kherson region and some basins of small rivers – 80-85%. While optimal level is 40%. Wooded territory of basin reaches 14% on average. While optimal level is 30%. The area of eroded land increased by 28%, and the total content of humus in the soil decreased by 10% in just the last 25 years. Products of erosion fall in water objects and lead to their pollution with organic compounds, mineral fertilizers, particularly nutrients – by nitrogen and phosphorus, as well as to siltation.

Building of cascade reservoirs caused changes migratory ways and reducing populations of many valuable species of fish. Reclamation activities in Polissya caused a significant change in the natural characteristics of the basin of the ecosystem. Against this background, a significant depletion biodiversity occurred in Polissya. There a number of native species, including 31 species of vascular plants and nearly 20 species of terrestrial mammals, was lost. Nearly 80% of natural ecosystems have been lost in Dnipro basin. Now Dnipro keeps its natural state only on small areas that connect the reservoir.

These problems the natural state of Dnipro basin are major and more important. They need paramount solution. But from this we can be concluded that ecological status of Dnipro is catastrophic. To date not only Ukrainian organizations and international organizations take part in addressing environmental problems of Dnipro. There are the International Development Research Centre, the Global Environment Facility, United Nations Development Programme. Also recently more and more concerned Ukrainian to ecological state of Dnipro basin exhibit own initiative to improve the ecosystem of the river. We should care not only about ourselves but about the fate of our posterity that will live in the country, we are building for them now!

Gordienko T., Tsvetayeva O.

Oles Honchar Dnipropetrovsk National University

THE CLIMATE CHANGE IMPACT ON THE WATER RESOURCES IN THE WORLD

Water is the softest, weakest creature in the world, but to overcome hard and strong it is invincible, and the world is not equal to it. (Tao Te Ching)

Water resources are used in various ways including direct consumption, agricultural irrigation, fisheries, hydropower, industrial production, recreation, navigation, environmental protection, the disposal and treatment of sewage, and industrial effluents. Water has sources and supplies, economic, social, and political characteristics which make it a unique and challenging natural resource to manage. The main climate change consequences related to water resources are increases in temperature, shifts in precipitation patterns and snow cover, and a likely increase in the frequency of flooding and droughts. Depending on the region, climate changes have widely differing effects on Europe's water. Higher temperatures will generally intensify the global hydrological cycle. Annual precipitation trends in Europe indicate that the Northern Europe has become 10%-40 % wetter over the last century, whereas the Southern Europe has become up to 20 % drier. Over the last century annual river discharge has increased in some regions, such as Eastern Europe, while it has fallen in others, such as southern Europe.

Climate change may also change the seasonal variation in river-flow. Higher temperatures will push the snow limit upwards in northern Europe and in mountainous regions. This, in conjunction with less precipitation falling as snow, will result in a higher winter run-off in northern European and mountain-fed rivers, such as the Rhine, the Rhône, the Po, and the Danube. Moreover, earlier spring melts will lead to shift in peak flow levels. Climate change tends to increase the frequency and intensity of rainfall; there may be an increase in the occurrence of flooding due to heavy rainfall events. Groundwater recharge may also be affected

with a reduction in the availability of groundwater for drinking water in some regions. Changes in average water availability in most European river basins are estimated to be relatively small for the next 30 years. However, in the long-term period most of the climate change scenarios predict that northern and Eastern Europe will have an increase in annual average river flow and water availability. In contrast, the average run-off in southern European rivers is projected to decrease.

The European area around the Mediterranean Sea is recognized as one of the world's regions where climate change has the greatest adverse impact on water resources. This is the result of the combined effect of increasing temperatures and precipitation decrease. This combined effect will give the higher evapotranspiration rates and result in periods with low river discharges (hydrological droughts). Occurred drought periods were reported in many studies in the area. The average annual runoff will decrease by 2070 with 50 % in southern and southeastern Europe, and increase by up to 50 % or more in most parts of northern and northeastern Europe. It is possible that in the future the extreme precipitation will be more frequent, especially in winter and more intense but the uncertainty in the projections is high. In general, in Europe, the timing of the flood risk tends to shift from snowmelt in spring to summer, autumn or even wintertime. In the most of European countries the maximum monthly discharges occur from January to June and from south-west to the north-east. This reflects, besides the general climatic pattern with winter rains in the maritime areas (Iberian Peninsula, western France, Great Britain, and Mediterranean countries), the rising influence of snowmelt in the continental and northern areas with snow accumulation in winter and melting periods from March until June. In the 2070s, the maximum average discharge occurs about one month earlier than today in northern and parts of central Europe. This can be explained by a general rise in temperature in the climate model for these areas, which induces an earlier snowmelt.

So, water resource users can reduce the negative effects of water shortages through a number of strategies. These include revising water storage and release programs for reservoirs, adopting crops and cropping practices that are robust over

a wider spectrum of water availability, adjusting water prices to encourage conservation and the expansion of water supply infrastructure. The ability to anticipate and efficiently prepare for future water resource management challenges is currently limited, in part, by imprecise regional climate change models and long-term weather forecasts. The uncertainty about future climate conditions makes it more difficult to optimally prepare for and adapt to associated changes in water resource availability and quality.

Gubenko M.

Oles Honchar Dnipropetrovsk National University

PERSPECTIVES OF THE QUANTUM COMPUTER

Informational technologies developing faster than their efficiency being realized.

In accordance with Moore's Law, the number of transistors in microprocessors continues to double every 18 month, so by the year 2030 the circuits in microprocessors will be measured on an atomic scale. The next logical step is to create quantum computer, which will use the power of atoms to perform memory and to process tasks. Such computer has the potential to perform certain calculations much faster than any silicon based computer.

• A quantum computer is a computation device that makes direct use of quantum mechanical phenomena (e.g. superposition) to perform operations on data. Quantum computers are different from digital ones based on transistors.

How the quantum computer will work

• A quantum computer will store information as either a 1 and 0 or quantum superposition of both states simultaneously. Such "quantum bit", called qubit, allows greater flexibility than the binary system.

Let's consider the following example: if a qubit is in a superposition of the states 1 and 0, and it performs a calculation with another qubit in the same

superposition, then 1 calculation obtains 4 results: 0/0; 0/1; 1/0; 1/1. The obtained mathematical results, applied to a quantum system, last as long as the system is in superposition of states until it collapses down into 1 state. The ability of quantum computer to perform multiple computations simultaneously is called quantum parallelism.

Benefits of the quantum computer

• A quantum computer will be able to store more bits of information in its memory than there are particles in the universe.

• The power of a single quantum computer will give an ability to simulate the whole world in a holographic environment, modulate different systems (economical, ecological, financial etc.), solve great number of equations necessary to create extremely accurate forecasts and simulate subatomic particles interactions and to understand how every single process in the world works.

• Several quantum computers linked together will create so powerful quantum Internet, that search engines will respond the queries almost like a human being, immediately.

Disadvantages which prevent the creating of the quantum computer

• The qubit calculations are performed while the quantum wave function is in a state of superposition between states 1 and 0, however, when a measurement of any type is made to a quantum system, decoherence breaks down and the wave function collapses into 1 state. Therefore, computer has to somehow continue making these calculations without having any measurements made until the proper time. After this time the calculated result can then drop out of the quantum sate. Then the system has to have a measurement taken to read the result, which then gets passed on to the rest of the system. That way a process of computing has a contradiction with itself.

• In order to create a quantum computer it is necessary to combine realms of superconductors, nanotechnology and quantum electronics. Each of these has been

so far fully developed, so the attempt to merge them all together is quite complicated scientific task.

• The perfect working quantum computer would be able to devastate world's financial system by ripping through their computer security encryptions, which are based on factoring large numbers that literally cannot be cracked by traditional computers within the life span of the universe. A quantum computer would be able to factor numbers in a reasonable period of time.

Hrushevska M., Osadcha L., Tsvetaeva O.

Oles Honchar Dnipropetrovsk National University

GLOBAL WARMING

Starting from the second half of the XVIII century, the world began the transition from manual labor to machines, from manufactory to factory. The process was called Industrial or Great Industrial Revolution. The Industrial Revolution began in Britain in the last third of the XVI century and adopted in the first half of the XIX century, comprehensive, covering then other countries in Europe and America. The result is a steam engine, textile industries and metallurgy. All this has led to the ejection a large number of air gases and combustion products (ash, slag, volatile gases) cause raise average temperature on Earth at 0.7 ° C. The greenhouse effect was discovered by Joseph Fourier in 1824 and was first investigated quantitatively Svante Arrhenius in 1896. The process of gradual increase in the average temperature of Earth's atmosphere and oceans in the XX and XXI centuries was called global warming. This term was employed August 8, 1975 the American climatologist Wallace Broker in the U.S. journal Science, in which he published an article entitled "Climate Change: Are we on the threshold of rapid global warming?'. The author spoke about a possible change in trend – from the gradual reduction in global temperatures to their growth. This term he describes the consequences of human impact on the climate. Recognizing the problem of potential

global climate change, the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) established in 1988 by the Intergovernmental Panel on Climate Change (IPCC). It is open to all member states of the UN and WMO. The main task of the IPCC is a regular review of indicators of climate change. IPCC prepares special reports and technical papers on issues that require independent scientific information and advice as well as support the UN Framework Convention on Climate Change (UNFCCC), through its work on methodologies for National Greenhouse Gas Inventories. The Convention was adopted by the "Earth Summit" in Rio de Janeiro in 1992 and entered into force on 21 March 1994. Agreement on the general principles of action on climate change, has been signed by more than 180 countries, including the former USSR and the industrialized countries. Estimates obtained from climate models of the IPCC report in 2007, reported that at the beginning XXII century, average global surface temperature could rise 1.8 to 3.4 ° C. In addition to sea level rise, global temperature will also lead to changes in the amount and distribution of precipitation. This can result in become more frequent natural disasters: floods, droughts, storms and other. Warming should probably increase the frequency and magnitude of these events. Another possible effect of the increase in global temperatures is to reduce crop yields in underdeveloped countries in Africa, Asia, Latin America and increase yields in developed countries due to the increase in carbon dioxide concentration and longer growing seasons. Climate warming may lead to a shift of species ranges to the polar zones and increase the probability of extinction of indigenous species inhabitants of the coastal areas and islands, whose existence is now under threat. The report of the working group of the Intergovernmental Panel on Climate Change (Shanghai, 2001) was given seven models of climate change in the XXI century. Key Findings – Continued global warming, accompanied by an increase in greenhouse gas emissions, increasing the surface temperature of the air, reducing the temperature variations, sea level rise. The most likely changes in weather conditions are more intense rainfall, higher maximum temperatures, more hot days and reducing the number frost days in almost all regions of the world and

in most areas of the continental heat waves will become more frequent. In addition to the UN Framework Convention on Climate Change, also adopted the Kyoto Protocol – an international treaty adopted in Kyoto (Japan) in December 1997, in addition to the United Nations Framework Convention on Climate Change (UNFCCC).

Kapinus Y., Golodock L., Bondar O.

Oles Honchar Dnipropetrovsk National University

ANTIBIOTICS RESISTANCE OF CONDITIONALLY PATHOGENIC BACTERIA IN THE UROGENITAL TRACT

Microflora of Urogenital (UGT) and gastrointestinal (GI) tract certainly plays a significant role in maintaining the health of a microorganism.

Both systems are open cavities, which are constantly in contact with the environment. Surroundings are mostly represented by microorganisms whose opportunistic and pathogenic share is relatively large. One of the important roles in protecting the mucosa from infection by pathogenic microorganisms plays a normal microflora that inhabits this body or cavity. During the evolution, the formation of «Macroorganism –microorganism» system took place that eventually led to the formation of modern normal flora.

Microbiocenosis of urogenital tract should be considered as one of the most important and integral components of maintaining a constant internal environment that is functionally related to the maintenance of immunological mechanisms. Disorder in the microbiota of UGT may be the factors of other types of diseases, which are not related to reproductive system. Regulatory role of microflora of UGT is beyond the reproductive system. Synthesis of biologically active compounds prevents colonization of a cavity by the oral opportunistic flora that prevents the occurrence and progression of dysbiotic phenomena.

Normally the vagina of a woman has a normal microflora. It consists of about 90% of lactobacilli (rods Dederlyayna), 9% – with bifidobacteria and less than 1%

are other conditionally pathogenic microorganisms which normally do not cause a disease.

During the research, we have found that at dysbiotic disorder of urogenital tract of a woman the microorganisms found in the vagina are represented by transient species. Most often one can find coagulase negative staphylococci (especially Staphylococcus epidermidis), besides *Corynebacterium sp*., association *Bacteroides sp*. And *Prevotella sp*., *Mycoplasma hominis*, present in moderate amounts (less than 4,00 lg CFU / ml).In a much lower concentrations one can meet the genera *Micrococcus sp*., *Propionibacterium sp*., *Eubacterium sp*. Occasionally (less than 10% of cases) one can distinguish the genera *Clostridium sp*., *Actinomyces sp*., *Fusobacterium sp*., *Ureaplasma urealyticum, Mycoplasma fermentas, S. aureus, Neisseria sp., Escherichia coli, Candida sp.*

The problem of antibiotic resistance of microorganisms is recognized as a global problem. Now one of the strategic objectives around the world is to restrain the development and dissemination of antibiotic-resistant microorganisms. Therefore, laboratory studies to determine the sensitivity of microorganisms causing human diseases to antibiotics is becoming more important.

During the studies, we have found that the resistance of staphylococci identified in patients is greater than 70%. Most strains of *Staphylococcus aureus* and some strains of other microorganisms produce penicillinase and cephalosporinases. Many staphylococci are resistant to other classes of antibacterial agents (macrophytes, aminoglycosides, fluoroquinolones).

It was found that for gram-positive cocci the highest degree of sensitivity was observed with regard to benzylpenicillin, amoskizyline / klavulon acid, cefotaxime, cefepime, cefoxitin, and some *Enterobacteriaceae* strains were characterized by sensitivity to amoskizyline / klavulon acid, cefotaxime, cefepime, gentamicin.

At present, the development of microorganisms resistance to antibiotics has reached such a large scale that it should cause attention to this problem. First of all this is due to the difficulties in selecting drugs for the treatment of infectious

patients. The solution of issues of antibiotic resistance, the possible transmission of resistance genes, division of antibiotics types specific to a particular hospital is global and is impossible without constant monitoring of the range of pathogens and their sensitivity to antibiotics in all hospitals.

Kapusta V., Stybul V., Tsvetaeva L.

Oles Honchar Dnipropetrovsk National University

DEFORESTEISHON IN UKRAINE

Wood – it is a combination of land, vegetation, dominated by trees and shrubs, animals, microorganisms and other natural components in their development of biologically interrelated, affect each other and the environment.

Forests different from Woodland based closing cover: in the forest branches and foliage crowns of individual trees overlap, although in this case, thereand may areas of open terrain – meadows. Woodland almost universally characterized by the presence of open soil with trees, distant from each other on a distance greater than the radius of their crowns. Forests can be found in any region where natural conditions are suitable for sustainable growth trees above sea level (and sometimes below) the line alpine meadows, except for areas where the natural frequency of fires too large, or the environment suffers from the press by natural or anthropogenic factors.

In general, forests dominated by angiosperms (to broad) inherent significantly more bio-diversity than forests dominated by gymnosperms (conifers). But to this rule there are exceptions: for example, aspen-birch forests in northern latitudes have lower rates of biodiversity than thence coniferous forests. Some forests contain many individual species of trees on a small area (such as tropical rain forests and deciduous forests of the temperate zone), and some only a few species that cover large areas (mountain pine forests).

