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ИНОСТРАННЫЙ ЯЗЫК В ПРОФЕССИОНАЛЬНОЙ КОММУНИКАЦИИ - 14

Материалы XIV Всероссийской научно-практической конференции студентов, магистрантов, аспирантов (г. Уфа, 8 – 19 апреля 2024 г.)

МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ РФ
УФИМСКИЙ УНИВЕРСИТЕТ НАУКИ И ТЕХНОЛОГИЙ

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Одной из основных задач конференции молодых ученых, помимо обмена информацией, является эффективное использование иностранных языков – английского, немецкого и французского – для осуществления профессиональной и научной коммуникации. В тезисах докладов обсуждается самый широкий круг проблем естественных, технических и гуманитарных наук.

Предназначено для молодых ученых, аспирантов, магистрантов и студентов, заинтересованных в совершенствовании навыков осуществления иноязычной профессионально-научной коммуникации.

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Секция 1

НАУЧНО-ТЕОРЕТИЧЕСКИЕ И ПРИКЛАДНЫЕ ПРОБЛЕМЫ ИССЛЕДОВАНИЙ (на материале кандидатских и магистерских диссертаций, выпускных квалификационных и научных работ студентов)

ГУМАНИТАРНЫЕ НАУКИ (КУЛЬТУРОЛОГИЯ, ПЕДАГОГИКА, СОЦИОЛОГИЯ, ФИЛОЛОГИЯ)

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Spiritual and moral education of the younger generation in a multicultural world (Духовно-нравственное воспитание подрастающего поколения в поликультурном мире)

The role of moral education in the improvement and development of personality has long been studied and proven by pedagogy. Even the ancient Greek philosopher Seneca uttered the phrase: "The one who has advanced in scholarship, but has lagged behind in morality, lives further than the one who has advanced."

We live in a multinational state. The basis of multicultural education is the rapprochement of students with cultures of different nationalities in the learning process, the ability to communicate and live in different national states. The main task of schools of the XXI century, carrying out the educational process, is the formation of a national intellectual elite through the purposeful development of students' abilities, identifying the potential of children from an early age. The problem of the unity of nations also exists in schools. It is important that students of different nationalities can live as a family through the teacher's educational process.

Spiritual and moral education is also successfully implemented in the lessons of the Tatar language and literature. The teacher informs

the children about the Tatar nation, introduces them to rituals, outstanding people, and with the help of literature prepares the student for adulthood. The science of literature is the most viable science. There is no other subject in school that would teach a child to live, communicate with people, how to behave in a given situation. Folklore works are presented in the literary programs for each class [1, c. 94]. Proverbs, riddles, fairy tales, sayings, songs, poems, stories included in textbooks help students to understand the rich spiritual world of the Tatar people more deeply and fully, to love and assimilate high moral standards, good traditions that have developed over many centuries.

Today, many peoples of our country face the issue of protecting, reviving, developing and preserving their native language as an important element of national culture and the ability to use it. After all, with the help of language, the thinking of a person and social groups is formed. By learning a new language, the student also gets acquainted with a new national culture, masters the vast spiritual riches accumulated in the language. The language is both the patron and the guardian of the culture of the people who speak this language. No nation can remain closed within its culture. Therefore, today the education of students who are able to live in a multicultural society occupies a central place in the new standards of the national education system [2, c. 23]. Students of national schools should be familiar not only with Tatar and Russian culture, but also with the culture of other peoples living around us. Only then will we be able to live in our country, as Gabdulla Tukai said: "exchanging languages, customs, mores."

Thus, multicultural education is very relevant at the present time. It expands the individual perception of the world, forms children's ideas about the interdependence of people living on the planet. The issues of morality that have always worried human society: conscience, justice, proper living on earth, fulfilling a sacred duty to parents and our homeland are eternal, common to all. To develop them in yourself, you need to be human. And raising children is the task for each of us. To perform this incredibly responsible, meaningful work, a teacher must spare no effort, work tirelessly, and constantly improve his professional skills [3, c. 158].

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Features of the obscene vocabulary and its classification (Особенности обсценной лексики и ее классификация)

A person is able to experience diverse emotions, strong emotions – there is a need to throw them out, and to meet this need, a huge layer of vocabulary is needed, which everyone is familiar with: abusive expressions, reduced, taboo words, profanity. This article is devoted to the consideration of obscene vocabulary and its classification. However, there are generally established prohibitions by the state and companies on obscene vocabulary, and a large number of attempts have been made to eradicate those words and stable expressions from texts that can even remotely be compared with indecent words and be beyond the norm.

The existence of obscene vocabulary in our world is as essential necessity as the emotions of people that need to be expressed through verbal communication. Despite all the state prohibitions that relate to language, in particular the linguistic phenomenon of obscene vocabulary, there have been and are linguistic constructions that violate taboos in all social strata of society. This is due to the fact that such language units are the most effective in expressing the emotional state between the participants of the communication act.

If we consider the connection and interpenetration of swear words and literary norms diachronically, then it seems possible to see

the semantic unity of sacredness and obsession. The actual "abusive phraseological units" are taken as a basis [1, p. 24]:

1. Stable phrases referring the object to the essence of "higher powers", that is, to a mythological character who represents absolute evil: *Well, to hell with you! Go to hell!*

2. Fixed expressions, in the modality of which the wishes of collapse, failure and pain are realized: *God punish you! Damn you!*

3. Fixed expressions that are transferred to the object of communication and are called the "method" of punishment: *So that you crash! Levant me! Plague take you!*

4. Fixed expressions, the functionality of which consists in the nomination of a "way" of superiority over the object of communication through the sexual sphere.

It is quite fair and reasonable to get the impression of the obvious dominance of sexualization in the expressions from the 4th group. This is what the vast majority of native Russian speakers think. This opinion is also confirmed by sociologists, in whose interpretation obscene expressions evolved from the beginnings of marital relations. A.V. Chernyshev strongly disagrees with this approach: "In the case of obscenities, the system of signifiers is really borrowed from the sexual sphere of human life, which does not necessarily mean describing this sphere through obscene speech" [1, p. 20]. Even though the author's thesis traces the rejection of the interpretation of obscene expressions from the position of sacredness, in historical retrospect, the sexualization of abusive lexicology tends precisely to the "mythological syncretism of the obscene and demonic" [1, p. 20]. Initially, the classes of expletive expressions presented were not interpreted to a person as an addressee, but performed the function of a "talisman" against "evil forces or evil spirits" [1, p. 22]. Further processing of the functional and semantic possibilities of the above phrases is explained by the fact that transferring them to a person recognized the latter as a "kind of servant of the devil" [1, p. 25]. Of course, this is in historical retrospect, and currently obscene expressions are being sexualized. It is possible that the result of this trend was severe censorship and social tabooization.

Russian language is partially tabooed at the present time, which is recognized as a consequence of the "total democratization of Russian society and Russian speech" [1, p. 26]. The long years of censorship of the Russian mat have turned into a stunning boom in its

use in recent decades. Also, the active use of euphemisms both in live speech and in literary texts has left its mark. Let's list some of them: *Holy crap!*, *Son of a gun!*, *Holy cat*, *fly plaque*, etc. And the next trend in the modern linguistic consciousness of the Russian person is the blurring of boundaries in the active use of the mat: abusive expressions are increasingly found in public speeches by politicians, journalists, lecturers, as well as in literary texts.

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Transgression in fiction on the example of the novels "The Demons" by F. M. Dostoevsky and "The Secret History" by D. Tartt (Трансгрессия в художественной литературе на примере романов «Бесы» Ф. М. Достоевского и «Тайной Истории» Д. Тартт)

In fiction, the concept of transgression is often used as a psychological term denoting going beyond existing limits, violating norms, rules, and moving from one fixed state to another [3]. In Russian classical literature, this principle was often used by Fyodor

Dostoevsky in his works. He also used it for creating the main character's image in his novel "The Demons". In modern foreign literature, transgression is represented as a trigger in Donna Tartt's works — for example, in the novel "The Secret History".

Traditionally, the characters of the aforementioned novel by D.Tartt have been compared to Rodion Raskolnikov, both as allusions and direct quotations within the text of the novel, as well as through the use of this analogy in a vast majority of critical and scientific articles. However, in our opinion, it is possible to move a little away from the psychology of "having the right" and consider the similarity of the unconditional leader of the chamber student group Henry Winter, the initiator of the Greek bacchanal, with the unwitting leader-inspirer of the nihilistic revolutionary circle, Nikolai Stavrogin.

Unlike "Crime and Punishment", in "The Secret History" the characters are not faced with the task of testing themselves, finding the limit to their strength, that is the last psychological or moral barrier that they need to break. The very fact of the murder: both — the first, accidental, and the second, planned, is perceived as inevitable, as a tribute to fate, to the "main character" of ancient Greek tragedies [2]. The moral component of the first murder does not bother any of them at all.

The tragedy of Nikolai Stavrogin is in his immensity, which exhausted him, made him an empty shell. In search of his limit, he commits the most terrible crime according to Dostoevsky: he rapes and drives a little girl to suicide. The crime that makes him dead or "warm", which meaning: "neither hot nor cold" [3]. After this event, his obsessive, uncontrollable desire to inflict suffering on himself directly or through others became the impetus for obtaining the desired transgression: he grabbed Gaganov by the nose, bit old Osipov's ear, compromised someone else's wife; he also had outbursts of aggression: he broke the bars and broke the window in the prison. Such actions helped him to get out of a state of utter apathy, mental torpor.

He was not afraid of death, he did not care about the outcome of the duel: he was afraid to kill himself, because according to Berdyaev, suicide in his case is a manifestation of generosity, a noble act that he was not capable of [1].

For Henry Winter, suicide is also a noble act, the last broad but theatrical gesture, an attempt to prove to himself and friends — and

most importantly, to his teacher, whom he loved more than anyone else in the world — that the values, beliefs, and ideals he teaches are not just empty words. In his case, the need for transgression appeared not because of a spiritual tragedy, the result of which was complete indifference to everything - but, on the contrary, the tragic case became a trigger and a leap for him, a man who, before the murder occurred, was powerless to break through his own absolute indifference. The only episode like an attempt at transgression that remains outside the narrative is a fight with some young man, as a result of which Henry had to be dragged away by six fellow students.

In a frank conversation with the narrator, Richard Papen, Henry admitted that for most of his life he felt nothing, nothing pleased him, he did not see the sense in any basic things, nor did he experience strong emotions and did not feel alive in principle. The consequence of the murders was the newfound peace and the opportunity to experience and live full, vivid emotions, organize his own life, take care of what is important to himself. He improved in appearance, began to build a romantic relationship with Camille and took care of the problem of her safety.

Thus, both Nikolai Stavrogin and Henry Winter had the need for transgression due to the inability to get out of spiritual stupor, a constant feeling of emptiness. The manifestations of violence became the way of transgression for both of them, the result of which were bright flashes of previously deeply suppressed emotions.

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«Personal reality»: on the question of the concept of a theme («Личная действительность»: к вопросу о понятии темы)

Being basic in literary studies, the term and category of a theme are devoid of a fixed meaning. However, despite the disputes of theorists and the obsolescence of ideological interpretations, there is a tendency in some definitions revealed by discoveries in psychology and neurophysiology. An interdisciplinary approach is able to update the concept of a theme in literature.

There are different ways of writing about the "theme" as the focus of human interaction with the world. According to Sergey Kormilov, who identified five points of view on this term (we are interested in the first two as substantial), the "theme" is a part of the recreated objective reality and mastered while working on the text «the subject of reproduction…» [1, p. 25-26]. However, we also find in Gennady Pospelov: the "theme" is not a calculated object of reality, but its fragment as a result of the empirical selection of life facts [2]. Clarifying this idea, Emilia Fesenko writes that the theme should not be called as life itself, but as «…the reflection of life phenomena in the writer's mind» [3, p. 58]. That is, it is important to outline in which individual consciousness the same sources of the topic will be reflected. Let us recall Lydia Ginzburg's fair clarification: art is an aesthetic «…interpretation of experience, not reality, because we know reality only in experience» [4, p. 350]. That is why there are themes (of a universal type) that appear differently to different authors, although they rely on the same reality. And this is not a question of dissimilar artistic intentions: if the author builds them on the basis of an external ideology (not necessarily political), then the latter is a social fact, and therefore can be perceived by one person (the author) differently than others.

In this regard, let us turn to the work of Dmitry Leontiev who speaking about art wrote about the personal representation of the world and the hegemony of the author's consciousness in the structure and content of the text. According to the psychologist, the world is

reflected in the individual author's (and human in general) consciousness in a fragmentary, selective, biased way; an image of the world arises. It, in turn, transforms depending on the chosen literary means and the framework of the linguistic material; the work appears as a kind of image representation of the world. It can be analyzed «…in relation to the displayed reality itself <…>, in relation to the inner world of the author who interprets this reality <…> and in the aspect <…> of the artistic embodiment features of the author's vision of the world…» [5, p. 422].

In general, the contribution of psychology to the comprehension of creative processes is significant: the reflection of the external world in the internal is the subject of this science – we also find this in art. There is no question of a complete reflection, and it is not a matter of criticizing the theory of mimesis (literature does not copy reality, but creates an alternative one). The human brain itself does not "read" everything observed, but "sees" only what it "knows". Tatyana Chernigovskaya comments on the facts of distortion, or even non-differentiation by us of what we can actually look at: the function of vision, "looking", is reserved for the eyes, but awareness of what is seen, its decoding is a neural network, for which «…special training and filling of the brain is needed» [6, p. 58]. This also applies to the thematic "view" of the objective world: the author does not consciously select its facts (even if he believes so), but distinguishes them or not – and after that (*NB!*) proceeds to the creative selection of recognized ones. If the writer refused any aspects of the depicted reality, then it may not be a refusal as an act of will, but the unwillingness of the brain to a priori perception of a part of the visible (for this reason ignored) components of reality.

"Visible", of course, both visually – but taking into account possible pathologies of the visual organs, which also obscure visual reality – and based on abstract principles of cognition. The last Leontiev after F. Vasilyuk calls the "life world": each of us «…is convinced that the world he knows is the only objective world» [7, p. 32]. But, as modern neuropsychology shows, this is not the case. We see the world only subjectively. Therefore, the range of phenomena that determine the "theme" as a concept is the same, according to Ginzburg, personal experience of reality.

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Möglichkeiten der Verwendung endophytischer Bakterien *Bacillus subtilis* in der Landwirtschaft (Возможности применения эндофитных бактерий *Bacillus subtilis* в сельском хозяйстве)

Endophytische Bakterien *Bacillus subtilis* sind Gram-positive, sporenbildende, fakultativ aerobe, das Bodenwachstum stimulierende Bakterien. Endophytische Bakterien gelangen immer mehr in den

Blickpunkt des Interesses, weil sie aufgrund ihres Lebensraumes innerhalb der Pflanze und der engen Verbindung zur Pflanze ihrer Wirtspflanze bestimmte Eigenschaften verleihen und an verschiedenen physiologischen Prozessen beteiligen. Dazu gehören vor allem die positive Stimulation des Wachstums und der Entwicklung der Wirtspflanze und die biologische Kontrolle unterschiedlicher phytopathogener Organismen [3].

Landwirtschaftliche Kulturpflanzen sind während der Vegetationsperiode ständig Belastungen unterschiedlicher Art ausgesetzt. Einer der weltweit am meisten verbreiteten Stressfaktoren ist die Bodentrockenheit. Viele Studien haben gezeigt, dass die Trockenheitstoleranz von Kulturpflanzen nach der Behandlung von Samen und oberirdischen Pflanzenteilen mit *B. subtilis* Bakterien zunimmt. Da Pflanzen unter der Einwirkung verschiedener Stressfaktoren die gleichen Signalwege einschalten und die gleichen Klassen von Abwehrproteinen aktivieren können, erhöht die Beimpfung von Pflanzen mit *B. subtilis* Endophyten auch ihre Resistenz gegen Salzgehalt [4].

Es ist bekannt, dass diese Bakterien gegen ein breites Spektrum phytopathogener grampositiver und gramnegativer Bakterien sowie gegen die Pilze *Alternaria solani, Aspergillus flavus, Alternaria alternate, Botryosphaeria ribis, Colletotrichum gloeosporioides, Fusarium roseum, Fusarium oxysporum, Helminthosporium maydis, Drechlera oryrae, Puccinia graminis* und viele andere wirksam sind [1]. Endophytische wachstumsstimulierende Bakterien können auch das Problem des Phosphormangels bei den Pflanzen lösen, da sie in der Lage sind, Verbindungen, die dieses Element enthalten, aufzulösen. Ein weiteres für das Pflanzenwachstum notwendiges Mineralienelement ist Stickstoff. *B. subtilis* ist in der Lage, Stickstoff aus der Luft zu binden und in eine pflanzenfreundliche Form umzuwandeln, was zur Steigerung der Erträge und zur Senkung der Kosten für Mineraldünger beitragen kann.