The largest forest biomes are:

• Rain forests (dank tropical forest),

• Taiga,

• Broadleaf,

• Tropical dry forests.

Total forest area in Ukraine – more than 10 million hectares, which is 17.2% of its territory. The largest forest cover – in the Ukrainian Karpats 32%.A wood area in natural plains naturally decreases from north to south. The forests are dominated by young and middle-wood species such as pine, spruce, oak. They cover about 90% of forest covered area.

Forests of Ukraine in its purpose and placement function mostly water protection, safety, hygiene, health and other functions and provide the needs of society in forest resources. 15.4% of the forests belong to the reserve and this proportion tends to increase.

The total stock stands at the beginning of 2012 amounted to 1 billion 512 million cubic meters.

According to scientists, one sunny day hectare forest absorbs from the air 120-280 kg of carbon dioxide and releases oxygen 180-200 kg. One tree produces medium size sufficient for three men breathing oxygen. Hectare pine forest holds 40 tons of dust and leaf – 100 tons.

Forests have a huge impact on the climate and soil condition. In the summer when it rains and rains wood retains moisture on the leaves and branches in autumn – the fallen leaves, roots and moss. Turning wood moisture gradually by evaporating it back into the atmosphere, where clouds are formed, which are again converted to precipitation as rain. Winter forests accumulate snow and give it a quick melt until spring. Without forests water melting snow and rain rapidly drains into bed streams and rivers, thus eroding the soil, forming gullies and cause flooding downstream. Moisture, arriving to the rivers, barely escapes back into the air, therefore often start drought [1].

The biggest problem at the moment is illegal deforestation. All Ukrainian forest illegally cut wood. First, industry thrives especially in the western regions. This forest occupies 20-40% of the territory. Cut down common in the region pine trees and also more expensive. One of the reasons of illegal felling's in Ukraine consider poverty Ukrainian in villages near forests. Many of them do not have enough money for firewood, so cut down a few trees to heat the home – a common occurrence. In the western regions as telling local foresters, people steal wood for building houses and outbuildings.

There is the Law of Ukraine "On the ban on deforestation and the introduction of a moratorium on the export of timber – and timber."This law establishes rules aimed at preventing deforestation Ukraine and state support of domestic timber processing enterprises. The objective of the Law is to regulate the legal relationship in order to improve performance, protection and restoration of forests, sustainable use of forest resources, improve the economic situation of domestic enterprises, protection of the consumer market of Ukraine, the interests of domestic producers and improve the structure of exports.

Forests must be cut very carefully. The massive felling of trees can cause sudden changes in temperature (colder in winter, warmer in summer), demolition of topsoil. As a result, the site cleared forests formed desert. This applies particularly to the southern areas of Ukraine. Earlier Celina Northern Black Sea grew lush grass, oak, groves and forests, but now there is only a bare steppe, which on all sides blown winds.

According to the World Wildlife Fund (WWF), 40 years and biological resources of the Earth will be completely exhausted. With forests worst situation: kill them in a matter of days, and they grow for decades. So you should think about how we replenish natural resources in order to restore ecological balance [1].

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Kirichenko A. N., Kuzmenko V. I., Atanova M. Y.

Oles Honchar Dnipropetrovsk National University

THERMOPLASTIC CONTACT PROBLEM OF CONNECTION LAYERS IN COMPOSITES

With the development of major industries it is necessary to use materials which have higher service properties. The best solution to this problem is to use the layered composite materials (CM), which incorporate not only the properties of the components, but are usually characterized by a range of new, often unique, qualities. So the research of CM behavior in real conditions is of primary importance.

Receiving valid results about deformation CM creates the preconditions to develop recommendations that allow us to minimize the undesirable effects. Such studies will help to assess the possibility of using CM and develop relevant recommendations.

Plane deformation of layered composite, which properties are described by Lame parameters λ and μ, is investigated. Deformation of the composite occurs under the action of plates with flat base. As a result of composite deformation plates receive vertical shifts (sags), which are considered to be given.

The problem is to find components of displacement vector $\mathbf{u_i(x,y)}$, small deformation tensor $\boldsymbol{\varepsilon_{ij}(x,y)}$ and stress tensor $\boldsymbol{\sigma_{ij}(x,y)}$. Mentioned characteristics have to satisfy equations of equilibrium, Cauchy relations and determinative relations.

So, we must find the above functions, which satisfy the system (1)

$$\begin{cases} \sigma_{ij,j} = 0 \\ \varepsilon_{ij} = \dfrac{u_{i,j} + u_{j,i}}{2} \\ \sigma_{ij} = \lambda\Theta\delta_{ij} + 2\mu\varepsilon_{ij} - \beta\upsilon\delta_{ij} \end{cases} \qquad (1)$$

and boundary conditions

$u_v(x,y) = -\Delta; u_\tau(x,y) = 0$, for the upper border,

$u_x(x,y) = 0; u_y(x,y) = 0$, for the lower border,

$\sigma_x(x,y) = 0;\ \tau_{xy}(x,y) = 0$, on the sides.

Formulated problem statement is not really usable for the construction of numerical methods of solution. The most natural is the variation formulation. The typical method of variation formulations construction of boundary value problems of elastic body theory is considered in [1]. A finite-element method was used for discretization of the problem. To approximate permissible functions the rectangular finite-elements were used.

Having substituted the expressions for the components of the vector displacement in functional of the extreme variation problem, we obtain a function of many variables. We received a problem of absolute minimization of quadratic functions of several variables. Let us write down the necessary condition for extreme. We receive a linear system of equations that was solved using method of successive over-relaxation (SOR).

Formulated problem was solved using the developed software.

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Oles Honchar Dnipropetrovsk National University

MATHEMATICAL AND NUMERICAL MODELING OF MASS TRANSFER IN SOIL

Last years due to food crisis further development of agricultural industry has become one of the most important aim of Humanity. Development of agricultural industry is impossible without correspondent development of agricultural science. For example, a progress in plant-growing completely depends on success in agricultural science, but the last is connected with understanding of biological, chemical, mechanical and thermal processes in soils. Biological and chemical processes are investigated intensively using all opportunities of modern science.

As for filtration flows and mass transfer processes in soils, which must be investigated mainly by mathematical tools, the unnecessary simplified mathematical models are used in this field. For example, roots of plants suck up water, that stimulates a specific filtration flows. However, cross-section area of plant root is negligibly small in comparison with reference size of whole domain. As a result, multiscale problems must be formulated as correct mathematical models of filtration in soils. In fact, multiscale problems have never used for this aim because of mathematical and computational difficulties are intrinsic to them. The similar situation takes place with sorption of salts dissolved in water by particle of rigid frame of soils, that was not considered properly. It is evident, that to improve the situation, new generalized mathematical models and algorithms of numerical solution must be proposed. The present work is to be considered as an attempt to provide some progress in this direction.

Generally speaking, there are two mathematical models of mass transfer in soil filtration model applied for water motion in saturated soil, and diffusive model by A.V. Lykov for unsaturated media. Accuracy and applicability of the second model requires additional special investigations and discussions. For the sake of simplicity, the following consideration will be restricted by the filtration model in plane case.

Let us consider a domain D of saturated porous media. Let there is filtration flow due to some external cautions and there are roots of plants which are perpendicular to a plane D. The roots of plants create locally decreased pressure due to osmotic effect and, as a result, they suck up water. Cross-section areas of roots of plants are negligibly small. Then the filtration flow is described by following equation:

$$\frac{\partial^2 p}{\partial x^2} + \frac{\partial^2 p}{\partial y^2} = \sum_{i=1}^{N} q_i \delta(X, X_i), \tag{1}$$

$$V = -k \operatorname{grad} p, \tag{2}$$

where p is pressure in porous media; N is number of roots of plants; q_i are intensities of sinks; δ is Dirac's delta-function; x, y are Cartesian coordinates,

X is point of domain D, X_i is position of the root of plant; V is velocity of the filtration flow; k is filtration coefficient. Correspondent boundary conditions are prescribed on the boundary Γ of the domain D for equation (1). Intensity of sink q_i depends on osmotic pressure, created by correspondent root of plant and local "pressure in infinity". The last term means the pressure in position of the sink, if the sink is absent there. The simplest dependence of q_i on pressure is, of course, linear, what provides completely linear filtration problem. However, such non-linear dependences are possible too, that leads to evident mathematical and computational difficulties.

Presence of delta- functions in the formulation of problem (1) makes it multiscale. As a result, the most popular finite difference and finite element methods can not be applied for its numerical solution. Thus boundary element method is the only tool, that can be used here. To apply a boundary element method, let us transform the initial governing differential equation to boundary integral equation:

$$c(X_0)\cdot p(X_0) = \int_\Gamma \varphi(X, X_0)\frac{\partial p(X)}{\partial n} dS(X) - \\ - \int_\Gamma p(X)\frac{\partial \varphi(X, X_0)}{\partial n} dS(X) + \sum_{i=1}^{N} q_i \varphi(X_i, X_o), \tag{3}$$

where φ is fundamental solution of Laplace equation; c is function of boundary shape.

Equetion (3) can be solved by usual boundary element algorithm with only difference in last term in right hand side of equation if q_i linear depends on p, equation (3) can be approximated by system lineal algebraic equations, including additional equations for determinations of unknown values q_i In the case of non-linear dependence, equations for q_i are non-linear and require a special iteration process to handle them.

Let us consider some substance transfer by filtration flow. It is described by following equation

$$\frac{\partial c}{\partial \tau} + (V \cdot \Delta) \cdot c = D_c \cdot \Delta c + \chi(c) + \sum_{i=1}^{n} Q_i \cdot \delta(X, X_i), \qquad (4)$$

where c is concentration of transferred substance; V is filtration velocity; D_c is diffusion coefficient; the second term in right hand ride of equation (4) $\chi(c)$ describes sorption process, that is this term represents distributed sources (sinks); the last term in right hand side of equation (4) corresponds to the mentioned effect of roots of plants.

Equation (4) with necessary initial and boundary conditional is multiscale problem, but this case requires completely another approach. The following spitting

$$c = c_1 + c_2 \qquad (5)$$

gives an opportunity to avoid computational difficulties. Concentration c_1 corresponds to distributed sources and it is described by transfer equation like (4) without the last term. Concentration c_1 field can be calculated by usual finite deferens method, for example, explicit “up-wined” scheme is used in the present work:

$$\begin{aligned} &\frac{c_{i,j}^{k+1} - c_{i,j}^{k}}{\Delta\tau} + \frac{V_{xi,j}^{k} + \left|V_{xi,j}^{k}\right|}{2} \cdot \frac{c_{i,j}^{k} - c_{i-1,j}^{k}}{\Delta x} + \frac{V_{xi,j}^{k} - \left|V_{xi,j}^{k}\right|}{2} \cdot \frac{c_{i+1,j}^{k} - c_{i,j}^{k}}{\Delta x} + \\ &+ \frac{V_{yi,j}^{k} + \left|V_{yi,j}^{k}\right|}{2} \cdot \frac{c_{i,j}^{k} - c_{i,j-1}^{k}}{\Delta y} + \frac{V_{yi,j}^{k} - \left|V_{yi,j}^{k}\right|}{2} \cdot \frac{c_{i,j+1}^{k} - c_{i,j}^{k}}{\Delta y} = \\ &= D_c \cdot \left(\frac{c_{i+1,j}^{k} - 2 \cdot c_{i,j}^{k} + c_{i-1,j}^{k}}{(\Delta x)^2} + \frac{c_{i,j+1}^{k} - 2 \cdot c_{i,j}^{k} + c_{i,j-1}^{k}}{(\Delta y)^2} \right) + \chi(c_{i,j}^{k}). \end{aligned} \qquad (6)$$

Concentration c_2 corresponds to localized sources (sinks) and it can be analyzed by potential theory methods. For example, this field can be approximated by sum of fundamental solution of Oseen’s equation.

The proposed approach is illustrated by several examples of numerical calculations, which conforms its workability and effectiveness.

Kochubey O. O., Yevdokymov D. V., Kriachunenko O. L., Goncharenko M. P.

Oles Honchar Dnipropetrovsk National University

ONE MATHEMATICAL MODEL OF MULTIPHASE FLOW IN SMALL DOMAIN

At present time, fast development of microelectronics, micromechanics and microbiology stimulates constantly growing interests to different mechanical effects in liquid media in small domains. Multiphase flows are always considered as the most sophisticated and difficult in fluid dynamics. It is quite natural, that multiphase flows represent a lot of difficulties on small size level. However such multiphase flows have some specific features in comparison with usual multiphase flows. First of all, number of the second phase objects is very restricted due to small size of domain. Thus, traditional average mathematical model of multiphase flows can not be used in this case and only Lagrangian approaches remain applicable. The second specific feature is Stokes flow taking place there instead of usual Navier-Stokes flow due to small reference size of domain. Multiphase Stokes flour with Lagrangian treatment of the second phase is rather new hydrodynamic problem. The aim of the presented work is to develop a solution technique for the considered problem.

It is well known from multiphase flow theory, that surface forces are sufficiently dominative in comparison with body forces for asymptotically small bodies, including inertia force. Consequently asymptotically small particle always moves under force equilibrium. If particles are small in comparison with referent size of small domain, they can be classified as extremely small. Thus, the above conclusion takes place in the considered case. This circumstance gives an opportunity to simplify the problem and to replace dynamic analysis of particle motions by kinematic analysis.

Let us consider small domain D, which contains a liquid with restricted number of spherical particles. Let us assume that there is some Stokes flow stimulated by external cautions in domain D. Smallness of the domain D. means

that its reference size is so small to provide $\mathrm{Re} << 1$ (Reynolds number is introduced by usual way as $\mathrm{Re} = \frac{U \cdot L}{\nu}$), that, of course, requires correspondent reference velocity U.

Following forces are acting on particles:

- gravitational force $\overline{F}_g = m \cdot \overline{g}$;

- Archimedes force $\overline{F}_A = -\rho_f \cdot \Omega \cdot \overline{g}$;

- possible other body forces, for example, electromagnetic force; all mass forces are assumed known and known summarized body force $\overline{F}_m$ can be introduced;

- thermophoretic and diffusiophoretic force determined by following formula:

$$\overline{F}_T = -\beta_T \cdot \mathrm{grad}\, T, \tag{1}$$

$$\overline{F}_D = -\beta_D \cdot \mathrm{grad}\, C, \tag{2}$$

where T and C are corresponding temperature of the liquid and concentration of saluted substance:

- vicious dray force $\overline{F}_\mu$;

- hydrodynamic interaction force $\overline{F}_i$.

For the sake of simplicity, a lot of physical phenomena; like Magnus force and Safmen force, are not considered here.

Generally speaking, all unknown forces can be obtained from solution of correspondent boundary value problem for Stokes equation system:

$$\begin{cases} \mu \cdot \Delta \overline{V} = \mathrm{grad} p, \\ \mathrm{div} \overline{V} = 0. \end{cases} \tag{3}$$

However, even numerical solution of boundary-value problem for system (3) with direct calculation of flow around every particle is completly impossible from computational point of view. That is why some simplifications and approximations must be used here. In particular, the following splitting with respect to physical processes is suitable to use in the considered case

$$\overline{V} = \overline{V}_0 + \sum_{i=1}^{n} \overline{V}_i, \tag{4}$$

where $\overline{V}_0$ is velocity field in the domain D due to external cautions, calculated without taking into account of particles; $\overline{V}_i$ are solutions of Stokes problem for spherical particle in unbounded space. All solutions $\overline{V}_0,\ldots,\overline{V}_i,\ldots,\overline{V}_n$ identically satisfy to system (3), but they do not satisfy to boundary conditions, that requires to organize an additional iteration process or to include additional arbitrariness with additional conditions for their determinations into the formulation. Note that an analytical solution for Stokes flow around a ball, which is well known [1], can be used here for $\overline{V}_i$ construction. Velocity $\overline{V}_0$ can be calculated by any numerical method, for example, boundary element method.

To complete a description of algorithm, it is necessary to consider motions of the particles. The force equilibrium condition is

$$\overline{F}_\mu + \overline{F}_T + \overline{F}_D = \overline{F}_m . \tag{5}$$

Since we deal with spherical particles, Stokes formula takes place in this case:

$$\overline{F}_\mu = 6 \cdot \pi \cdot \mu \cdot R \cdot \left(\overline{V}_f - \overline{V}_i\right), \tag{6}$$

where R is radius of particle; $\overline{V}_f$ is flow velocity in point, where the particle is situated, under assumptive that the particle is absent there. Thus

$$\overline{V}_i = \overline{V}_f - \left(\overline{F}_m - \overline{F}_T - \overline{F}_D\right)/(6 \cdot \pi \cdot \mu \cdot R). \tag{7}$$

The equation system (7) with correspondent boundary conditions can be considered as Cauchy problem for determination of particle motions:

$$\begin{cases} \dot{x}_i = V_{xi}, \\ \dot{y}_i = V_{yi}, \\ \dot{z}_i = V_{zi}. \end{cases} \tag{8}$$

To make the analysis easy and clear, the simplest mathematical models for temperature and concentration fields are used here:

$$\Delta T = 0, \tag{9}$$

$$\Delta C = 0. \tag{10}$$

Boundary-value problems, created by equations (9), (10) and correspondent boundary conditions, can be solved by any numerical method, for example, boundary element method is used here.

The proposed approach is illustrated by several examples of numerical calculations, which conforms its workability and effectiveness.

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Kochubey O. O., Yevdokymov D. V., Kriachunenko O. L., Morenko M. S.

Oles Honchar Dnipropetrovsk National University

NUMERICAL ANALYSIS OF AIR POLLUTION TRANSFER BY COMBINED METHODS

Modern stage of human activity demonstrates an evidently increasing dependence of human life quality on environment situation. Growing number of problems with human health are explained by negative ecological actions, stimulated by human industrial and agricultural activity. Mainly ecological danger is connected with air, water and soil pollutions. The term “pollution” is determined by usual way as non-specific introduction of some chemical substances, including radioactive substances, into environmental media in non-specific amounts. In spite of clear understanding of ecological danger, that have been stimulated by some political and social ecological movements, and huge efforts of governments, as well as special organizations, ecological problems remain extremely serious and unsolved.

Let us consider reasons of such situation. First of all, ecological theories on modern stage of their developments remain “qualitative sciences”. The last conclusion means that real mechanisms of influences of environment on human health still remain unknown. We only know that human organism has some adaptive opportunities, that provide quite wide boundaries for “normal life”. Beside of that, there are sufficient differences between long-time and short-time negative environmental actions. However all mentioned effects remain almost

completely unclear of ecological sciences. The so-called limit concentrations were determined on the base of pure understanding of the considered phenomena, nevertheless the mentioned limit concentrations are defined in legislations of many countries. More than that, we don't know the answer to main question of modern ecology: is some specific problem with human health caused by influence of specific pollution, or by action of other pollution, or by combined action of several pollutions, or by completely other negative tendencies in human life? Thus, creation of quantitative ecological theory must be considered as a main aim of ecological sciences at nowadays.

Investigations of pollution transfers, united by name of "computational ecology", are based on well-known approaches of computational fluid dynamics and successfully developed since approximately 1960 using the same computational devises that are finite difference and finite element method software. As a result, a lot of problems about pollution transfer in regional and subregional scales were successfully solved numerically by the mentioned software. However from the very beginning of such investigations; it was clear, that linear sizes of pollution sources are sufficiently less, than correspondent sizes of solution domains. In fact, it was classical multiscale problem, but a proper attention was not paid to this circumstance. To avoid this difficulty, the source of pollution was distributed on one or several finite difference cells (one or several finite elements), that was physically incorrect, but it provided quite good numerical results on regional scales. Natural mathematical model of local pollution source is, of course, Dirak's delta-function, but such formulation requires a consideration and solution in generalized function spaces, that is completely impossible for finite difference and finite element methods. At the moment, pollution concentration distributed near the pollution source attracts main interest. Especially it is important for investigation of air pollution transfer in cities and industrial districts, where a lot of sources are located and pollution concentrations must be calculated near the sources. Thus, finite difference method and finite element method cannot provide proper accuracy of pollution transfer calculation and must be replaced by same other numerical method.

Since multiscale problems in complex geometrical shape domains are considered, it is quite natural to apply for their numerical solution methods of computational potential theory. However, well-known disadvantages of computational potential theory in transfer problems for distributed fields made this group of numerical methods ineffective for the considered kind of problems.

The aim of the present work is to analyze an opportunity of development of combined numerical method for solution of the considered problem. The main idea of combined numerical method is the splitting of vorticity field and concentration fields into localized fields and distributed fields. The localized fields are calculated by Lagrangian algorithms of computational potential theory and distributed fields are calculated by usual finite difference method.

Let us formulate the fluid flow problem in term “vorticity – stream function” in dimensionless form. For the sake of simplicity let us restrict the following consideration by a plane case.

$$\frac{\partial^2 \psi}{\partial x^2} + \frac{\partial^2 \psi}{\partial y^2} = -\omega, \tag{1}$$

$$\frac{\partial \omega}{\partial \tau} + V_x \cdot \frac{\partial \omega}{\partial x} + V_y \cdot \frac{\partial \omega}{\partial y} = \frac{1}{Re} \cdot \Delta \omega. \tag{2}$$

Here all notations are used in traditional senses. Reynolds number is introduced by usual way $Re = \frac{UL}{\nu}$, but the kinematic viscosity ν can be physical coefficient of viscosity or effective coefficient of turbulent viscosity. For ideal fluid flow following equation must be used instead equation (2):

$$\frac{\partial \omega}{\partial T} + V_x \cdot \frac{\partial \omega}{\partial x} + V_y \cdot \frac{\partial \omega}{\partial y} = 0. \tag{3}$$

Substance concentration transfers are described by following equations:

$$\frac{\partial C_i}{\partial \tau} + V_x \cdot \frac{\partial C_i}{\partial x} + V_y \cdot \frac{\partial C_i}{\partial y} = \frac{1}{Pe_D} \cdot \Delta C_i. \tag{4}$$

The formulated above equations must be complemented by proper initial and boundary conditions.

According to potential theory equation (1) must be replaced by following boundary integral equation [1]:

$$C(X_0)\cdot\psi(X_0)=\int_\Gamma \varphi(X,X_0)\cdot\frac{\partial\psi(X)}{\partial n}dS(X)- \\ -\int_\Gamma \psi(X)\frac{\partial\varphi(X,X_0)}{\partial n}dS(X)+\int_D \varphi(X,X_0)\cdot\omega(X)dX, \tag{5}$$

where X_1, X_2 are point of plane, function C is boundary shape function, determined in [1], $\varphi(x_1,x_2)$ is fundamental solution of Laplace equation.

Splitting into localized and distributed field is following:

$$\omega(X,\tau)=\omega_1(X,\tau)+\omega_2(X,\tau), \tag{6}$$

$$C_i(X,\tau)=C_{i1}(X,\tau)+C_{i2}(X,\tau), \tag{7}$$

where

$$\omega_1(X,\tau)=\sum_{n=1}^{M_1}\omega_n\cdot\delta(X_n,X)+\sum_{n=M_1+1}^{M_2}\omega_n\cdot H(D_n), \tag{8}$$

here δ is Dirahin delta-function, H is Heaviside's function of domain,

$$C_i(X,\tau)=\sum_{n=M_2+1}^{M_{3i}}C_{in}\cdot H(D_{in}). \tag{9}$$

Motions of the objects introduced by relations (8),(9) are described by Cauchy problem for following system of ordinary differential equations

$$\dot{x}_k=V_x(X_k), \\ \dot{y}_k=V_y(X_k). \tag{10}$$

Points X_k in equation (10) are either points, where discrete vortices are situated, or representative points of boundaries of localization domains. The last trick is similar to contour dynamics method. Components of velocity V_x, V_y in (10) are obtained by direct differentiation from (5). The distributed fields ω_2 and c_2 are continuous in domain D functions. Transfers of the mentioned fields are described by equations (3), (4) and can be calculated using some finite difference

scheme. For example, an explicit up-wind scheme on rectangular grid is used for numerical calculation in present work.

$$\frac{U_{i,j}^{k+1}-U_{i,j}^{k}}{\Delta\tau}+\frac{V_{x\,i,j}^{k}+\left|V_{x\,i,j}^{k}\right|}{2}\cdot\frac{U_{i,j}^{k}-U_{i-1,j}^{k}}{\Delta x}+\frac{V_{x\,i,j}^{k}-\left|V_{x\,i,j}^{k}\right|}{2}\cdot\frac{U_{i+1,j}^{k}-U_{i,j}^{k}}{\Delta x}+$$
$$+\frac{V_{y\,i,j}^{k}+\left|V_{y\,i,j}^{k}\right|}{2}\cdot\frac{U_{i,j}^{k}-U_{i,j-1}^{k}}{\Delta y}+\frac{V_{y\,i,j}^{k}-\left|V_{y\,i,j}^{k}\right|}{2}\cdot\frac{U_{i,j+1}^{k}-U_{i,j}^{k}}{\Delta y}= \qquad (11)$$
$$=\frac{1}{Pe_D}\cdot\left(\frac{U_{i+1,j}^{k}-2\cdot U_{i,j}^{k}+U_{i-1,j}^{k}}{(\Delta x)^2}+\frac{U_{i,j+1}^{k}-2\cdot U_{i,j}^{k}+U_{i,j-1}^{k}}{(\Delta y)^2}\right).$$

All notations in finite difference scheme (11) are used in usual sense.

The proposed approach is illustrated by several examples of numerical calculations, which conforms its workability and effectiveness.

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Konovalov E. O., Chernitska O. V., Atanova M. J.

Oles Honchar Dnipropetrovsk National University

APPLICATION OF KORNIYCHUK 'S INEQUALITY TO THE UPPER BOUND DIMENSIONAL LINEAR WIDTHS SUBCLASS H^{ω} OF SPACES L_p (p = 4)

Inequality which is valid for all $u \geq 0$ for $0 < p \leq 3$ was established and proven by M.P Korniychuk [1, p. 225-226]:

$$\eta(u, p) = (1+u)^{p+1} - 2^p(u^p + u) \geq 0\,. \qquad (1)$$

Inequality is examined for significance $p = 4$. The continuous function f(t), $t \in$ [a,b] is considered and has the view such as on the drawing (Fig. 1).

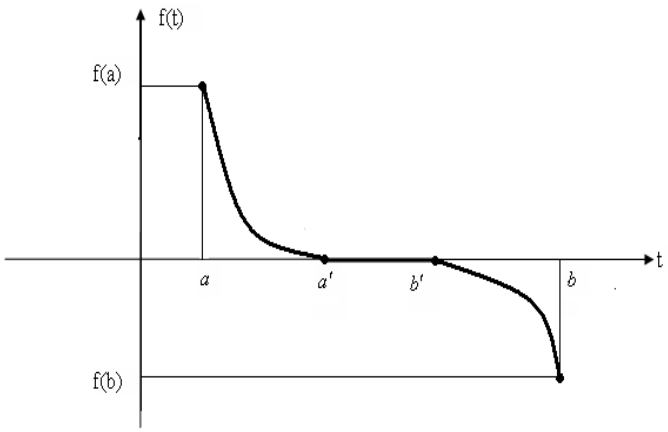

Fig. 1. Function f(t)

Function $\eta(u, p)$ becomes negative in the intervals $(-\infty;-1) \cup (0,1;10) \cup (10;\infty)$. If you want to do the inequality (1) correct, you will require compliance next equality:

$$| \rho'(x) | = \sqrt[3]{\frac{(b-b')^2}{(a'-a)^2}} = c = const \geq 10 . \qquad (2)$$

So, if function f(t) such as on the drawing, for p=4 and $u \geq 10$, next inequality will correct:

$$\int_a^b |f(t)|^4 dt \leq 2^{-4} \int_0^{b-a} \omega^4(f,t)dt , \qquad (3)$$

where $\omega(f,t)$ – is the modulus of continuity of function f(t).

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Kovalchuk Y. P., Ushakova G. A., Znanetska O. M.

Oles Honchar Dnipropetrovsk National University

ASTROCYTES REACTIVITY IN THE BRAIN DURING THE PROCESS OF AGING

Neuroglia is auxiliary but important component of central nervous system which is combined with neurons genetically, morphologically and functionally. It is a complex of cellular elements that carries out basic, trophic, secretory and protective functions. Experimental results confirm the active participation of glial cells in the key functions of nervous system.

The structure of glial cells includes such proteins as S-100b protein and glial fibrillary acid protein (GFAP).

Protein S-100b is considered as one of main molecular components of the intracellular systems providing a functional homeostasis of brain cells by a combination and integration of various metabolic processes. It is one of the first specific proteins of CNS that was found by Mur, S-100b is a marker of brain damage (cortical, ischemic, etc.) metabolic disorders in the brain due to the impact of various factors on the organism which is investigated. It is significant that experimental effect to S-100b protein usually isn’t accompanied by noticeable alteration of animals somatic condition, but at the same time it leads to various violations of integrative function of the brain, information homeostasis in providing and optimization of that its function is defined. S-100b protein localization as specific protein of nervous system has been a subject of numerous researches. S-100b protein was found in CNS and PNS of all vertebrata and some invertebrate animals. Mainly it is concentrated in a neuroglia (85-90%), a significant amount of it is in astrocytes, in neurons (no more than 10-15%), in olyhodendrotsytes its quantity is insignificant. Messes and other authors have investigated the intensity of biosynthesis of S-100b protein in the process of ontogeny of humans and animals. It`s turned out that S-100b protein appears at 10-15 week in a brain of an embryo of humans in different areas of the brain: cerebellum, pans average and

midbrain spinal cord, etc. At about the 30th week there is an accumulation of S-100b protein in all the areas of CNS, except a frontal lobe where the increase of protein content coincides with the emergence of bioelectric activity of the brain.

The glial fibrillary acid protein (GFAP) is a histospecific component of the intermediate filament (IF) of astrocytes cytoskeleton. GFAP as a part of PF plays an important role in movement modulation of astrocytes and providing stable morphology of their shoots during astrogliosis development. GFAP is a specific marker of astrocytes and takes part in the formation of cytoskeleton of cells glial filament, takes part in molecular mechanisms neuron – astrocytes interactions. It is a highly specific protein of a brain which isn't found outside of CNS. It has been shown that GFAP very quickly releases in blood after traumatic injury of the brain (can be used as a marker of damage and predictive factor concerning the result), but multiple traumas can be without GFAP release. In CNS after damage astrocytes correspond for astrogliosis. Astrogliosis is characterized by fast synthesis of GFAP. It is known that the level of GFAP usually increases with aging. Thanks to high specificity and early release from CNS after traumatic injury of the brain, GFAP can be a very useful marker for early diagnostics. Astrocytes reactivity in the brain of gerbils during aging has been the purpose of our work.