Die Fähigkeit von *Bacillus subtilis*, die Abwehrmechanismen von Pflanzenknollen und -samen zu modulieren, wenn sie unmittelbar vor der Lagerung mit endophytischen Bakterien behandelt werden, wurde ebenfalls nachgewiesen [3].

Darüber hinaus können endophytische Bakterien bei der Verbesserung und Wiederherstellung der Bodenstruktur eingesetzt werden. *B. subtilis* von Endophyten erhöhen die

Wasserdurchlässigkeit und Erosionsbeständigkeit des Bodens und bauen Schadstoffe wie Erdölprodukte, Pestizide und Herbizide ab.

Biopräparate auf der Grundlage endophytischer Mikroorganismen *Bacillus subtilis* sind somit eine kostengünstige und umweltfreundliche Technologie zur Steigerung der Ernteerträge, da die Bakterien wachstumsfördernd wirken, verschiedene Aspekte des Stoffwechsels aktivieren, einen hohen Immunstatus der Pflanzen bewirken und ihre unspezifische Resistenz gegen eine Vielzahl von Krankheitserregern erhöhen, d. h. eine systemisch induzierte Resistenz auslösen.

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The influence of biological drugs on the level of enzyme activity in the tissues of the honey bee
(Влияние биопрепаратов на уровень активности ферментов в тканях медоносной пчелы)

In order to quit out of a bee's hibernation period, probiotic supplements are used to have an effect on its body and, specifically, on intestinal bacteria. Probiotics right after entering the gastrointestinal tract, act on pathogenic microorganisms and stimulate the release of biologically active substances, then activate normal microflora and protective systems [1, p. 163].

We researched the effects of drugs: "SpasiPchel", "PcheloNormoSil", "Apivitaminka"; these were the object of the study. The subject of the study is the effect of feed additives on the level of enzyme activity in the body tissues of the honey bee.

The aim of the research work was to determine the effect of biological drugs on the level of enzyme activity in the tissues and blood of the honey bee.

We set the following tasks:

-conducting a cage experiment of feeding bees with sugar syrup that has the addition of various commercial feed additives

-obtaining hemolymph and intestines of bees that took probiotic and vitamin feed additives;

- determination of the amount of protein, the level of activity of catalase and peroxidase in the body tissues of bees;

Research shows us that bees have increased peroxidase and catalase activity in their intestines during living at the queen cell than without it. This may be due to the fact that the queen cell contains many beneficial bacteria that help the health of bees [2, p. 14].

The experiment is carried out on bees (*Apis mellifera mellifera*) of the central forest-steppe zone of the Republic of Bashkortostan.

The method for catalase activity is based on determining the residual amount of hydrogen peroxide that forms a complex with

ammonium molybdate (method by M.A. Korolyuk) in immunological tablets. The reaction has started by adding 0.01 ml of supernatant to 2 ml of 0.03% hydrogen peroxide solution.

The level of catalase, peroxidase, and protein activity were determined in the hemolymph and intestine. To determine each biochemical indicator, 3-4 individual worker bees were used; they were euthanized in ether vapor for the research. Samples were prepared by grinding and homogenizing intestine tissues in a buffer solution.

As a result of the experiment, it was found that biological drugs affect the level of enzyme activity in the body tissues of the honey bee. Probiotic drugs preserve the healthy intestinal microflora, thereby influencing the positive dynamics of physiological activity. In the hemolymph and intestines of bees, a high level of catalase and peroxidase activity is determined; in the control option it is higher than when using drugs. The effect of the drugs also contributed to better functioning and cleansing intestines of bees taking feed additives.

While taking probiotic and vitamin feed additives in bee tissues (hemolymph and intestinal tissue), a significant increase in protein content was noted.

The activity of oxidoreductase in the hemolymph is well observed. In the control sample, the activity of hemolymph peroxidase and catalase was higher compared to the drugs. It can be seen that bees are characterized by high individual variability of this indicator, this is especially clearly seen in the example with the drug “SpasiPchel”.

In the intestines, catalase activity was higher than when using probiotic and vitamin feed additives. With the use of the drug “SpasiPchel” there is no significant effect, but with “PcheloNormoSil” and “Apivitaminka” a slight decrease is observed.

The activity of intestinal peroxidase decreased during use the feed additives “PcheloNormoSil” and “Apivitaminka”, and the drug “SpasiPchel” was absent.

When using probiotic and vitamin feed additives in bee tissues (hemolymph and intestinal tissue), a significant increase in protein substance was noted. It has been established that the protein content is high when using “Apivitaminka”.

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Analyzing social infrastructure by the example of the healthcare system in the Volga Federal District and the Republic of Bashkortostan in particular
(Анализ социальной инфраструктуры на примере системы здравоохранения в Приволжском Федеральном округе и в частности Республики Башкортостан)

Social infrastructure is a branch of infrastructure, which is aimed at creating favourable living conditions for the population (providing conditions for labor, cultural and social activities, everyday life, interpersonal and social interaction).

One of the components of social infrastructure is health care. It includes medical organizations, which are divided into pharmaceutical, therapeutic and preventive institutions. The development of this sector plays a crucial role in the quality and conditions of life of the population.

In the course of the analysis we considered the indicators of provision of subjects in the field of health care.

As a result of assessment of these indicators and their analysis the following picture emerged:

The most secured in healthcare regions of the Volga Federal District are the Republic of Tatarstan, Nizhny Novgorod region, Samara region, Republic of Bashkortostan, Saratov region.

The lagging subjects were Kirov Oblast, Penza Oblast, Ulyanovsk Oblast, Republic of Mordovia and the most depressing situation was observed in the Republic of Mari El.

If we look at the full picture of the economic development of the leading regions in healthcare in the Volga Federal District, we can notice a tendency that the top five leaders both there and there will be unchanged (excluding a slight rotation among these 5 subjects).

The volume of investments in healthcare is also quite important. In the leading subjects the percentage of funds spent on healthcare is higher than in the lagging ones. In this connection we can conclude that the economic development of the region is directly related to the situation in the healthcare system.

As for the Republic of Bashkortostan, the indicators of this region are at a high level. Bashkortostan ranks 4th in the Volga Federal District in terms of the level of development of medicine in general. In the capital city of Ufa there are scientific institutes studying eye, cardiovascular and other diseases. Complex surgeries are regularly performed in Ufa, for the sake of which people from neighbouring less affluent regions come to the Republic. The Ufa Medical University currently has 8671 students. The volume of investments in Bashkiria for 2022 will amount to 243 billion rubles, with medicine accounting for 1/10th of the total investment volume (24.3 billion rubles)

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Liver mass indices of ROSS-308 broiler chickens in the study of the drug "Argumistin®" (Показатели массы печени цыплят-бройлеров РОСС-308 при исследовании препарата «Аргумистин®»)

The liver is directly involved in the pharmacokinetics of Argumistin®, and therefore its mass indicators will be useful for the modern poultry industry.

The purpose of the work: to study the liver mass indices of broiler chickens under the influence of the drug Argumistin®.

Materials and methods: on the basis of Bashkir State Agrarian University, a study was conducted of the drug Argumistin® on ROSS-308 broiler chickens from a day old to 57 days old. 2 groups of broiler chickens – control and an experimental one – were formed, with 25 heads each. The experimental group received the drug Argumistin®. On the 8^{th}, 15^{th}, 22^{nd}, 29^{th}, 36^{th}, 43^{rd}, 50^{th}, 57^{th} days diagnostic slaughter of 3 chickens from the control and experimental groups with morphological cutting of carcasses was performed. After the evisceration of the internal organs, the measurements were taken. The weight of the liver was specified using gram scales; the length, width, and height of the liver lobes were assessed with the help of a caliper.