12 gerbils were divided into two groups (n = 6): 1 – control one as for age, adults (8 months) with a standard diet, 2 – old (2 years) animals with a standard diet. At the end of experiment the animals were decapitated under mild anesthesia, the brain was isolated from and divided into three parts: cerebellum, thalamus and hippocampus, which are subsequently used to obtain cytosolic and cytoskeleton fractions proteins. The concentration of GFAP and S-100b protein was determined by solid-phase competitive ELISA. Statistical analysis of the results was performed using SPSS 10.0 for Windows, the difference was considered significant at $p < 0.05$.

The experimental data show a stable level of filament GFAP in the thalamus of gerbils aged 6 months and 2 years. In adult animals, the protein content was 2mkg/ml, and the old ones 1.8 mkg/ml. In the hippocampus and cerebellum of experimental animals the significant increase in the level of GFAP was determined

in old gerbils compared with adults, indicating the development of reactive astrogliosic in these structures during the aging. We observed that in adult animals it was 1.1 mkg/ml, and the old ones 2.2 mkg/ml. For S-100b protein, the experimental data show a stable level in the thalamus and cerebellum of gerbils aged 6 months and 2 years. In the hippocampus of experimental animals the significant increase in S-100b protein in old gerbils (2,1 ± 0,6 mg / ml) was determined compared with adult ones (0,6 ± 0,09 mg / ml), indicating the development of reactive astrogliosis in the hippocampus.

The analisis of the data obtained indicates a lack of probable changes in protein metabolism in astrocytes thalamus of old gerbils, but simultaneously it is established that the development of astrogliosis in the hippocampus and cerebellum can lead to disruption of integrative brain function and information homeostasis. The indicated brain areas play an important role securing and optimizing these functions.

Kuzmenko N., Bezugly V., Tsvetayeva O.

Oles Honchar Dnipropetrovsk National University

ACTUAL PROBLEMS OF MINING

Life appeared on earth about 2,5 million years ago, but we have crossed the threshold of balance, which is necessary for the existence of our planet. The global problems of our time accompanied mankind throughout history. Widespread environmental problems gained processes such as desertification, mining, pollution of soil, the destruction of forests.

Today the most urgent problem is a waste-free production in the mining of minerals. All minerals are under the ground. People, use number of instruments and mechanisms to get them out that are do not always positively effect on nature. The problem is that a significant amount of waste accumulate in areas where coal preparation plants and coal mines. Overall, there is not clean production in man-made systems.

An oil disaster was happened in the Gulf Mexico. The oil rig «Deepwater Horizon» exposed, resulting in deaths of 11 workers, most tower felt, tons of crude oil turned on the ocean. 4.9 million barrels of oil got into the Bay, polluting the coast, smashing towns destroying economy and the environment. The accident in the Gulf of Mexico, where after the explosion and sinking drilling platform formed a huge oil slick on the water, was the first huge disaster in history. To eliminate it, as experts note, they may have to use extraordinary means, and the consequences of an event can make review of the development plans for offshore oil production.

There are also disadvantages in mining of solid minerals. Coal and oil shale are mined by open and mining methods. They both have negative consequences. But mining method is considered the most dangerous. Coal to oil fields are located at great depths, so they have to dig deeper, that subsequently leads to the subsidence of land.

In November 18, 2007 on mine named after “Zasyad`ko” (in Donetsk region) occurred the biggest incident in the history of Ukraine, 106 people were killed and 156 were wounded. Consequently there were two blasts – on December 1, injured 54 of miners and on December 2, 5 more miners were added. Only after that its work was suspended.

Statistical data on accidents as a result of accidents due to explosions and sudden shaft of methane emissions from coal and gas, a slight decrease their rates in the last decade compared with the previous one.

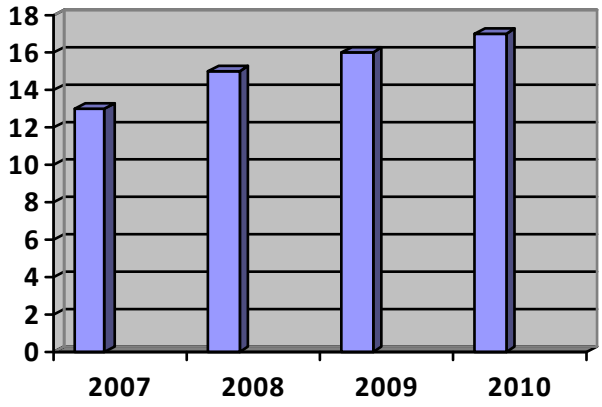

Fig. 1.The dynamics of industrial accidents in coal mines Ukraine

In preventing the explosions it is necessary to consider their origin and their nature. For these dangerous horizons and faces, as well as mines, there are two options: to stop coal mining or to degase and gradually transit to underground coal gasification. Of course, the last option is economically justified and the only possible, both in terms of industrial safety of explosive mines, and the ensuring the country's own energy.

In concluding, we must understand that mankind now has entered a qualitatively new stage of interaction with the natural environment, extensive use of his resources. Minerals planet of Earth's biosphere are limited and well-defined parameters and values. So, the actions of society must now be balanced and proportionate to the current environmental situation and must not come into a conflict with the natural and environmental laws lead to negative and irreversible processes.

Lomyga L. L., Lykholat Y. V., Ponomarjova L. F.

Dnipropetrovsk

ERFOLGSBEWERTUNG DER INTRODUKTION VON ARTEN DER GATTUNG PEPEROMIA RUIZ ET PAV. IM BOTANISCHEN GARTEN DER DNU

In der letzten Zeit hat der Grad der anthropogenen Verschmutzung der großen Industriestädte seinen Höhepunkt erreicht. Dies führt zur Erschöpfung der natürlichen Flora des Gebiets. Ihre Erneuerung ist durch die Einführung der neuen introduzierten Pflanzenarten möglich.

Unter den in unserem Gebiet wenig erforschten Arten sind Vertreter der Gattung *Peperomia Ruiz et Pav.* (Familie Piperaceae) zu nennen. Seit 1975 wird die Sammlung dieser Gattung in Bedingungen des Expositionsgewächshauses im botanischen Garten der Dnipropetrowsker Nationalen Universität entwickelt. Sie verfügt über mehr als 1.000 Taxa, deren Verbreitungsgebiet Zentralamerika und

tropisches Asien ist. Das sind mehrjährige Gräser, die ein terrestrisches oder epiphytisches Leben führen, an Bäumen, Faulstämmen, auf lockerem Waldboden, selten an den Felsen wachsen.

Einer der wichtigsten Indikatoren der erfolgreichen Einführung einer Pflanze ist Blühen und Bildung von keimfähigen Samen. In diesem Zusammenhang war das Ziel unserer Arbeit, das Timing der Blüte -und Fruchtbildung der eingeführten Pflanzen der Gattung *Peperomia* aus der Sammlung des geschützten Bodens des botanischen Gartens der DNU, ihre Dauer und Frequenz festzustellen. In Bedingungen des Gewächshauses erfolgt die Blüte bei allen Vertretern dieser Gattung außer der *P. pereiskiefolia.* Das zeugt von einem nicht ausreichend hohen Introduktionsgrad.

Der photoperiodischen Reaktion nach kann unter Peperomien zwischen drei Gruppen unterschieden werden: Kurztagpflanzen, deren generative Phase im September und Oktober beginnt (*P.rubella, P. verticillata*), Langtagpflanzen im Februar-März (*P. marmorata, P. caperata*) und eine Gruppe von Pflanzen (*P. incana, P. clusiaefolia, P. obtusifolia*), deren generative Phase von der Tageslänge nicht abhängt.

Die Analyse der Wachstumsrhythmen in Gewächshausbedingungen zeigt die Abwesenheit der Ruheperiode der Pflanzen. Die Verzögerung oder Beschleunigung des Wachstums ist entweder mit den Änderungen der Umgebungsbedingungen oder mit dem Beginn einer bestimmten Phase der Pflanzenentwicklung verbunden.

Dank der Vielfalt der Stamm- und Blattspreitenstruktur sind bunte Peperomia-Formen eine perspektive Gattung für Begrünung von Wohnungen und für saisonale Stadtbegrünung, sowie ist die Verwendung von Epiphyten- und Ampelarten für vertikale Konstruktionen möglich. Da diese Methode der Gartenarbeit keinen zusätzlichen Platz erfordert, ist sie in der modernen Metropole, wo die Konzentration der schädlichen Emissionen und des Staubes einen kritischen Wert erreicht, sehr aktuell. Die Verwendung von Pflanzen mit einer hohen gasfangenden-und phytonociden Aktivität kann dazu beitragen, das Mikroklima der begrenzten Flächen mit einer hohen Menschenkonzentration zu verbessern und negative Auswirkungen der anthropogenen Faktoren auf die Gesundheit und psychische Gesundheit der Menschen zu verringern.

Lubenets A., Tsvetayeva O.

Oles Honchar Dnipropetrovsk National University

BOTTLE MAIL

As you know, everything new is well forgotten old. That`s why it isn`t surprising that many methods of previous generations get a second life. As an example of this thing we can name a bottled mail. It can carry also a scientific mission. With this mail we can research choppy ocean currents, understand how they relate and what benefit humanity can be learned.

Ensconced in a plain glass bottle, the scrap of paper drifted in the North Sea for 98 years. But when a Scottish skipper pulled it from his nets near the Shetland Islands , he didn't find a lovelorn note or marooned sailor's SOS.

«Please state where and when this card was found, and then put it in the nearest Post Office,» read the message. «You will be informed in reply where and when it was set adrift. Our object is to find out the direction of the deep currents of the North Sea.»

The message in a bottle found by Andrew Leaper – certified by Guinness World Records on August 30 as the oldest ever recovered – belonged to a century-old science experiment. To study local ocean currents, Capt. C. Hunter Brown of the Glasgow School of Navigation set bottle number 646B adrift, along with 1,889 others, on June 10, 1914.

«Drift bottles gave oceanographers at the start of the last century important information that allowed them to create pictures of the patterns of water circulation in the seas around Scotland», Marine Scotland Science's Bill Turrell explained in a statement.

Turrell's Aberdeen-based government agency still keeps and updates Captain Brown's log. According to Turrell, Leaper's discovery – plucked just 9 miles (15 kilo-meters) from where Brown released it – is the 315th bottle recovered from that

experiment. Each one, Turrell explained, was «specially weighted to bob along the seabed», hopefully to be scooped up by a trawler or to eventually wash up on shore.

Of course, people used a bottled mail more than 100 years ago, but even then people tried to use it with a scientific aim.

Around 310 B.C., the Greek philosopher Theophrastus plopped sealed bottles in the sea to prove that the Mediterranean was formed by the inflowing Atlantic. (There's no record showing that he ever received a response.)

In the 16th century, Queen Elizabeth I of England – thinking some bottles might contain secret messages sent home by British spies or fleets – appointed an «Uncorker of Ocean Bottles», making it a capital crime for anyone else to open one.

And in the 18th century, a treasure-hunting seaman from Japan named Chunosuke Matsuyama, shipwrecked on a South Pacific island with 43 shipmates, carved a message into coconut wood, put it in a bottle, and set it adrift. It was found in 1935—supposedly in the same village where Matsuyama was born.

In the 20th century, doomed World War I soldiers used bottles to send last messages to loved ones. And in 1915, a passenger on the torpedoed «Lusitaniatossed» a poignant note that read, according to one report, «Still on deck with a few people. The last boats have left. We are sinking fast. Some men near me are praying with a priest. The end is near».

Today drift bottles are still used by oceanographers studying global currents. In 2000 Eddy Carmack, a climate researcher at Canada's Institute of Ocean Science, started the Drift Bottle Project, initially to study currents around northern North America.

In the past 12 years, he and his colleagues have launched some 6,400 bottled messages from ships around the world. Of those, 264 – about 4 percent – have been found and reported.

«There have been some amazing paths followed by these bottles», Carmack said.

Three that were dropped into the Beaufort Sea, above northern Alaska and northwestern Canada, became frozen in sea ice, he said. Five years later, melting Arctic ice had flushed the bottles all the way to northern Europe. Another bottle circled Antarctica one and a half times before it wound up on the Australian island of Tasmania. Some have made it from Mexico to the Philippines. And others have demonstrated that oil spills and debris from development in Canada's Labrador Sea and Baffin Bay could end up on Irish, French, Scottish, and Norwegian beaches.

Although, a large quantity of atlases of ocean currents exists now, even now they have many blind spots. Perhaps a bottle mail isn`t the fastest and the best way to explore these spots, but it brings a tangible and real results for many years. A bottle mail is useful for climatology, because the changes of currents` nature often depends on the unequal distribution of atmospheric pressure, separated from the main stream flow causes swirls which cause hurricanes and cyclones.

It is too early to discount the bottled mail; it brings great benefits not only for science.

Mizin V. V., Liashenko V. P., Bondar O. E., Didkivskyy A. P.

Dnipropetrovsk National University named after Oles Honchar

THE STATE OF AUTONOMIC ADAPTIVE RESPONSES OF STUDENTS UNDER INFORMATION LOAD

Nowadays the pace of life and the amount of information load are steadily increasing, which leads to emotional stress and the development of adaptive-compensatory reactions. This condition is characterized by activation of the sympathetic division of the autonomic nervous system, low functional capacity and physiological reserves. Ultimately this could lead to pathological conditions. Information load especially affects the vegetative adaptive response of students

who have difficulty coping with the learning material. Therefore, the aim of this work is to study the heart rate variability in students with low levels of physical activity that will determine the predominant type of the regulation and mechanisms of autonomic adaptive responses in terms of the presented dosage of information load.

The study involved 20 second-year and third-year students with low level of physical activity (aged 18–19 years) of Natural Sciences Departments of Dnipropetrovsk National University named after Oles Honchar. The evaluation of physical activity was performed by the method of Fremenheim study. All the participants were healthy. To determine the variability of the heart rate we used a heart rate monitor POLAR RS800CH. The testing was conducted before and after the information load. The information load was carried out with the Schulte, Bourdon and Gorbov tests given in the computerized form and used for the integrated assessment of attention and the ability to perceive meaningful information. The statistical analysis of the results was carried out with nonparametric methods.

The results showed that the boys with low level of physical activity in the regulation of the heart rhythm demonstrated sufficiently high frequency and timing of heart rate variability. Among the indicators of heart rate variability before the information load, the indicator of VLF range dominates (41.6%), indicating a high level of suprasegmental structures impact on the cardiovascular system. There is an initial high level of LF low frequency range while the high-frequency HF spectrum is within the normal range (using standard HRV indices developed by the European Society of Cardiology and the North American Society of cardiostimulation and electrophysiology). The value LF/HF (3,13) indicates a disorder in balancing mechanisms of a vagal-sympathetic tone.

The information load causes changes in the mechanisms of vegetative activity. A significant reduction in the rate of power of VLF range (34.2%), an increase in the ratio of LF / HF and increase in time analysis of heart rate variability (STD RR (SDNN)) indicate a decrease of hyper adaptive condition.

There is a slight increase in LF and HF power spectra, and a decrease in para-sympathetic activity level of autonomic regulation (RMSSD).

The results showed that students of the second and third years of study of Natural Sciences Departments demonstrated the prevalence of sympathetic regulation of heart rhythm disorders and the balance of autonomic nervous system. Information load significantly affects these parameters, which leads to disruption of autonomic regulation. The prevalence of the sympathetic link of controlling and functioning of the body under the internal stress can lead to the formation of organic and physiological disorders. The obtained results allow us to address the health of students and their formation as future professionals in an integrated way.

Moskaleva O., Bezugluj V., Tsvetayeva O.

Oles Honchar Dnipropetrovsk National University

THE MAJOR ECOLOGICAL PROBLEMS OF THE RIVER DNIPRO

Dnipro is the third length basin area in Europe what leaking on the territory of tree countries: Russia, Belarus and Ukraine. It is the largest river of our country, the symbol power, its multiannual history. Dnipro provides water not only for water users with in its basin but to the main source of water supply of major industrial centers in the south and north eastern Ukraine. Dnipro provides water to about 2/3 of the territory of Ukraine, including about 30 million people, 50 major cities and industrial centers about 10 thousand villages and more than one thousand public economic and 50 large irrigation systems.

During its life, the mankind is trying to get as much as possible from without regard to its potential possibilities. This led to the disruption of the natural balance.

The main causes of the crisis are:

- building cascade reservoirs on the Dnipro that radically changed the dynamics of the runoff;
- large-scale reclamation;

- the construction of numerous industrial complexes in the basin river;
- huge volumes of water with drawls for industry and accretion.

These reasons that degraded the ecosystem of Dnipro where the valuable species of fish extinct, the huge amount of terragenous deposits, heavy metals, radionuclides, humus substances accumulate, coast erosion develops.

The enterprises pollute the waters of the Dnipro pouring their waste water into the river. Petroleum, carbon, iron cyanide, nitrogen ammonium, nitrite, rafinidy, heavy metals, biogenic and organic substances appear there. These substances alter the quality and transparency of the water changing water salinity, flowering banks appear and organisms die.

The biggest industrial facilities, pollutants on the Dnipro are: metallurgical factory named after Dzerzhinsky (Dniprodzerzhynsk), plant «Zaporizstal» (Zaporizhzhia), metallurgical plant named after Petrovsky (Dnipropetrovsk). Every year they throw under 156, 104 and 93 m^3 of wastewater pollutants from sewage companies into the Dnipro.

The largest nuclear power plant in Europe in Zaporizhzhya is located near Dnipro. It is more than 20 liters of effluent in the areay Zaporizhzhia or Herson in 1 m^3 Dnipro water. This figure rises and every year.

About 900000 tons of pollutants gets basin in Ukraine onto Dnipro. In 1990 the total number of substances that fall into water with sewage is 793000 tons. In the 1991–1995 the average annual amount is 1003000 tons, in 2005 – 26100000 tons, 2009 – 44270000 tons, 2010 – 47640000 tons (see Fig. 1).

The most polluters of water resources are utilities, ferrous and nonferrous metallurgy, coke severe, energy transportation engineering and agriculture. Only sewer systems of Dnipropetrovsk and Zaporizhzhya annually throw 196 and 172 million accordingly m^3 of polluting wastewater in Dnipro.

Agriculture is one of the main sources of nutrients. The great plowering of lands, their reclamation, erosion and other factors lead to an increase in revenue drain agricultural land to water bodies.

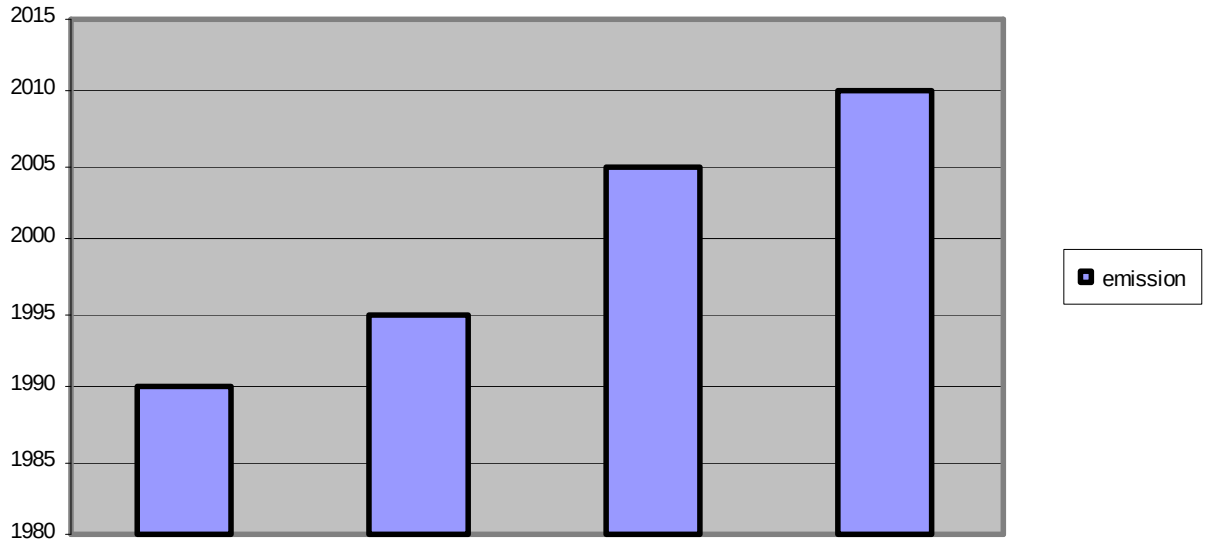

Fig. 1. The dynamics of emission of harmful substances into the Dnipro

Another factor of pollution treatment is the low efficiency of available facilities. Centralized biological structures are working ineffectively. There are no virtually local treatment facilities to remove the excess of minerals or water desalination. Scientists found that 80% of human diseases associated with tainted water.

In general the deterioration of the ecological status of water bodies of the Dnipro may threaten the genetic degradation of population of Ukraine and affect the environmental performance of farms. To prevent, it is necessary to make the scheme of sewage and pollutants, processing waste, to develop the planning of the household considering ecological reserve and economic opportunities. This requires the qualified personnel with a high level of environmental consciousness and the scientific view of nature.

Oganesiyan M. S., Gorban V. A., Bondar O. Y.
Oles Honchar Dnipropetrovsk National University

PARTICULAR QUALITIES OF THE CONTENT OF CALCIUM CARBONATES IN THE ORDINARY CHERNOZEM UNDER THE SHELTER BELT OF DNIPRO PRYSAMARIYA

Calcium carbonates are ones of the chief components in the ordinary chernozem (black soil). They affect different processes in the soil, the main of which are changes in concentration and activity of calcium ions in the soil solution, the state of absorbing complex of soil, soil acidity (pH). They also help to build strong coagulation structures, provide antiwind resistance of soil, increase the mobility of some chemical elements, improve a number of water-physical properties of soil: density, water permeability, porosity, etc. Special research of carbonate morphology, micro-morphology and mineralogical composition gives information about genesis of soil and can help diagnose features of chernozem that is very important today. Carbonates are sensitive indicators of changes in the conditions of mineral formation, because they have a wide range of isomorphism in their crystal lattice, moreover they have a large variation degree of order or disorder in a structure.

Calcium carbonate has white color, it is found in various forms in the thickness of soil profile. Calcium neoplasms have extremely diverse forms that depend on environmental conditions, in which the migration of bicarbonate solutions takes place. The character of carbonate neoplasms is determined by a complex combination of factors (concentration of the soil solution, partial pressure of soil CO_2 , humidity and evaporation in the middle of the soil mass, the nature of the soil profile draining, activity of soil biota, soil temperature, density and porosity of the soil profile etc.). These factors determine primarily the amount of $CaCO_3$ and its microstructure. On the other hand, the habitus of carbonate neoplasms also depends on the structure and composition of the soil, the sizes and shapes of cavities in which the deposition of calcite crystals takes place. So all these factors naturally vary within the limits of the soil profile that causes formation of certain forms of

carbonate neoplasms that are contained in the profile of chernozem and their migration.

The main purpose of our work was to investigate the characteristics of the content of calcium carbonates in the ordinary chernozem under the shelter belt of Dnipro Prysamariya. To establish the content of carbonates, we used generally accepted method which is based on the records of the weight loss of soil due to the allocation of CO_2 in the acid destruction of carbonate.

The trial area, from which we selected soil samples for analysis of calcium carbonate content, was situated on the watershed of the virgin steppe plakora under trees of the shelter belt. The Table 1 below has our results of research.

Table 1. The content of the calcium carbonates in the ordinary chernozem under the shelter belts of the Dnipro Prysamariya

Date of sampling	Content $CaCO_3$, %	The average value, X	Standard error of, Σ	Coefficient variations, V, %	X_{true}, p= 0,95 *a= 0,05*
H (0–30 cm)					
12.07.2011	1,46	2,78	2,62	94,24	2,78 ± 2,62
29.08.2011	1,74				
30.09.2011	6,70				
30.10.2011	1,22				
Hp (30–70 cm)					
12.07.2011	6,46	6,03	2,44	40,46	6,03 ± 2,44
29.08.2011	4,35				
30.09.2011	9,33				
30.10.2011	4,01				
Ph (70–90 cm)					
12.07.2011	17,79	14,79	3,53	23,88	14,79 ± 3,59
29.08.2011	16,18				
30.09.2011	15,48				
30.10.2011	9,69				
Ph_k (90–120 cm)					
12.07.2011	16,63	18,27	3,49	18,79	18,27 ± 3,49
29.08.2011	15,12				
30.09.2011	23,04				
30.10.2011	18,30				

Analyzing the table information, we can say that the shelter belt trees directly affect the distribution of calcium carbonate in the soil profile. Trees of the shelter belt lead to eluvial removal of carbonates from the upper genetic horizons and their illuvial accumulation in the lower genetic horizons of the ordinary chernozem of the shelter belts improved by trees.

Pryshchepa I. V., Nedzvetskii V. S., Znanetska O. M.

Oles Honchar Dnipropetrovsk National University

CHANGES IN HIGHER NERVOUS ACTIVITY OF RATS WITH STZ – INDUCED DIABETES

Keywords: diabetes, central nervous system, emotional activity, intermediate filaments, glial fibrillary acidic protein, hydrated C_{60}, oxidative stress.

Diabetes is a disease characterized by hyperglycemia resulting from deficiency of insulin secretion, the effectiveness of the hormone, or the joint effects of these factors. Severe metabolic abnormalities that occur in diabetes is the basis for the development of complications in the nervous system. The complications are the leading cause of disability and mortality among patients with diabetes mellitus, and primary attention should be paid to diabetic neuropathy, nephropathy and retinopathy. Given this, there is a right question: why diabetics primarily affects the nervous tissue, kidney and retina? According to numerous studies, this is due to the peculiarities of intracellular glucose metabolism in these tissues. Under conditions of hyperglycemia, excess glucose enters all cells, but most of them are the mechanisms by which cells remove excess glucose by restoring intracellular homeostasis. The feature of retinal capillary endothelial cells, mezanhial cells of renal glomeruli, neurons and Schwann cells are that these mechanisms are not available here, so they cannot remove the excess glucose, which leads to a sharp increase in its concentration inside the cell . According to many researchers, that is the reason why these cells are affected first. This insight has led to an active search

and development of tools that can not only effectively monitor the performance of blood glucose, but also reduce its concentration in the target cells.

Diabetes is often accompanied by impaired cognitive activity, cognitive deficits and increased risk of dementia, especially as for the elderly. It is known that in pathological conditions associated with neurodegenerative and age-related changes the generation of reactive oxygen and food increases, as nerve cells are extremely sensitive to oxidative stress. These observations confirm the idea that mnemonic dysfunction is largely associated with the disorder of glucose metabolism and the development of oxidative stress in the cells of the brain. The affection of the peripheral nervous system is also due to the complex metabolic and cardiovascular disorders. Metabolic disturbances in diabetes include many factors, among which the most important ones are the long-term chronic insufficiency of insulin and hyperglycemia. The increased level of blood glucose initiates a series of biochemical changes that are the leading factors in the development of pathological lesions in the patients with diabetes. In the pathogenesis of diabetic complications the leading role of oxidative stress is beyond any doubt. It has been found that hyperglycemia resulting from activation of some biochemical processes leads to the accumulation of free radicals. As it is known, a free radical is a molecule or its part that has an unpaired electron on the outer molecular or atomic orbit. The presence of such an electron gives to radical a very high oxidative ability. Increased formation of free radicals is realized as the oxidation of most hydrocarbons and carbohydrates in combination with protein in autooxidation fatty acids in triglycerides, phospholipids and cholesterol esters. The latter damage intracellular membrane proteins, nucleic acids and lipids, and cause the degradation and aging of cells. The accumulation of free radical oxidation products contributes to the development of pathological processes: dysfunction of mitochondria and changes in the synthesis of fatty acids and prostaglandins, membrane damage and endothelial dysfunction, hypercoahulation. Endothelial dysfunction plays an important role in the development of coronary heart disease, hypertension, arteriosclerosis, cerebral circulatory disorders in patients with diabetes.

Hyperhichemical state was induced by intraperitoneal injection of streptozotocin (STZ, 50 mg/kg). Experimental work was conducted on sexually mature (24–25 weeks) Wistar rats. The animals were divided into four groups, which consisted of 8 animals each. The first group – TSW, the second – STZ + C_{60}HyFn, the third – C_{60}HyFn, the fourth – saline.

The fractions of soluble, cytoskeleton and membrane proteins were obtained from the tissues of hippocampus, cortex and cerebellum 28 days after the induction of hyperglycemia and putting of C_{60}HyFn. After decapitation the brain was removed, cooled and separated into sections. The content of soluble and filament forms of GFAP was determined using immunoblotting. Statistical analysis of the results was performed using SPSS 10,0 for Windows, the difference was considered significant at $p < 0,05$.

The behavior testing of control, STZD and diabetic groups of animals that received injections of hydrated fullerene, was done using the test "open field". It has been determined that the inhibition of locomotor activity of the second group of animals is 1,2 and 1,4 times compared with the control and STZD + C_{60}HyFn groups respectively.

In the group of STZD animal the rates of search activity (mink reflex) reduced to 1,15 times compared with the control one. The inhibition of search activity has been found in STZD group of animals that received injections C_{60}HyFn (0,1 mg / kg body weight) 1,23 and 1,06 times compared with the second and control ones. The group of STZD animals has the lowest emotional activity index (poles). It is 1,2 times smaller relative to the control one. The same figure of STZD + C_{60}HyFn group of animals is 1.01 and 1,23 times higher than the second and control groups of animals respectively.

The indicators of emotional activity (grooming) of the second group of animals were 1.25 and 1.3 times reduced compared with the control and STZD + C_{60}HyFn groups of animals. In the group of diabetic animals that received injections of hydrated fullerene the indicators of emotional activity (grooming) increased to 1,03 and 1.29 times compared with the control and STZD groups of animals respectively.

One the grounds of the above parameters the change of behavioral responses it can be concluded that the introduction of C_{60} has largely restored the normal functioning of nervous system of animals.

Pugach D., Gorb A., Tsvetayeva O.

Oles Honchar Dnipropetrovsk National University

THE DISPLACEMENT OF THE PHENOPHASE OF WINTER CROPS IN DNEPROPETROVSK IN CONNECTION WITH THE CHANGES OF THE ECOLOGICAL CONDITIONS IN THE REGION

The changes in temperature in the upward influence on the ecological environment. The increasing of the the average temperature in Dnepropetrovsk in the XX century in 08 degrees [1] reflected in terms the phenophase of crops. So there is an urgent issue to study the changes in terms of occurrence and duration of the phases of development, particularly cereals.

The object of this work is to study phenophase of the winter wheat, the subject-phase changes due to changes in thermal regime.

The purpose is to study the temporal displacement of the phenophase winter wheat in the Dnepropetrovsk region due to global warming.

The study assigned materials monitoring phases of winter wheat during 1972–2010 years [2]. The rate of increase in average air temperature in the late XX and early XXI centuries observation period is divided into two half-cycles –1972–1990 and 1991–2010. The onset time and final phases of development of winter wheat are presented in each of the half-cycles for the northern, central and southern regions are evaluated. The phenophase of «termination vegetation» in central and northern areas was two days longer, and the phase of «vegetation» began one day earlier. Phases «earing», «bloom», «milking» and «full maturity» started 2–3 days earlier (Table 1). Harvesting started previously earlier.