Results and discussion: we studied the growth dynamics by daily weighing, but we will give data of the every week mass, starting from the first day to the 57-day age. From the age of 8 days to the age of 22 days, the experimental group lags behind the control group by 2,7%, however, from the age of 29 days, the control group lags behind the experimental group until the end of the studies, which was 8,5% (at $P \leq 0,05$ compared with the control group)

During the observed study period, the control group increased its weight 43 times, and the experimental group 48 times, which is 10.4% more. Starting from the age of 29 days, the experimental group is 0.66% ahead of the analog group (at $P \leq 0,05$). In the subsequent, no

advance of the control group was established and each subsequent weekly mass of the experimental group on the 36th, 43rd, 50th, 57th day was at 4,1%, 12,2%, 10,5%, 9,97% (at $P \leq 0,05$) higher, respectively.

The liver is the largest gland in the body. It is divided into two large main lobes and the convex surfaces are directed ventrally to the abdominal wall, and the concave ones are attached to the stomach and intestines [1, p.934, 4, p.156].

Comparing the liver mass of the control and experimental groups during a 57-day scientific study, we obtained data indicating the domination of liver mass of the control group over the experimental. The average daily values only on the 50th day showed a better result in the experimental group – 2,8 g, the control group – 2,4 g, the remaining days control prevailed. Over a period of 57 days, the control group increased liver mass from the 1-day age by 18 times, but the experimental group by 17,9 times.

The relative increase in liver mass in the experimental group on day 29 exceeded the control by 11,44%. Further, we observe a similar excess on 36, 43, 50 days by 1,5%, 5,55%, 17%, respectively, and by the end of the studies a slight decrease in the experimental group relative to the control group by 13%.

In the process of growth, the mass coefficient of the liver decreases from 4,9% to 1,6% in the control group and 1,3% in the experimental group on the 43rd day of life. Stabilization of liver mass coefficient indicators is observed at the age of 50 days: in broiler-chickens of the control group it is 2%, in broiler-chickens of the experimental group it is 1,8%. By the end of the experiment, these indicators remained unchanged.

Conclusions.

The results of the research are as follows:

1. The live mass of the experimental group has increased starting from the age of 29 days by 48 times which is 10,4% more than that of the control group.

2. The average daily liver mass indices in the control group exceeded those of the control group till the 50^{th} day. However, over a period of 57 days, the control group increased liver mass from the 1^{st} day of age by 18 times, and the experimental group – by 17.9 times.

3. The relative increase in liver mass remained higher in the experimental group in relation to the similar group from the 29^{th} to the

50th day; on the 57th day it was 13 % higher in the control group.

4. The ratio of liver mass to body weight showed a decrease from the 1st day to the 43rd day; starting from the 50th day stabilization is observed, though, in the ratio, control prevails over the experimental group.

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Problems in the classification of wetlands
(Проблемы в классификации водно-болотных угодий)

There is no single generic term for «bog» in the English language, but there are many terms for specific types of bogs. The meanings of the term can vary widely between disciplines and between scientists, depending on historical, cultural and often personal

experience. The same trend can be seen in the definition of the term «bog» in Russian [1].

The main objective of this thesis is to attempt to compare English and Russian terminology relating to some wetlands.

According to the Merriam-webster dictionary, wetlands are land or areas (such as marshes or swamps) that are covered often intermittently with shallow water or have soil saturated with moisture [3]. In the Russian classification, wetlands correspond to the term «водно-болотные угодья». This is a generic name for all varieties of flooded land, whether peat or not, and regardless of vegetation type.

According to the Merriam-webster dictionary, bog is a poorly drained usually acid area rich in accumulated plant material, frequently surrounding a body of open water, and having a characteristic flora (as of sedges, heaths, and sphagnum) [3].

In the Russian classification, bog («болото») is an area of land that is over-watered with a stagnant water regime and where organic matter accumulates in the form of undecomposed vegetation. The term bog includes such concepts as swamp («заболоченные земли») and peatland («торфяники») or peat bog («торфяное болото»). Swamp is an area with excessive moisture and a peat layer of less than 20-30 cm. A peatland is also an area with excessive moisture, but the peat layer must be greater than 20-30 cm [2].

Wetlands are also subdivided by trophic status. Thus, the English classification uses the term minerotrophic, which corresponds to the Russian term eutrophic bog («эфтрофное болото»), also this type of bog is called fen, or lowland bog («низинное болото»), respectively. Also in the domestic classification, a transitional bog («переходное болото») or mesotrophic bog is distinguished. We failed to find a synonymous term in the foreign classification. The following bogs are ombrotrophic or oligotrophic («олиготрофное») by trophic status, respectively. The second name of this bog is upland bog («верховое болото») because it is fed mainly by precipitation and has a convex shape, unlike lowland bogs.

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Agrobacterium transformation by *Agrobacterium rhizogenes* (Агробактериальная трансформация при помощи *Agrobacterium rhizogenes*)

Currently, plants whose genotype has been artificially changed are widely used in genetic engineering. Such organisms are convenient for studying various mechanisms of interaction of plant genes, their regulation and response to stimuli and unfavorable conditions.

There are many different ways to transform the plant genome, but one of the most common and effective is the method of obtaining hairy roots using bacteria of the genus Agrobacterium. These gram-negative rod-shaped microorganisms are capable of infecting healthy plants by transferring part of the genetic material into host cells, which leads to the appearance of a disease called hairy roots [2].

Hairyroot is a natural phenomenon that is the neoplastic growth of additional roots in infected plants. The cause of the appearance of “hairy roots” is a phytopathogenic bacterium – Agrobacterium rhizogenes.

A.rhizogenes infects many plant species, mainly dicotyledonous plants. The ability to cause the formation of additional roots is due to the presence of rol genes in Agrobacteria (from the English “root locus”), which, through the horizontal transfer of a DNA fragment (T-DNA), enter plant cells and induce the growth of root hairs [4].

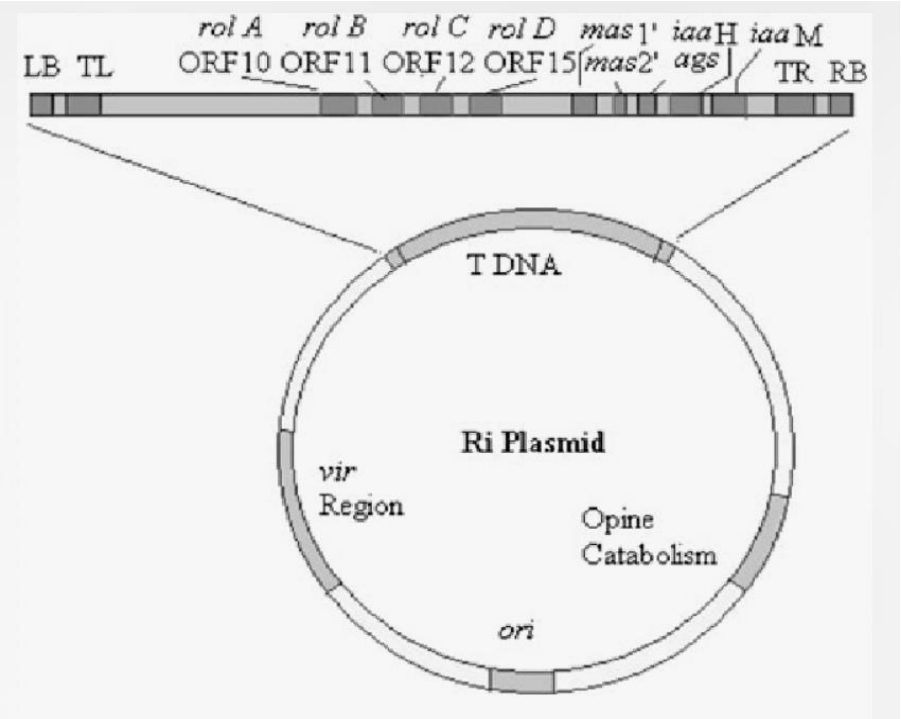

Fig. 1. Structure of Ri-plasmids of Agrobacterium rhizogenes.

The genetic information necessary for A.rhizogenes to infect healthy plants is mainly located in special megaplasmids – Ri-plasmids (from the English “root inducing”). Agrobacterium Ri-plasmids contain a number of important elements, without which plant infection is impossible.