Note. Sign «-» – onset phanophase in the second half-cycle before in the first «+» sign – onset phenophase later.

Table 1. The displacement of terms of the phenophase onset of winter wheat in Dnepropetrovsk

№	Period	Territory	Terms phenophase area early (day, month)											
			sowing	seedling	third letter	bushing	termination of vegetation	vegetation	booting	earing	flowering	lactic ripeness	wax ripeness	full ripeness
1	1972-1990	North	10.09.	18-19.09	4-5.10	14-15.10	12-13.11.	3.04.	1.05.	1-2. 06.	6. 06.	21-22. 06.	21-22. 06.	13. 07.
		Central	11.09.	20.09	4-5.10.	15.10	13-14.11.	31. 03.	28.04.	29-30. 05.	4. 06.	18-21. 06.	18-21. 06.	11.07.
		South	12-13.09.	20-21.09.	4-5.10.	15.10	15.11.	28. 03.	25.04.	27-28.05.	2-3. 06.	17-18. 06.	17-18. 06.	9.07.
2	1991-2010	North	11.09.	18-19.09	4-5.10.	13-14. 10	14-15.11.	02. 04.	29-30.04.	30.05-1.06.	3-5. 06.	20-21. 06.	20-21. 06.	10-12. 07.
		Central	12.09.	19.09.	4.10	13-14. 10.	15-16.11.	30.03.	26.04.	27. 05.	1.06.	17. 06.	17. 06.	9.07.
		South	12-13.09.	19-20.09.	3-4.10	13.10	16-17.10.	27.03.	23-24.04.	25-26. 05.	30-31. 05.	14-15. 06.	14-15. 06.	6-7.07.
3	Displacement phenophase	North	+1	0	0	-1	+2	-1	-1.5	-1.5	-2	-1	-1	-2
		Central	+1	-1	-0.5	-1.5	+2	-1	-2	-2	-3	-1.5	-1.5	-2
		South	0	-1	-1	-2	+1.5	-1	-1.5	-2	-3	-3	-1.5	-2.5

In some years there has been lengthening and warming autumn season. In 2010, this fact made a positive impact to the development of winter wheat, which, due to insufficient rainfall and stocks of productive moisture in the soil, some farms were sown at 1-3 weeks after the optimal timing. But, in a warm autumn the phenophase of «termination vegetation» lasted even until the third week of November, which helped to perpetuate and bush the plants.

As a result, it can be argued, that the changing the terms of offense ends and the duration of phenophase crops appear in a warming climate.

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Puschil Y., Liashenko V., Bondar O., Didkivskyy A.
Oles Honchar Dnipropetrovsk National University

THE INDICATORS OF NEUROVEGETATIVE STATE OF HUMANITIES STUDENTS

The modern pace of life requires the appropriate effeciency of training process, the main indicators of which are the level of physical and mental performance as well as educational and labor activity of students. The effectiveness of current adaptive reactions in the body of a young professional is defined by the relationship of neural properties, autonomic reactions and personal settings, which together provide coordinated mental and physiological functions. Neurovegetative imbalance reduces adaptive capacity, influences the performance of physical and mental activity, prevents adequate perception of the new material. Based on this, the neurovegetative features of students in the humanities were monitored.

The study involved 15 boys of the 3rd year of study (aged 18-19 years) of the Humanities Departments of Dnipropetrovsk National University named after Oles Honchar. All participants were healthy. To determine the variability of a heart rate, we used a heart rate monitor POLAR RS800CX.

Statistical analysis of the results was performed with nonparametric methods.

The study examined the following parameters of spectral analysis: HF, (%) – power spectrum of high frequency components of variability in% of total power fluctuations; LF, (%) – power spectrum of low-frequency component of variability in% of total power fluctuations; VLF, (%) – very low power spectral component of variability in% of total power fluctuations; HF – average capacity of a high component of HRV in ms2; LF – average power low-frequency components of HRV ms2; LF / HF – ratio of values of low-and high-frequency component of HRV; Total – total power spectrum of HRV in ms2. Components of temporal analysis: SDNN – standard deviation of NN-intervals, reflecting all periodic components of variability during recording, that is a summary measure HRV; RMSSD – estimates comparing NN-intervals; pNN50 – This criterion is related to NN-intervals, which differ from each other by more than 50 ms, with a total of NN-intervals.

The results showed that students' high-level power (HF) and low frequency (LF) components were below normal (standard use HRV indices developed by the European Society of Cardiology and the North American Society of pacing and electrophysiology), indicating the reduced functional activity of cardiac muscle and insufficient influence of the sympathetic and parasympathetic nervous system on a heart rate. VLF component responsible for a vascular tone and thermoregulatory system remained normal.

The indicators RMSSD and LF / HF were higher than normal, indicating the unbalanced influence of sympathetic and parasympathetic divisions on the heart, with a predominance of sympathetic regulation. These results indicate the low adaptive capacity of the organism to stressful environmental factors.

Monitoring of neurovegetative features of humanities students showed the presence of imbalance in vegetative control of an organism that can affect its functional state as a whole.

This disorder of the neurovegetative state shows early signs of worsening adaptations of the body to stress, thereby leading to decreased performance. These data will provide methods and systems for improving health of students that is an important factor in the training of highly qualified specialists.

Rybakov A. E., Reutskova O. N., Kucherenko S. K.

Oles Honchar Dnipropetrovsk National University

MARKET AND CONSUMER EQUILIBRIUM

Market equilibrium

Consumers and producers react differently to price changes. Higher prices tend to reduce demand while encouraging supply, and lower prices increase demand while discouraging supply. Economic theory suggests that, in a free market there will be a single price which brings demand and supply into balance, called equilibrium price. Both parties require the scarce resource that the other has and hence there is a considerable incentive to engage in an exchange.

An equilibrium prevails when economic forces balance so that economic variables neither increase nor decrease. A market equilibrium is attained when the price of a good adjusts so that the quantity buyers are willing and able to buy at that price is just equal to the quantity sellers are willing and able to supply. When a market equilibrium is attained, forces of supply and demand balance so that there's no tendency for the market price or quantity to change over a given period. The equilibrium price acts to ration the good so that everyone who is willing and able to buy the good will find it available. Similarly, at the equilibrium price, everyone who wants to sell the good will be able to do so successfully. Equilibrium price is also called market clearing price because at this price the exact quantity that producers take to market will be bought by consumers, and there will be nothing 'left over'. This is efficient because there is neither an excess of supply and wasted output, nor a shortage – the market clears efficiently. This is a central feature of the price mechanism, and one of its significant benefits.

A shortage exists in a market if the quantity demanded exceeds the quantity supplied of a good over a given period. For example, there will be a monthly shortage of compact disc players if at the current market price the monthly number of players that sellers are willing and able to make available falls short of the monthly number that buyers are willing and able to purchase. A surplus exists in a market if the quantity supplied exceeds the quantity demanded of a good over a given period.

At the market equilibrium price of the good, there can be neither surpluses nor shortages in the market over any given period. When a market clears, the good is rationed in the sense that there are neither surpluses nor shortages over a period.

Consumer equilibrium

As a consumer, you have limited income available to spend on the goods that provide you with utility. Your problem is to allocate your income (for example, per month) among the items you want. The opportunity cost of spending some of your income on any one good is represented by the price of that good.

Each tune you buy more of an item you simultaneously obtain extra utility which is the marginal utility of an item and sacrifice the opportunity to purchase

other goods. Assuming you can buy as much of an item as you want at the market price, the sum of expenditure on other goods you sacrifice for each unit of a particular good is constant. For example, if buns and ice cream cones both cost $1, you ll have to give up one bun each time you buy another ice cream cone. However, the marginal utility per dollar of ice cream cones will therefore be less as you buy more cones per month. As a rational consumer, you presumably seek to obtain the greatest possible utility from spending your limited income. You'll gain utility each month by consuming more buns if your marginal utility per dollar of buns exceeds your marginal utility per dollar of ice cream cones.

As long as the marginal utility per dollar is not the same for all goods consumed, the consumer can gain by reallocating income to buy more of the goods that have higher marginal utility per dollar than others. Of course, when you consume more goods with high marginal utility per dollar, the marginal utility per dollar of those goods declines. Consuming fewer goods with low marginal utility per dollar increases their marginal utility per dollar. Adjusting marginal utility per dollar in this way by controlling the purchase of particular goods enables you to maximise your satisfaction from spending your income.

So, a consumer equilibrium is attained when a consumer purchases goods (for example, weekly) until the marginal utility per dollar is the same for all goods consumed.

Stasiuk M., Mudrenko A. A.

Oles Honchar Dnepropetrovsk National University

PROBLEMS OF NANOINDUSTRY INFRASTRUCTURE DEVELOPMENT AT REGIONAL LEVEL

In today's competitive global environment, the competitive advantages of Russian industry have become possible thanks to the development of high-tech industries based on the use of nanomaterials and nanotechnology. Effective

functioning of nanotechnology is impossible without the infrastructure availability. One of the priorities to the development and stimulation of nanotechnology is building nanotechnology infrastructure at the federal and regional levels. Under the Program "Development of nanoindustry infrastructure for 2012-2015" the objective to develop the infrastructure within the national nanotechnology network (NNN) at the federal level and regional nanotechnology network (RNN) at the regional level has been set.

Nanoindustry Infrastructure includes science-educational and research organization, logistics development, skills for scientific discovery and management of nanotechnology, manufacturing companies as a part of the venture capital companies, technology parks, business incubators.

National Nanotechnology Network is a multilevel, multi-dimensional structure, which consists of the separate subnets on the priority directions of nanoindustry development.

The structure of the RNN should include industrial and technological, financial, information, expert and consulting, and human infrastructure.

The specific problems faced by the region during the creation of region nanoindustry infrastructure are to be distinguished.

Industrial and technological infrastructure of RNN is necessary for enabling access of enterprises (mostly small) to production resources. Its elements are the centers of innovation development in the regions, the scientific and technological parks, centers of technology transfer, business incubators, engineering and innovation center, logistics centers, special economic zone of technology-innovative and industrial-production type.

The main problems of production and technological infrastructure of the nanotechnology network in most regions are:

1. The absence of several key elements of infrastructure;

2. Inappropriate use or misuse of existing elements;

3. The absence of a methodological framework for the establishment and further integrated development of production and technological infrastructure;

4. Insufficient funding.

Financial infrastructure is the most controversial and debated. Despite the availability of a wide range of financial instruments, the main source of funding for

Venture financing from the regional venture funds does not give the significant positive results. A possible reason is that the technology venture capital funding is not enough tested and therefore is not very effective. Large companies currently prefer to be engaged in the development of promising projects within the enterprise itself, instead of using ready-made developments create in the framework of projects with venture capital financing. The reason for such behavior most likely is a complex procedure "exit" from an investor of venture companies.

The analysis of the system infrastructure for nanotechnology in region suggests that, despite the presence of basic essential elements, there are several problems that hinder their further development and efficient operation. The independent operation of these elements can not be used as a basis for infrastructure provision of actively engaged in region to the creation, implementation and production development of nanotechnology, providing growth competitiveness and efficiency of goods and services. For their coordination within regional nanotechnology network requires approval of nanotechnology development strategy at the regional level, relevant programs of this strategy, to ensure their coordination with existing official document in regions, as well as the selection of the parent organization of region infrastructure nanotechnology.

Yarotska A., Bezugly V., Tsvetaeva O.

Oles Honchar Dnipropetrovsk National University

PROBLEMS OF THE DAMP EQUATOR WOODS

The damp equatorial woods of South America, the Central Africa and South-East Asia belong to the most important biosystem of the Earth. The equatorial woods occupy the greatest places in a river basin of Amazon (the wood of Amazonia), in Nicaragua, in the southern part of the peninsula Yucatan (Guatemala, Belize), in

the biggest part of Central America (here they are called "selva"), in the equatorial Africa (from Cameroon to the Democratic republic of Congo), many areas of South-East Asia (from Myanmar to Indonesia and Papua New Guinea), in the Australian State of Queensland. The damp equatorial woods of Africa occupy a hollow of Congo and the coast of the Gulf of Guinea to the North from the equator. These woods differ a huge specific variety of plants up to 50 m high and a multiple layers. At such multiple layers on the soil not enough light gets, but land plants develop as it is good. The equatorial wood – the homeland of many valuable plants, for example, an olive palm – tree, from which receive palm-oil. Wood of many trees goes on production of furniture and in a large number is exported. Many plants give not only valuable wood, but also fruits for use in technical production and medicine. These woods serve as "planet lungs", emitting oxygen and absorbing carbon dioxide. However they are cut down with menacing speed as economically to prepare wood and to create new pastures. But in Amazonia, in a river basin of Congo, on the Zond archipelago impassable virgin thickets still remained, and in Brazil and Costa Rica programs which will allow to combine profitable land use with preservation of unique environment are developed. The magnificent vegetation of the damp equatorial woods is connected not with fertility of the soil (it is very poor here), and intensive circulation of the nutrients almost entirely consisting in a biomass. If cut down trees, a little that will grow on their place, and frequent heavy rain will quickly wash away the bared soil. After destruction of the Amazonian wood the earth was used by farmers only some years while its fertility didn't fall too low. Now the Amazonian wood remains only for 85% of its potential area. Preservation of this most valuable natural heritage became a problem of the international scale.

The huge site of the wood in the north of Brazil was reduced during petroprospecting works. Steady rains cause a soil erosion which expands emptiness more and more and cuts deep ravines in the bared slopes. It constantly grows.

Very often data of the woods lead the sharp outbreaks of the infectious diseases which carriers are insects. So, malarial mosquitoes breed in the still water which quantity sharply increases in the course of wood data.

In general 18 million hectares of the wood disappear, and not only for the sake of wood annually are around the world are reduced. Especially intensively the woods are reduced in Brazil and Indonesia (pic. 1). The community has to help the equatorial countries to develop more rational systems of land use and to find alternative sources of the income to slow down destruction of natural riches.

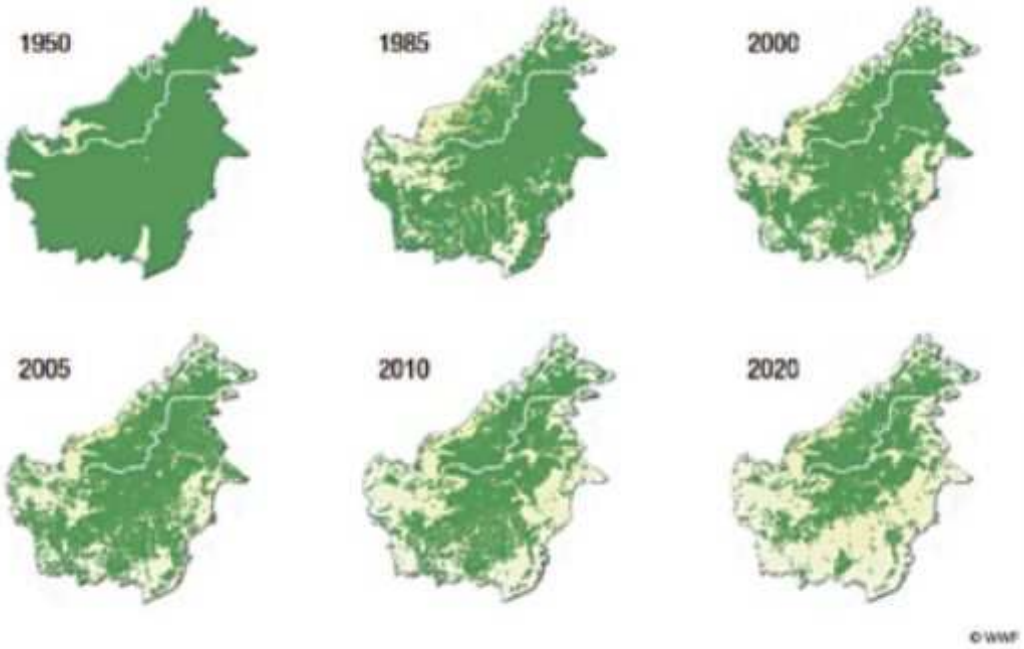

Fig. 1. Dynamics of deforestation on Kaoimantan's island in the Zond archipelago

The technique of preservation of the fertility, reproducing a cycle of natural regeneration is so far developed. Thus copy system "from a farm to the wood", consistently using useful plants in each stage of a cycle:

- jumping of grassy cultures (Ananas comosus, Saccharum officinarum);
- for the second year to farmers recommend to put bananas and a papaya which keep efficiency within 5–10 years;
- at the same time introducing trees which are a part of the radical wood (a peach palm tree, the Brazilian nut).