First of all, this is T-DNA – a section of Ri-plasmid DNA that is directly integrated into the genome of a plant cell. T-DNA includes special regions - sites through which T-DNA is inserted into the plant genome. These are the right and left parts of T-DNA – TR-DNA and TL-DNA, respectively [3]. On the right side of the T-DNA (TR-DNA) there are genes that are responsible for the synthesis of substances necessary for agrobacteria to feed during growth, and on the left side (TL-DNA) there are rol genes: rolA, rolB, rolC and rolD [1].

The entire infection process begins with the integration of a DNA fragment of a microorganism – T-DNA – as a result of the expression of vir-region genes. After the integration of T-DNA into the plant genome, the implementation of rol genes occurs, which in turn leads to neoplastic growth of hairy roots and the synthesis of valuable secondary metabolites – opines.

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Impact of CO2 concentration on microalgae cultivation (Влияние концентрации CO2 на культивацию микроводорослей)

Climate change is considered an important issue for the environment and ecosystems. This phenomenon worsens when more carbon dioxide is released into the air. According to some studies, increased carbon dioxide production is expected due to the development of manufacturing industries, transportation modes, and human activities [3]. While the use of fossil fuels significantly contributes to global warming and climate change, widespread adoption of alternative renewable energy sources can play a crucial role in reducing environmental pollution and preserving the use of limited non-renewable resources worldwide [1].

Microalgae are recognized as the third generation of renewable biomass resources for biofuel and bio-based chemical production. Additionally, microalgae have been identified as a biological CO2 capture technology due to their high photosynthetic capacity [4]. Microalgae are primarily cultivated under atmospheric conditions but can also thrive in environments with high CO2 concentrations, such as power plant flue gases. Numerous studies have investigated the cultivation of microalgae with added CO2 [2]. Utilizing CO2 for microalgae growth offers several advantages, including low cost,

direct CO2 capture from exhaust gases, and operational simplicity. Some studies confirm that microalgae can biofix 10-50 times more carbon compared to terrestrial plants [6]. However, excessive carbon dioxide in the culture medium can lead to a drop in pH, inhibiting microalgae growth. Additionally, microalgae cultivated under carbon dioxide-limited conditions tend to have restricted growth.

Optimizing CO2 biofixation requires consideration of various parameters such as nutrient availability, light intensity, temperature, pH, adequate surface area to volume ratio, and gas-liquid counterflow. Certain microalgae species, like Chlorella sp., have been isolated for their ability to convert high levels of CO2 from inlet air into biomass within photo bioreactors. To determine the optimal conditions for CO2 removal, Chlorella sp. was studied under different CO2 concentrations and gas flow rates, cultivated in Rudich medium [5].

Experimental Setup and Cultivation Conditions: Microalgae were cultivated in a 10 L cylindrical glass reactor with a working volume. Cultures were positioned on a bench at 26 ± 1°C under cool-white fluorescent light (General Electric) for a duration of 16 days. The light intensity at the surface of the photobioreactor was approximately 1 lux, measured using a Lux-meter. Ambient air was mixed with CO2 to achieve desired concentrations using a gas mixer instrument. The aeration gas was filter sterilized and pumped into the microalgae culture medium. The CO2 and O2 concentrations of the gas in both the input and output of the photobioreactor were measured using a STAR GAS global diagnostics system. Additionally, a portable multiparameter instrument was employed in each run of the photobioreactor to monitor and record dissolved oxygen, temperature, and pH. Probes were immersed in the photobioreactor for 2 minutes during each measurement. All experiments were repeated in triplicate, and the average values were represented. In this study, four experimental runs were conducted to assess microalgae growth under various CO2 concentration levels and gas flow rates.

Experimental Set-up and CO2 Concentration/Gas Flow Rate: Different runs of experiments were conducted with varying CO2 concentrations and gas flow rates. The growth monitoring and assessed parameters included the relationship between biomass concentration or dry weight and optical density. Various concentrations of carbon dioxide were employed for aeration of the culture medium inside the Carbon Dioxide Biofixation by Chlorella sp.

The concentrations used were 0.03%, 1.75%, and 9.45% CO2, representing conditions akin to industrial flue gases. The fixation rate of CO2 was evaluated based on the mass balance of microalgae.

Observations and Findings: The lack of sufficient carbon dioxide, considered the primary carbon source, was identified as the main limiting factor in some runs. Proper mixing in the system and an adjusted pH value, conducive to microalgae activity, led to a peak dry mass concentration of 2.8 g/L in 13 days in one particular run. The pH of the algae culture was found to be closely related to the solubility and availability of carbon dioxide in the photobioreactor. Additionally, the dissolution of CO2 in water led to acidification due to the formation of carbonic acid. The relationship between pH, biomass growth, and photosynthetic demand was observed, with increasing CO2 concentration leading to a decline in pH initially, followed by an increase with algae growth. Furthermore, it was noted that without CO2, the growth curve remained linear, whereas with CO2 aeration, it exhibited an exponential shape. The CO2 biofixation rate was observed to remain at 100%, indicating complete consumption of the inlet CO2 by the algae for fixation.

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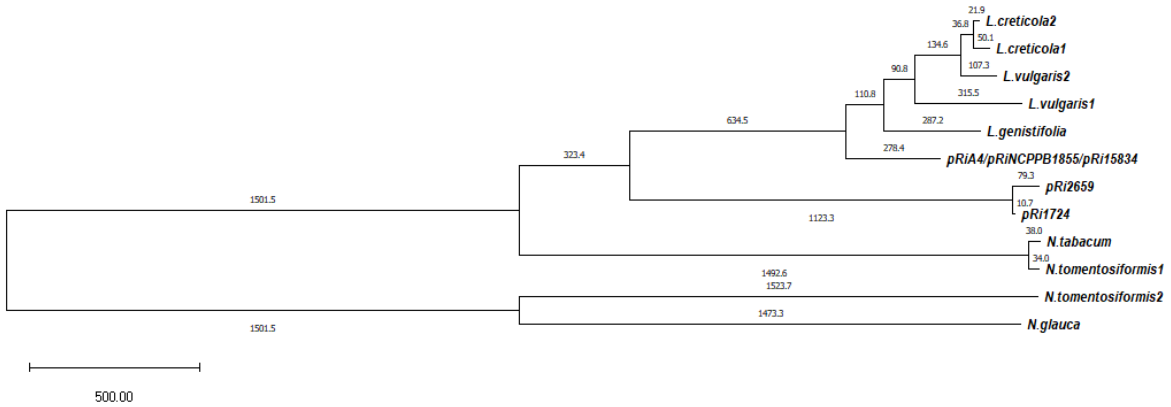
rolC-like genes of naturally transgenic plants (*rolC*-подобные гены природно-трансгенных растений)

The integration of transfer DNA (T-DNA) from A*grobacterium* species to plants is a common method of genetic engineering. The expression of T-DNA genes in these plants causes formation of tumors, hairy roots or crown galls [3].

Some of T-DNA genes can modify plant growth. These genes called plast genes (for phenotypic plasticity). *rolC* is one of plast genes and it expression strongly affects the plants morphology. For example, *rolC* transformants of *Nicotiana tabacum* show dwarf and bushy growth, loss of apical dominance. Such plants have tiny flowers and small pale green leaves [2, 3].

It is known that plant species inside the genera *Nicotiana, Linaria* and *Ipomoea* contain homologs of agrobacterial T-DNA. Probably it is the result of genetic transformation of their ancestral forms. Such plants are called naturally transgenic and their T-DNA is called cellular (cT-DNA) [2]. It was recently revealed that some of *Scrophulariaceae* plants (*Antirrhinum, Digitalis* and *Veronica*) also have ancient T-DNA sequences [4].



Plant or plasmid	GenBank
pRiA4 / pRiNCPPB1855 / pRi15834	MT514512.1
Linaria creticola 1	MF997051.1
Linaria creticola 2	MF997052.1
Linaria genistifolia	KC309424.1
Linaria vulgaris 1	EU735069.2
Nicotiana tabacum	X91881.1

Plant or plasmid	GenBank
Linaria vulgaris 2	EU735069.2
Nicotiana glauca	X03432.1
pRi1724	KY000038.1
Nicotiana tomentosiformis 1	KJ599826.1
Nicotiana tomentosiformis 2	KJ599826.1
pRi2659	EF433766.1

Fig. Phylogenetic tree of naturally transgenic plants and some of Agrobacterium plasmids.

Previously, it was assumed that proteins encoded by *rolC* have cytokinin-β-glucosidase activity and are able to release free cytokinins from conjugates, but at the moment this hypothesis is unlikely [1].

In databases there are many entries of naturally transgenic plants, but unfortunately, only some of them have a complete gene sequence. The figure shows the phylogenetic tree of several naturally transgenic plants with whole gene sequences and plasmids of agrobacteria. The multiple sequence alignment for the phylogenetic tree was built using Clustal Omega online program by EMBL-EBI. A Jalview program was used to visualize the results. The phylogenetic tree was constructed using the Neighbour-joining method.

As is seen, the sequences of *rolC*-like genes of genus *Linaria* are very close to each other. Their closest homologue in agrobacteria is the *rolC* gene from plasmids *pRiA4, pRiNCPPB1855* and *pRi15834*. It is likely that these strains transferred their plasmid to plants sometime during the process of evolution. *pRi1724* and *pRi2659* form one clade a little further from the organisms above.

rolC-like genes of genus *Nicotiana* differ much more from genus *Linaria* and *Agrobacterium*. *N. tabacum* and *N. tomentosiformis 1* are more similar to other organisms than *N. glauca* and *N. tomentosiformis.* However, of the bacterial plasmids, the closest to all of them are also *pRiA4, pRiNCPPB1855* and *pRi15834.*

The presence of several *rolC*-like genes in one organism and their difference may indicate a different time of introduction of these genes from agrobacteria.

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How genetic methods help to solve crimes (Методы генетического анализа в расследовании преступлений)

Genetics and criminology have become closely intertwined in recent decades, presenting new avenues for crime-solving and criminal identification [1]. With advancements in technology, genetic methods have become integral to forensic science, offering more precise and reliable results in crime investigations [2]. Techniques such as DNA analysis and molecular genetic research are now widely incorporated into both criminal and civil proceedings.

The DNA analysis method, discovered by British geneticist Alec Jeffreys on September 10, 1984, has revolutionized forensic medicine

worldwide [3]. It is instrumental in solving a wide range of crimes and establishing kinship, among other applications. Unlike previous methods, such as determining species and group affiliation of biological traces, DNA analysis provides definitive identification of individuals, making it a cornerstone of forensic science. This method capitalizes on the individual specificity of DNA, ensuring accurate identification with near certainty, except in cases of identical twins.

Forensic DNA analysis enables examination of various human tissues and fluids containing DNA, including blood, saliva, hair with viable bulbs, and even fragments of tissues and organs [4]. Additionally, it allows for the study of contaminated biological objects, microquantities of material, and mixed traces containing genetic material from multiple individuals.

While obtaining DNA from fresh blood, saliva, or semen samples is relatively straightforward, extracting DNA from touched objects presents challenges [5]. However, technological advancements now enable the generation of DNA profiles from minute samples, as small as 50 picograms, which were previously impossible to analyze. Nonetheless, care must be taken to distinguish between crime-related DNA and background or unrelated DNA.

DNA fingerprinting, based on analyzing unique sections of the genome and genetic markers, aids in determining differences between individuals or establishing their absolute identity. By comparing DNA profiles from crime scenes with criminal databases or suspect samples, forensic scientists achieve accuracy rates of up to 99%.

Furthermore, genetic analysis allows for determining a person's sex and, to some extent, the age and ethnic background based on DNA characteristics. The main method employed in modern forensics is Short Tandem Repeat (STR) analysis, which amplifies specific DNA sections unique to each individual [6]. In cases of highly degraded samples, mitochondrial DNA analysis serves as a viable alternative.

In conclusion, DNA analysis provides reliable and objective results, serving as a crucial tool in upholding justice and societal safety. As technology continues to advance, DNA analysis becomes increasingly accessible and effective, cementing its role as an indispensable component of modern forensic science and crime prevention efforts. Thus, DNA analysis remains pivotal in the fight against crime and the maintenance of the rule of law.

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Features of the morphological structure of the thymus and bursa Fabricius of broiler chickens (Особенности морфологического строения тимуса и Фабрициевой сумки цыплят-бройлеров)

In this article, the central apparatus of the immunity of broiler chickens has been studied by histological methods since it ensures the proliferation of immunocompetent antigen-independent cells as well as their circulation in tissues and organs [2]. The study of the

structural and functional features of the central organs of immunogenesis in raising broiler chickens depending on age, manifestations of non-communicable diseases, is the biological basis for characterizing immune reactivity and is relevant for veterinary science and practice [1; 5].

The purpose of the work: to study the morphological features of the organs of immunogenesis of broiler chickens at 4 weeks of age by analyzing the structural and functional state of the thymus and cloacal bursa in healthy broilers at the age of four weeks and interpreting the data obtained.

Materials and methods of research: The experimental part of the study was conducted on the basis of the veterinary clinic of Bashkir State Agrarian University. 6 ROSS-308 broiler chickens of 4 weeks of age from “Turbaslinsky broilers” farm of Blagoveshchensk district of the Republic of Bashkortostan were the object of the study. Morphological studies of the immune organs of broiler chickens were carried out by means of pathoanatomical autopsy.

Pieces of thymus and bursa Fabricius sac were taken for histological studies. The production of histological preparations and staining were done according to the generally accepted method.

The results of the study and discussion: The average value of the thymus in length was 3.8 cm and in width 0.7 cm; the average weight of the organ was 6.777 grams. The thymus was surrounded by 0.2 cm thick adipose tissue. Topographically, it is located along the trachea and has the appearance of a long string consisting of 6-7 pairs of lobes reaching cranially to the 3rd cervical vertebra. Histological studies were performed on the first paired cervical lobes. A histological examination of the periphery of the organ reveals a connective tissue capsule well. The parenchyma of the organ is formed with lobules of various shapes and sizes. Separate lobules were found along the periphery of the thymus in which there were no distinctions between the cortical and cerebral zones. The formed lobules were also noted. A clear distinction between the cortical and cerebral zones was observed, the corpuscles of Ghassal protruded in the latter.

The average size of the bursa Fabricius was 1.7-1.9 cm, and the average weight was 3.258 grams. Histological examination revealed the presence of primary and secondary folds covered with a single-layered multi-row prismatic epithelium. Numerous follicles are located under the epithelium. In these follicles, a clearly formed

cortical substance was noted, in which three rows of mature cells were visible. As for the medulla, it had both lymphocytes in its composition, in which B lymphocytes were mainly determined giving a positive reaction to glycogen, and lymphoblasts which were mainly in a separate state from each other or in groups in small quantities. In view of these facts, a clear differentiation in all follicles of the bursa Fabricius was observed. In the center of the folds there are layers of loose fibrous tissue where numerous blood vessels are found.

Conclusions: It was found that at the beginning of postnatal ontogenesis of chickens, morphologically, they have already got central organs of immunogenesis, namely the thymus and Fabricius sac, which is consistent with the data available in the literature.

The results of the studies of the morphological features of the central link of the immunity of broiler chickens should be used to analyze the indicators of the morphofunctional state of immunocompetent organs when studying the state of immunodeficiency in chickens.

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МАТЕМАТИЧЕСКИЕ И КОМПЬЮТЕРНЫЕ НАУКИ

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Die Nutzung der Lambertsche W-Funktion für die Lösung einer Gleichung mit Tetration (Использование W-функции Ламберта для решения уравнения с тетрацией)

Schon seit der Schule kennen Kinder die einfachsten mathematischen Operationen. Zuerst beginnt man mit der Addition, der erste Operator in der Geschichte der Mathematik. Nachdem die Berechnung komplizierter geworden hatte, hat man die Multiplikation erfunden. Dann die Potenzierung. Aber ist das alles?

Tatsächlich kann man die Definition der Operatoren erweitern. Diese Erweiterung nennt man “Hyper-Operatoren”. Das einfachste Beispiel des Hyper-Operators höherer Ordnung ist die Tetration. Wie man Potenzierung als wiederholte Addition erklärt, so erklären wir Tetration als wiederholte Potenzierung:

a^^b=a^(a^(a^(...))) b Kopien von a, für a∈R, b∈N

Für die weiteren Berechnungen müssen wir noch eine Funktion betrachten. Die lambertsche W-Funktion ist die Umkehrfunktion von $f(z) = ze^z$. Diese Funktion kann nicht als elementare Funktion ausgedrückt werden, ist aber gut erforscht. Anwendung findet die Lambert-W-Funktion in mathematischen Aufgaben der Physik.