Problems of the damp equatorial woods have to be studied and be exposed to the multilateral analysis from ecological, to be exact, eco-economic point of view.

Yevsyevskaya V., Tsvetayeva O., Bezugly V.
Oles Honchar Dnipropetrovsk National University

OCEAN POLLUTION AMICABLE OIL AND PETROLEUM PRODUCTS

Among the most harmful chemical contaminants, it was outlined in International Convention for the Prevention of Marine Pollution by Dumping of wastes in the 1972, oil and petroleum products were include. The major source of pollution are local, domestic and industrial waste water, oil, and other radioactive materials.

According to estimates of the National Research Council of the USA \ National Research Council almost 1.5 million m3 of oil and petroleum products get into the water annually, about 45% of leaks are of natural causes, such as oil from subsea reservoirs spontaneously poured into the sea. Approximately 5% of the oil gets into the sea, oceans and lakes as a result of extraction and production. Transport accidents (tankers, pipelines, etc.) provide 22% of such spills. The rest of oil (28%) falls into the water as a result of hundreds and thousands of small accidents and leaks that are often not noticed the press, government, and law enforcement agencies: the cause may be, for example, leaking gas tank on a boat or inadequate treatment facilities working (Fig. 1).

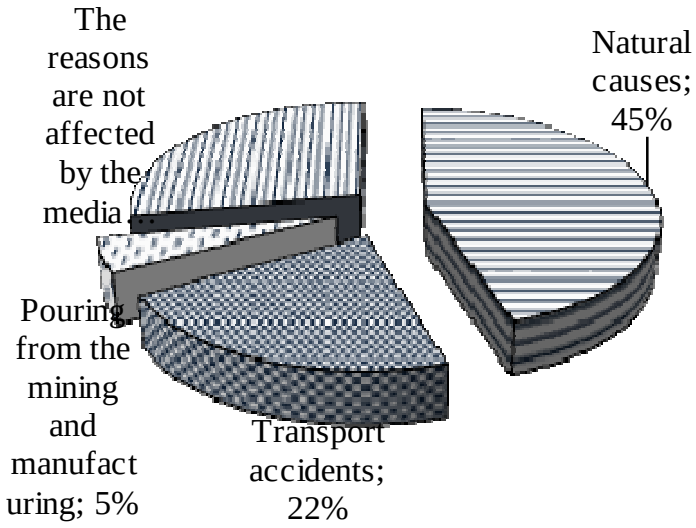

Fig. 1. The main causes of falling oil and petroleum products into the waters of the ocean

In 1969, during the voyage a cross the Atlantic on a papyrus boat "Ra", Thor Heyerdahl noticed that the surface of the sea was free of the globules of oil and tar for only a few days for theen tire two-month period of travel. Today, the situation is not improved. According to the National Academy of Sciences of the United States in the mid-70's of the twentieth century 6 million tons of oil felt into the sea about. By the end of 70's oil spill in the seas and oceans were increased to 10 million tons a year. The greatest harm caused oil spills from tanker accidents and accidents on offshore drilling platforms.

It is estimated that 200 000 tons of oil is enough to make all the Baltic Sea into a biological desert. The contaminants increase the sensitivity of marine mammals especially seals, to the distemper, which struck the Caspian Sea in 2000, that killed at least 30 thousand of this species. Probably metal pollutants in the ocean are also the cause of skin ulcers and liver enlargement of the fish, including flounder, 20% of the population is in the North Sea affected by these diseases.

Thus the problem of pollution of the oceans is really actual today. It is a topic for discussion for most experts and oceanographers. Pollution of surface waters of the Earth may cause the changes in water cycle, thermal conditions, atmospheric circulation, climate change, etc. Expressing serious concern over its pollution, specialist marine scientists believe that only the combined efforts of all countries in the world you can protect the oceans and preserve his wealth for present and future generations.

Zhuckov V., Osadcha O. V.

Oles Honchar Dnipropetrovsk National University

THE ASPECTS OF RESEARCHING PHYSICAL PROPERTIES OF GRAPHENE

The problem of looking for new semi-conductor materials for using in electronics is vital nowadays. It can be explained, first of all, by the fact that there is serious shortage of silicon which is the most accessible and widely used semi-conductor. Trying to find a solution to this problem, scientists turned to a newly-discovered super-

material – graphene. Graphene is the first material that is two-dimensional. This gives it unique properties. 2D materials display very interesting properties, and are fundamentally different from the 3D materials we encounter everyday. The discovery of 2D materials means that scientists now have access to materials of all dimensionalities, including 0D (quantum dots, atoms) and 1D (nanowires, carbon nanotubes)

Since 1959 many scientists have been looking for graphene using complex experiments. But the first crystals of graphene were discovered in 2004 using a very simple and effective method – namely ordinary scotch tape! During experiments in Manchester, scientists noticed small parts of graphene on the tape used to clean a graphite stone. These two scientists Andre Gain and Konstantin Novoselov in 2010 were awarded Nobel Prize in Physics for this simple but groundbreaking experiment.

Thanks to the scotch tape method this area of the science grew extremely quickly. And today hundreds laboratories all over the world deal with different aspects of graphene-researches.

Graphene has a combination of unique properties. First of all, graphene is the first 2-D crystal ever known to us and the thinnest object ever obtained and also the lightest one. Furthermore, graphene is the world strongest material harder than diamond and about 300 times stronger than steal. Graphene conducts electricity muck better than copper. It is transparent material. Also graphene is bendable and can take any form you want. And this unique super-material gave birth to a new class of crystals that are also just one atom thin! And what is more fantastic is that this can be shuffled with each other to engineer new materials on demand to meet the special needs of different industries.

There are theories which show that graphene should not be able to exist without being destroyed by thermal fluctuations. These fluctuations should cause the crystal to melt. Workers who tried to create atomically thin films of other materials in the past found that the films were unstable and tended to separate and 'clump up' rather than form perfect layers. In fact, anyone who has ever written with a pencil has probably created graphene flakes.

Graphene can be used for many different purposes including:

– transistors: Graphene can be used to make excellent transistors. It is so thin we can easily control whether or not it conducts by applying an electric field. We would like to be able to do this with metals, but we cannot make metal films thin enough to affect their conducting state in this way. Electrons in graphene also travel ballistically over sub-micron distances. As a result, graphene-based transistors can run at higher frequencies and more efficiently than the silicon transistors we use now. At the present moment we have no way to produce entire integrated circuits from these transistors since we are limited by the size of graphenes that can be produced.

– gas sensors: Gas molecules that land on graphene affect its electronic properties in a measurable way. In fact, scientists have measured the effect of a single molecule associating with a graphene. This means that we can create gas sensors which are sensitive to a single atom or molecule!

- inert coatings: Graphene is resistant to attack by many powerful acids and alkalis such as hydrofluoric acid and, so one day could be used to give objects an atomically thin protective coating which would provide protection against these agents.

All these factors move graphene from the laboratories to the market place driven by demand from industries where such super materials are required: automotive, electronics, energy storage, communication, sensors, soars, oil and etc. The discovery of graphene has provided opportunity for scientists to investigate these possibilities. Thanks to mass production methods that have been intensively developed graphene is likely to appear in the surrounding world soon.

Zhukova J., Osadcha L., Tsvetayeva O.

Oles Honchar Dnipropetrovsk National University

THE SPATIAL VARIABILITY OF SNOW COVER AND SOIL SURFACE TEMPERATURE OF THE STEPPE

The snow cover is a layer of snow on the soil surface formed by snow. The thickness of the snow cover and it's mechanical properties vary continuously during the winter. One of the most important properties of the snow cover is the density which defines many of its characteristics. Thermal properties of snow effect on the redistribution of heat in the snow cover and heat exchange with the environment. Snow cover alters the thermal and dynamic properties of the underlying surface and reduces the heat transfer between the earth and the atmosphere. It reduces the upward heat flux from the soil, which reduces heat loss to the atmosphere, reduces soil freezing and amplitude of temperature fluctuations. During thawing snow delays heat input to the soil. Snow and vegetation cover, topography, soil properties, its moisture content, as well as human activities are known as effecting on soil freezing.

Spatio-temporal variability of snow cover, being formed in accordance with the physical and geographical features of the study area, has an impact on the variability of the components of the landscape: meteorological and hydrological parameters, soil and vegetation cover.

Snow cover plays an important role in the functioning of ecosystems – the impact soil formation processes, the plant and animal life. A special soil climate creates under the snow, which differs greatly from the climate of the surface layers in areas devoid of snow cover, as well as the climate of the surface air. Preservation and accumulation of snow has a great importance in the prevention of freezing winter crops, perennial grasses and planting of fruit crops.

Aim: identification patterns of the spatial variation of snow cover, and the formation temperature of the soil.

Objectives: 1) to investigate and compare the thickness of snow cover and soil temperature; 2) determine the relationship between snow cover and soil temperature; 3) to establish the nature of the spatial variability of these parameters.

Methods. Sample ground laid on stony slope of the ravine (the eastern outskirts of the city of Dnipropetrovsk, 48 ° 23'11 n.l 48 ° 23'11" v.d). Slope south-eastern exposure with a slope 13 °. In the direction down the slope beam (beam perpendicular to the direction of the thalweg) 7 transects were laid at intervals of 3 m Each transect consists of 15 test plots at intervals as 3 m. Thus, the polygon is a regular grid of 15 × 7 size mesh 3 m. Selection of soil samples and measuring temperature, conductivity, soil and snow cover power produced at the control points – the corners of the squares. Measuring the temperature of the soil was carried out in a layer of 2-3 cm depth digital thermometer with an accuracy of 0,1 ° C. Measurements of soil temperature and snow cover, held on December 18 and 24, 2012. The temperature during the measurements was -8.5° C December 18 and -10,5°C on December 24. The results of the temperature survey are shown on Table 1.

Table 1. Descriptive statistics of snow cover, and soil temperature at a depth of 3 cm in the area grass-fescue-feather grass steppe

Index	Date	Sample size	Average	Minimum	Maximum	Variance	Asymmetry	Kurtosis
Snow cover, cm	18.12.12	105	3,24	1,05	5,68	1,28	–0,01	–0,92
	24.12.12	105	10,51	7,77	13,17	1,54	0,00	–0,72
Temperature, °C	18.12.12	105	–3,35	–5,70	–1,60	0,81	–0,33	–0,36
	24.12.12	105	–2,01	–3,50	–1,10	0,22	–0,53	0,85

Findings

A linear relationship between snow cover and soil temperature in the steppe area is established. The relationship between snow cover and temperature increases with the total capacity of the snow cover. Spatial variability of soil temperature and snow cover repeat micro relief features of the polygon: the variability of snow cover directly affect spatial factors, the temperature of the soil is mediated by their snow cover effect.

Варлан К. Є., Посудієвська О. Р., Кузьменко О. Л.

Дніпропетровський національний університет імені Олеся Гончара

EPOXY SYNTHETIC POLYMERIC SINGLE-FUNCTIONAL MATERIALS

The origin and development of many branches of science and technique are obliged to the appearance of the specific class of synthetic compounds – polymers. They gave the basis for creation of materials with the complex of unique properties which natural and traditional artificial materials don't possess. Without polymers no modern electrical engineering, energy engineering, mechanic engineering, aircraft and rocket building space exploration would exist. Some modern polymeric composition materials exceed steel in strength and are used at 550 °C and higher. Such materials are used for building of helicopters – 45–50 % of the composition; battle airplanes – 25–30 %, rockets – 75–80 %, armed rocket engines working on solid fuel – 85–90 %.

Among the above mentioned synthetic materials special place is occupied by materials on the basis of epoxy resins. The complex of valuable properties stipulated their wide use almost in all spheres of human activity of man. A great number of single-functional materials were created. Epoxides are widely used, in particular, in the space system engineering as multifunctional products. They are the components of composition for construction materials, solid fuel rocket charges, armor coating, protective and fastening elements in solid fuel engines etc. Another promising knowledge – intensive area of technique, where polymeric epoxy materials are used, is the so-called small-scale engineering energy. In particular, film and membrane materials that possess specific properties, not characteristic for the known polymers, are offered on the basis of epoxides. They possess different types of conductivity, diffusive permeability, sorption and ion-exchange properties. Due to the combination of the above-mentioned properties such materials are used in electrochemical packages, such as fuel and lithium sources of current, solar batteries. Similar pellicle materials are used in gas sensors,

systems of sorption and thin division etc. It should be noted that the progress in the sphere of creation of electrochemical packages is indissolubly connected with progress in space engineering.

Among promising materials of such type home and foreign researchers point out stereo-chemical cross-linked polymers with ammonium groups – polymeric anionites. In particular, such materials were obtained on the basis of interpolymer complexes formed from poliepichlorohydrin and polyvinylpyridine.

With the purpose of search of new promising film polymeric materials, satisfying to the complex of special materials, we synthesized and investigated the systems based on oligomerous diepoxides and piperazine. As diepoxides we used diglycidyl ethers of oligoethyleneglycol with pendent chloromethyl and hydroxymethyl groups. For the choice of optimal conditions of film obtention we conducted preliminary investigations of different model systems. For this purpose, reacting capacity of different functional groups of polyfunctional epoxides in relation to piperazine was defined, along with the ways of its regulation. In order to fulfill this task, methodology of non-aqueous pH-titration of the investigated systems was preliminarily developed and quantitative estimation of all changes in the reacting system was conducted.

As a result of our investigation, elastic structured transparent film materials were obtained. We defined the possibility of regulation of film properties by chemical modification with toluene diisocyanate and epoxidized oils. Among film properties we should also note the following abilities:

- Ability to swell in water and polar solvents;
- Ability for ion exchange. The static exchange capacity was 3 meq/g;
- Ability to sorb dyes effectively: Congo red, methyl orange etc.

Current research is conducted on the improvement of properties of the obtained stereochemical cross-linked polymers. In particular, the investigations focus on the possibility of creation of composition materials by nano- and ultrafine filling with the use of ashen-gel technology, as well as of chemical modification of polymeric matrix.

Лещенко И. Г., Абрамовский Е. Р.

Днепропетровский национальный университет имени Олеся Гончара

THE ANALYSIS OF SOME NEW DIRECTIONS IN DEVELOPMENT OF UKRAINIAN WIND ENERGETIECS

Wind flows and Solar radiation, as well as some other natural phenomena, are considered as renewable energy sources. The use of such sources started to develop very rapidly several decades ago. It was motivated by the necessity to replace some power plants, which are using the gradually exhausting fossil fuels. We will discuss the situation in the field of wind energy production. The annual growth of wind turbines capacity now very high and it is greater then the rate of development of any contemporary branch of industry. The share of wind power in the world energy production now is about 2 %, but in several countries it riches up to 15 %. The leading positions in this development possesses such countries as Germany, Spain, U.S.A., Denmark, China, Great Britain and some others.