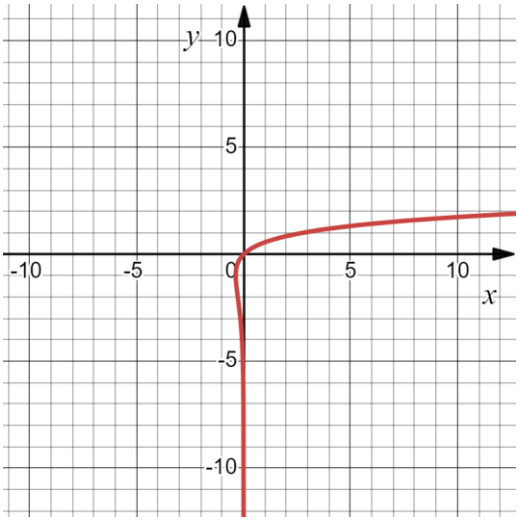

Fig.1 Der Graph von W(x)

W(x) ist auf dem Intervall $(-\frac{1}{e}; 0)$ mengenwertig, weil $f(x) = xe\hat{}x$ für $x \in (0;1)$ nicht injektiv ist.
Und jetzt wollen wir die Gleichung $x\hat{}x = a$ betrachten. Solche kann man mit lambertsche W-Funktion lösen:

$$x\hat{}x = a$$
$$ln(x\hat{}x) = x\ ln\ x = ln(a)$$
$$ln\ x * e\hat{}(ln\ x) = ln\ (a)$$
$$ln\ x\ = W(ln\ a) \Rightarrow\ x = e\hat{}(W(ln\ a))$$

Diese Gleichung hat zwei Lösungen für $a \in (e\hat{}(-1/e),1)$. Zum Beispiel für $x\hat{}x = e/3$, haben wir $x = e\hat{}(W(ln\ e/3)) = e\hat{}(W(1 - ln\ 3)) \approx 0{,}02741\ oder\ 0{,}89576$.

Die Welt Mathematik trägt mit sich unzählige Aufgaben, für die noch keine Losung gefunden ist.

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Development and implementation of a career guidance system for university students
(Развитие и реализация системы профориентации для студентов вузов)

In the modern educational context, career guidance systems play a crucial role in the successful career adaptation of students. An effective career guidance system should facilitate interaction among three key stakeholders: students, educational institutions, and employers. This article examines the role of each of these participants in the career guidance system and their interaction in the process of students' career development.

Role of Students:

Students play a central role in the career guidance system, actively shaping their career path. They have the opportunity to:

Provide Personal Information: Students fill out profiles containing information about their education, skills, interests, and

preferences.

Compile Portfolios: Creating and maintaining portfolios that reflect their academic and extracurricular achievements, projects, and professional experiences.

Take Career Assessment Tests: Participating in assessments aimed at identifying personal inclinations, interests, and potential, aiding students in making informed career decisions.

Respond to Job Opportunities: Students respond to offers for internships, traineeships, or jobs that match their interests and qualifications.

Role of Educational Institutions:

Educational institutions play an important role in supporting students in career guidance and development. Their tasks include:

Posting Student Profiles: Publishing student profiles on the institution's platform to provide information about their academic and extracurricular experiences, interests, and potential.

Monitoring Career Assessment Tests: Monitoring the process of students taking career assessment tests and providing necessary support and resources.

Providing Recommendations: Based on assessment data and analysis of student profiles, educational institutions offer recommendations regarding career paths and further development.

Role of Employers:

Employers play a crucial role in the career guidance system, providing students with opportunities for practical experience, internships, and future careers. Their functions include:

Posting Job Vacancies: Publishing job vacancies on the career guidance platform, allowing students to explore offers and apply for them.

Reviewing Applications: Evaluating students' offers for internships or traineeships, conducting interviews, and selecting the most suitable candidates.

Supporting Professional Development: Providing students with opportunities to gain practical experience, develop skills, and build careers in line with their interests and needs.

Interaction between Universities and Employers:

Effective cooperation between universities and employers plays a vital role in ensuring successful integration of students into the labor market. Key aspects of this interaction include:

Partnership Relations: Universities establish partnerships with various companies and organizations, providing students access to a wide range of opportunities for internships, traineeships, and subsequent employment.

Adaptation of Educational Programs: Universities update their educational programs considering the requirements of the modern labor market and feedback from employers. This enables them to prepare professionals in demand with relevant skills and competencies.

Internships and Traineeships: Universities collaborate with employers to organize internships and traineeships for students, allowing them to gain practical work experience and familiarize themselves with the requirements and specifics of specific industries.

Employment after Graduation: Cooperation between universities and employers is also aimed at ensuring successful employment of graduates. Employers actively participate in providing job vacancies and organizing career events for final-year students. Universities may provide employers with information about their graduates, increasing the likelihood of employment for students and reducing the flow of young specialists seeking employment in other regions.

Conclusion: The career guidance system for university students is an essential tool for supporting youth career development. Successful implementation of this system requires joint efforts from students, educational institutions, and employers, ensuring the integration of personal interests, educational opportunities, and labor market demands.

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Software testing process management (Управление процессом тестирования программного обеспечения)

The process of software test management is considered as a key element to ensure software quality and reliability. The steps from

planning to evaluation of results are covered, including risk analysis, test evaluation and execution, monitoring and control, and results analysis. The importance of each step in minimising risk and improving product quality is highlighted, as well as the significance of test management in achieving product conformance to industry standards and customer expectations.

Software test management is a complex process aimed at ensuring high quality testing to guarantee the creation of a reliable software product. This process includes organising, controlling, ensuring transparency and tracking of testing, which helps to achieve compliance of software testing with the established goals and expectations. Test management covers the entire project life cycle and includes planning, monitoring and control, as well as evaluation and documentation of the testing process.

Main stages of test management:

1. Test planning:

a. Risk Analysis: Identification of potential threats to the project with a view to minimising them.

b. Test estimation: Predicting the resources and time required for testing.

c. Test Plan Development: Creating a document that defines the testing strategy, objectives, resources, and schedule.

d. Organising the testing process: Allocate roles and responsibilities in the testing team.

2. Performing testing:

a. Monitoring and Controlling: Tracking the progress of testing to ensure that it is on track.

b. Problem Management: Identifying and resolving problems that arise and deviations from the plan.

c. Test Reporting: Analysing and documenting test results.

Risk analysis is a fundamental step that a test manager should undertake even before starting a project. This process involves identifying, assessing and prioritising the risks associated with testing in order to develop strategies to minimise or eliminate them. Early detection of risks can prevent potential losses and reduce the costs associated with fixing problems later in the development process.

Test estimation is a critical stage where the scope of work, the time required to perform testing, and resources are analysed and determined in advance. Accurate estimation contributes to more

efficient project planning and management, allowing you to more accurately determine the timing of work and resources required.

Test planning ensures the creation of a clear and structured test strategy that includes defining test objectives, selecting test methodologies and techniques, planning resources and allocating tasks. The test plan serves as the basis for the entire team, providing a common understanding of the goals, expected results and success criteria of the project.

Organising testing requires a clear definition of the roles and responsibilities of everyone involved in the process. Effective organisation includes assigning qualified people to their respective roles, ensuring their cooperation and coordination. Assigning tasks and defining responsibilities are essential for creating a productive and efficient testing team.

Monitoring and control of testing include observation of the testing process, collection and analysis of data on the progress of work. These actions allow timely identification and correction of deviations from the plan, adapting the testing process to the current project conditions.

Problem solving is an integral part of test management, as unforeseen situations and difficulties may arise during the implementation of any project. Timely identification and effective problem solving help to minimise risks and prevent delays in the project schedule.

The test report is the final stage of test management, where the results of testing are analysed and documented. During this period, the test manager and the team summarise the results of the work, assessing the extent to which the test objectives have been met and whether the results obtained meet expectations and requirements. The test report includes a detailed description of the tests performed, defects and faults detected, and recommendations for their elimination.

In conclusion, software test management is a complex and multifaceted process that requires careful planning, thorough organisation and effective monitoring. It plays a key role in ensuring software product quality and its compliance with customer requirements and industry standards.