Unfortunately, Ukraine is stile far behind the leaders in this field: At present time in Ukraine are operating 7 wind power stations with the total capacity about 200 MW. It is much less then 1 % of total value. Most of Wind Turbines are installed along the shores of Asov and Black seas, where wind potential in greater than on other territories. The thorough study of situation with energy supply indicates that there exist the real opportunity to increase sufficiently wind energy output in this country. One of the ways to solve the problem is development of Ukrainian offshore wind power plants. Very valuable experience in such use of wind turbines have Great Britain, Denmark, Germany and other countries. Nowadays there exist large number of offshore wind power plants, each of them is having the capacity within the range from 50 MW to 750 MW. Most of them belong to the countries bordering on the North sea and the Baltic sea. The main advantages of such wind turbines siting are: the availability of large continuous areas suitable for major wind plant and higher wind speeds, which generally increase with distance from the shore. There exist also problems and disadvantages like higher cost of wind turbine

installation on the sea bed, its regular maintenance and so on. The use of contemporary technologies allows to overcame (at least partially) such disadvantages.

Ukraine has vast territories with swallow waters, and main of them is Sivash lake, having the total area more then 2.5 square kilometres and depth ranging from 0.5 m to 5 m. The analysis of possible use of megawatt category wind turbines, sited on the Sivash region, has been made by authors.

Another direction of wind energetics is related to the use of wind turbines sited on urban territories. In this case the prevailing technology is mounting the wind turbines on the top of buildings and structures. The advantage of such technology is availability of local and inexpensive power source, which can be used by residents of apartments and employees of the offices. In this case there exist also some problems which is necessary to solve. Main of them is the vibration of wind machine wich can be transferred to the building. But now the use of special chassis and of her devices allows to prevent such vibration and other harmful phenomena. It is easy to show, that development of offshore wind power plants and use of wind turbines on the territory of big cities can provide important contribution to energy supply in this country.

Лещенко И. Г., Абрамовский Е. Р., Пономарёва Л. Ф.

Днепропетровский национальный университет имени Олеся Гончара

EINIGE PARAMETER DER WINDKRAFTANLAGEOPTIMIERUNG UNTER BERÜCKSICHTIGUNG IHRER VERWENDUNG IN LOKALEN WINDBEDINGUNGEN

Es ist bekannt, dass der Prozess der Optimierung jedes zu entwerfenden Objektes folgende Verfahren umfasst: 1) Auswahl einer Zielfunktion, die in den meisten Fällen ein komplexer Parameter ist; 2) Vorgabe der Beschränkungen für einzelne Komponenten des vorgegebenen komplexen Parameters; 3) Suche nach Extremum der gewählten Zielfunktion. Die Optimierung kann mehrstufig sein,

wenn man am Anfang der Entwurfsphase das Extremum der einzelnen partiellen Parameter des zu entwerfenden Objektes berechnet.

Die Windkraftanlagen gehören zu den Objekten, die die detaillierte Optimierung benötigen, weil ihre Effektivität nicht nur von der Wahl des Konstruktionsschemas der Anlage, sondern auch von den meteorologischen Bedingungen in der Gegend, wo man sie errichten möchte, wesentlich abhängt. Es kann gezeigt werden, dass solche wichtige Funktionen der Windkraftanlage wie die Kapazität der jährlichen Energieerzeugung (kWh) gerade die genannten Kennziffern einschließen.

$$E = \frac{\rho TS}{2000} \int_{V_S}^{V_k} V^3 C_p(V) f(V) dV ,$$

wo ρ die Dichte des Luftstroms (kg/m^3), T die jährliche Zeit (8760 Stunden), V die Geschwindigkeit der Windströmung (m s), V_S und V_k jeweils die Startgeschwindigkeit und die Sturmabschaltungsgeschwindigkeit, C_p Leistungsfaktor, $f(V)$ die Funktion der Windgeschwindigkeitsverteilung sind. Aus dem aufgenommenen Ausdruck sieht man, dass als primärer, zu optimierender Parameter den Faktor C_p, und als komplexer Endparameter (die Zielfunktion, abhängig von den örtlichen Windbedingungen) $\overline{E} = E/S$ genommen werden können, wobei S die überstrichene Fläche einer Windenergieanlage ist. In dieser Arbeit wurden ein Paar Punkte auf dem Territorium der Ukraine, wo die durchschnittliche Geschwindigkeit gleich oder größer als 5 m/s ist, analysiert. Für diese Punkte wurden die bekannten Werte der Funktion $f(V)$ verwendet und der optimale Wert $\overline{E}$ für jeden von ihnen berechnet. Als variable Parameter, wie das in der Arbeit von Abramovsky Yev. R. «Aerodynamic theory of wind turbines» vorgeschlagen war, wurde die Nennwindgeschwindigkeit V_N gewählt. Es wurde gezeigt, dass der Wert V_N für jeden der Punkte unterschiedlich sein wird. Somit wurde festgestellt, dass die Windkraftanlagen unter Berücksichtigung der lokalen Windverhältnisse in unserem Land effektiv funktionieren werden.

Охотник Е. К., Тимошенко Ж. И., Демиденко А. С.
Днепропетровский национальный университет имени Олеся Гончара

METEOROLOGICAL ASPECTS OF AIR POLLUTION IN THE BUILT ENVIRONMENT

Atmospheric air is a basic essential elements of the environment, and is significant for the normal existence of most terrestrial organisms.

Most of the world's population lives in cities. This is primarily due to the fact that the city is the center of the financial, economic and scientific development. However, there is an opportunity to select not only the positive aspects of urbanization, but negative, for example, disruption of the ecological balance. One of the most important environmental problems of urban areas is a significant pollution of surface layers of air. Primarily, this is due to the amount and intensity of the source of pollution, but also the important role played by the meteorological conditions that may contribute to a dispersion of pollutants and cause the increase of their concentration.

The goal of our research is to study the influence of meteorological factors on the air of the city. Methods of study of the relationship based on the results of theoretical and experimental study of the laws of distribution of pollutants.

The climate city of Dnepropetrovsk city is temperate, with mild winters and warm summers. The average annual temperature is 9,0°C, the lowest it in January (minus 3,7°C), the highest – in July (22,1°C). In an average year in Dnepropetrovsk falls 513 mm of precipitation, less of them in March and October, most of all – in June and July. The relative humidity in an average year is 74%, the lowest (61%) in August, the highest (89%) – in December. The smallest clouds observed in August, the highest – in December. The most frequency in the city there are winds from the north, the least – from the north-west and south-west. The highest wind speed – in January and February, the lowest – in the summer. In January, it was an average of 5.4 m/s in July – 3.7 m/s.

In calculating and modeling air pollution should consider architectural and planning features of the urban area that contribute to the formation of the local climate, and are the cause of differences in climate built environment on climate

suburban area. The city has a special microclimate conditions which depend on topography, emissions enterprises, heat balance changes.

All meteorological factors affect air pollution. There is a relationship between the concentration of the pollutant and the speed of the wind. Increasing wind speed facilitates dispersion of contaminants in the atmosphere and drives out of the city a lot of polluted air, clean the urban industrial environment. However, strong wind promotes mixing the air layers, as a result of contaminants received from high sources, fall into the lower layers of air, there is a growth in their concentrations at the surface. But defined dangerous wind speed does not exist, which influence on the increase of air pollution. Precipitation cleanse the air, the effectiveness of cleaning depends on the amount and duration of precipitation. Increased humidity can cause both air purification and increase the toxicity of pollutants.

The spreading of pollutants depends on the type of the sources of pollution. According to some experts who have investigated the influence of meteorological factors on the level of air pollution of big cities, it was found that the relationship between the level of contamination by some impurities and meteorological conditions is low. This is related with a wide range of heights of sources of pollutants in the atmosphere and lots of them.

Thus, it may be noted that apart from the obvious advantages of urbanization creates a number of problems, including environmental ones. Human activity affects the micro- and mesoclimate characteristics of urban areas, thus forming climate, typical for large cities. In turn, climate change leads to changes in weather that affect the nature of the spread of pollutants and the atmospheric air of the city as a whole. An important objective is to study the pollution, and the need to take into account the natural and human factors, to select for this purpose the most appropriate mathematical model and visualize the data with the help of modern information technology.

Implementation of all these conditions is the basis for reasoned decision making. Thus, taking into account the formation of the actual weather conditions and the conditions of the climatic zones activities to improve the urban environment carry out:

- management measures wind speed and ventilation of the city (urban planning and streets, orientation of buildings, creation of trees and shrubs and herbaceous plantings of various types, water systems, etc.);
- measures to control the relative humidity of the air (creating ponds and streams, increasing the surface area with natural permeable cover, watering green areas, cleaning streets and squares, etc.);
- measures to combat air pollution by placing polluting facilities outside the city or in the lee of the city (creating chimneys which contribute to pollutant dispersion, effective use of abatement equipment, transition to less toxic fuels, etc.);
- measures to regulate the incoming solar radiation (layout of streets and neighborhoods, green spaces, the use of different-level building, painting the walls, roofs and bridges, the design of buildings and their components, etc.).

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Чернушенко Т. А., Чернушенко О. А., Голяк В. І.

Дніпропетровський національний університет імені Олеся Гончара

DIE SCHWEFELHALTIGEN AMINISÄUREN ALS ABWASSERREINIGER VON CHROM

Das Problem der Verschmutzung erlangte zurzeit globale Bedeutung. 24 Tonnen Chrom gelangen ins Meer jedes Jahr. Viele Chromsalze werden von den Gerbereien und Galvanischen Einrichtungen abgegossen. Chrom ist giftig, aber auch ist es in geringeren Mengen für verschiedene Organismen notwendig. Es bildet Verbindungen und Komplexe mit organischen Verbindungen sowohl in den Lösungen als auch in

den Körpern. Es wird auch von Körpern aus dem Wasser gut absorbiert und durch Nahrungskette übergegeben. Vollständige Einstellung der anthropogenen Verschmutzung ist unwirklich, so soll man eine wirksame Wasseraufbereitung anwenden. Besonders gefährlich sind die Verbindungen von sechswertigem Chrom. Die sechswertige Form weist eine hohe Wasserlöslichkeit auf. Chrom kann aus der Lösung durch die Reduktion Cr(VI)→Cr(III) mit Hilfe von chromhaltigen Mikroorganismen oder schwefelhaltigen Peptiden, Aminosäuren extrahieren.

Es wurde festgestellt, dass Chrom (III) zu den biologisch aktiven Metallen, zu FTG gehört, und seine Verbindungen mit Aminosäuren eine hypoglykämische Aktivität zeigen. Die Teilnahme von Spurenmetallen in biochemischen Transformationen wird entweder durch direkte Eingabe des Metallions in das Enzymmolekül als unverzichtbarer Aktivator, oder durch die Umsetzung einer Verbindung zwischen dem entsprechenden Enzym und dem Substrat, oder durch die Blockierung der aktiven Stellen der Enzymmoleküle durchgeführt. Die Gesamtheit der biologischen Wirkungen von Spurenelementen und pharmakologisch aktiven Liganden in den Komplexen fördert in vielen Fällen die Senkung der Toxizität, sowie die Steigerung von Aktivität der Metallionennährstoffe bezüglich ihrer anorganischen Salze.

Bei der Betrachtung des Wirkmechanismus von Chrom auf Bio-Organismen sind auch wichtige Daten auf ihre Bindung an den Stickstoff, Sauerstoff und Schwefel Bioliganden.

Es wurde die Reduktionreaktion von Chrom (VI) durch Cysteine zu weiterer Komplexbildung Tsistinat Chrom (III) untersucht.

$2CrO_4^{2-} + 6\ RSH + 2H_2O \rightarrow [Cr(RS\text{-}SR)_3Cr] + 10OH^-$.

$2Cr^{3+} + 3RS\text{-}SR \rightarrow [Cr(RS\text{-}SR)_3Cr]$

Die Koordinierungsformel für den Komplex wurde basierend auf Elementaranalyse, Infrarotspektroskopie, Elektronenspektroskopie und Leitfähigkeitsmessungen abgeleitet. Der Aufbau der Verbindung kann als Polymer dargestellt werden, in welcher Cystein zwischen den Chromionen die Brücke ist.

Gemäß der IR-Spektroskopieangaben wird Cystein tetradentat durch zwei Amino- und zwei Carboxylgruppen koordiniert. Auf die Koordination auf Sauerstoff des

Carboxylates zeigt das Fehlen der Absorptionsbande bei 1740cm^{-1} in dem Komplex, die für die Carbonylgruppe charakteristisch ist, ein signifikanten Unterschied zwischen den antisymmetrischen und symmetrische Streckschwingung von COO^-, und die Bande bei 580cm^{-1}, die durch Schwankungen in Cr-O charakterisiert wird. Das Absorptionsbande bei 3190cm^{-1} und 3070 cm-1 und die Streckschwingungen von M-N bei 496nm zeigen auf die Verbindung des Metalls mit Aminogruppen.

Oktaedrische Komplexverbindung der Struktur wurde durch die Elektronen-spektroskopie bestätigt. Im elektronischen Absorptionsspektrum werden Banden beobachtet, die auf d-d Übergänge bedingt sind, die nach spin $^4T_{1g}(P)*^4A_{2g}$40.000cm^{-1}, $^4T_{1g}(F)*^4A_{2g}$27.000cm^{-1}, $^4T_{2g}(F)*^4A_{2g}$18.000cm^{-1} erlaubt sind. Die Parameter des Kristalls Bereich: Dq = 1800 cm^{-1}, B = 365cm^{-1}; β=0,355; β^0 =64%.

Der Wert LD_{50} für [Cr (RS-SR)$_3$Cr] 2568 (mg/kg).

Also, die Verbindungen von Chrom(VI), die gefährlich sind, werden im Biosystem durch die schwefelhaltige Aminosäure – Cystein reduziert.

ЗМІСТ

Наукове видання

Мови видання: англійська, німецька

АКТУАЛЬНІ ДОСЛІДЖЕННЯ В СФЕРІ СОЦІАЛЬНО-ЕКОНОМІЧНИХ, ТЕХНІЧНИХ І ПРИРОДНИЧИХ НАУК ТА НОВІТНІХ ТЕХНОЛОГІЙ

Матеріали Регіональної студентської науково-практичної конференції

(4–5 квітня 2013 р.)

У трьох томах

Том 3. Сучасні дослідження в сфері технічних і природничих наук

Окремі доповіді друкуються в авторській редакції

Організаційний комітет не завжди поділяє позицію авторів

За точність викладеного матеріалу відповідальність покладається на авторів

Відповідальний редактор *Біла К. О.*
Дизайн обкладинки *Єпішко Д. В.*
Технічний редактор *Капуш О. Є.*

Здано до друку 29.03.13. Підписано до друку 01.04.13.
Формат 60x84$^{1}/_{16}$. Спосіб друку – різограф.
Ум.др.арк. 4,45. Тираж 100 пр. Зам. № 0313-10.

Видавець та виготовлювач СПД Біла К. О.
Свідоцтво про внесення до Державного реєстру ДК № 3618 від 6.11.09р.

Надруковано на поліграфічній базі видавця Білої К. О.
Україна, 49087, м. Дніпропетровськ, п/в 87, а/с 4402

тел. +38 (067) 972-90-71

www.confcontact.com
e-mail: conf@confcontact.com