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The two policemen theorem
(Теорема о двух милиционерах)

Mathematical analysis is a key discipline in mathematics, focusing on the study of limits, derivatives, and integrals of functions. This branch of mathematics finds wide application in various scientific and applied fields, including physics, economics, engineering, computer science, biology, and medicine. A statement in mathematics or logic, the truth of which can be rationally demonstrated, is called a theorem. When studying mathematical analysis, every student at technical faculties encounters the intermediate value theorem, although in different countries we may come across different interesting names for this theorem.

The intermediate value theorem states that if one sequence (function) is sandwiched between two others that have the same limit, then it also has the same limit. In simple terms, a function that is "sandwiched" between two other functions with the same limit will also have the same limit. This theorem is used to determine the limit of a function by comparing it with two other functions, the limits of which are known or can be calculated with certainty. It was first used by geometric mathematicians Archimedes and Eudoxus in an attempt to calculate π, and was formulated in modern terms by Carl Friedrich Gauss.

Imagine there are three functions. And the value of one of them is between the other two: not less than one, but not greater than the second. The theorem asserts that if two of these functions converge to a certain value, then the function in the middle also converges to the same value.

Russian mathematicians jokingly named this theorem "The Two Policemen Theorem" and to make it easier to understand, they tell students the following story: "If two policemen $\{x_n\}$ and $\{z_n\}$ go to the police station a: $\lim_{n\to\infty} x_n=\lim_{n\to\infty} z_n=a$, then the suspect $\{y_n\}$ who is between them, $x_n \le y_n \le z_n$, will also come to this station: $\lim_{n\to\infty} y_n=a$."

In Italy and France, the theorem is similar to the Russian one and is called "The Two Carabinieri Theorem" and "The Two Gendarmes Theorem" respectively.

In English-speaking countries, the name of the theorem is completely different and is called "The Sandwich Theorem." This name comes from the fact that the theorem can be likened to a sandwich, as in a sandwich, sauces and cheese are sandwiched between two pieces of bread, similarly in this theorem function f (x), the limit of which needs to be found, is sandwiched between two functions.

It should be noted that the theorem will not be applicable if none of the restrictions exist, which is indicated by the names of the theorems.The Two Policemen Theorem is closely related to a number of statements in mathematical analysis. For example, the theorem on the limit of a monotonically bounded function follows from it. Applying the theorem to the sequence of its partial sums, one can obtain the convergence test for a numerical series. It simplifies reasoning when studying the limits of functions and series.

Thus, the Two Policemen Theorem plays a huge role in the development of mathematical analysis, and the names of the theorem help new generations of mathematicians to easily understand its essence through examples from life experiences, which will lead to new discoveries in the world of mathematics and numerous applications in various fields of science.

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Sustainable reforestation as the basis for the conservation of natural resources in the Republic of Bashkortostan (Устойчивое лесовосстановление, как основа сохранения природных ресурсов в Республике Башкортостан)

In modern society, there is an increasing need to consider such an area of environmental research as the reproduction of forest resources [1, 2]. After all, forests play an important role in compensating for the share of carbon dioxide released into the atmosphere, as well as regulating the climate.

Emissions produced by various industries cause enormous harm to the ecology and natural environment. Deforestation does not reduce carbon emissions, which leads to climate change. In addition, deforestation leads to the destruction of many species of living organisms, which leads to disruption of ecosystems and biodiversity of forests. Forests act as a natural barrier, preventing soil erosion, protecting water resources from pollution, which helps maintain water quality. Cutting them down can cause water levels to rise, leading to flooding.

According to official data from Bashkortostanstat [3], for the period from 2016 to 2023, the total area of forest resources in the region remained virtually unchanged, amounting to 5309.3 thousand hectares (as of January 1, 2023). In the Republic of Bashkortostan in 2022, natural restoration was promoted on the territory of 55.9% of forests, artificial restoration was carried out on the territory of 42.2% of forests, and combined restoration was used on the territory of 1.9%. The dynamics of reforestation in the Republic of Bashkortostan is positive (Figure 1).

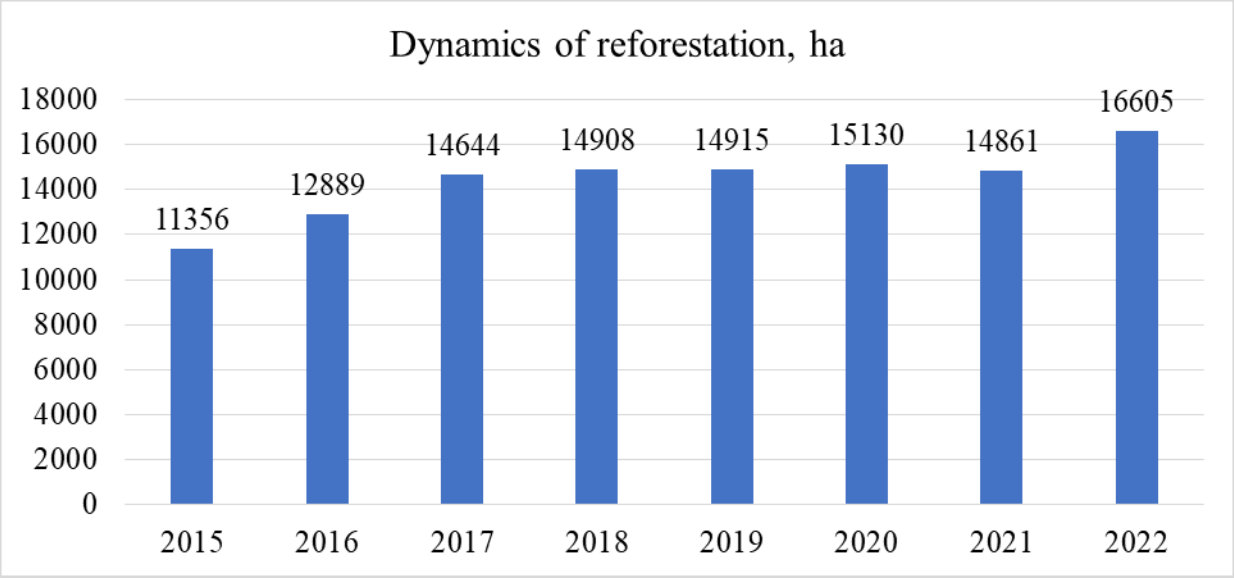

Figure 1 – Total area of reforestation in the Republic of Bashkortostan (hectares) [3, P.82]

For the period from 2015 to 2022. The growth rate of the reforestation area in the Republic of Bashkortostan increased by 46.2%, amounting to 16,605 hectares in 2022.

Conclusions. Of no small importance in solving environmental issues is the solution of such issues as the protection of forests from forest fires, from pests and various diseases, from damage by harmful insects, as well as from adverse weather conditions and other measures. In addressing issues of preserving environmentally friendly nature, an integrated and systematic approach should be used, similar to how it is successfully implemented in the Republic of Bashkortostan.

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Analysis of the dynamics of changes in the value of shares of companies - Netflix, Apple, Tesla, Amazon (Анализ динамики изменения стоимости акций компаний - Netflix, Apple, Tesla, Amazon)

Exploratory Data Analysis (EDA) is an analytical approach to summarizing key characteristics in data, often using visualization techniques. Characteristics include outliers, data gaps, and relationships between features within a single dataset. Exploratory analysis is needed to form hypotheses, supplement the dataset with new features, as well as to select the pool of the most suitable machine learning models.

The main objectives of exploratory data analysis include:

1. Search for anomalies in the data. Anomalies in the data can include values that are atypical for an existing dataset - errors, outliers, or unusual events. For example, one of the most common tasks of anomaly detection is to identify potentially fraudulent transactions within the banking sector.

2. Understanding the relationships and correlations between features within a dataset. This stage is important for the formation of business value. For example, data analysis allows us to formulate new hypotheses, which can later be verified using A/B testing.

3. Identification of the structure and characteristics of the dataset. This part of the analysis allows us to understand the structure of the data – to determine the types of variables, the presence of omissions or duplicates.

4. Preparation of data for subsequent stages of analysis. This part of the analysis involves processing gaps/duplicates in the data, generating new features, clearing data from noise, and converting features.

The main tools and methods of exploration analysis include:

1. Visualization. It can be either one–dimensional, that is, the analysis of each feature separately, or multidimensional - the analysis

of the relationship between the features. One-dimensional ones include histograms, boxes with moustaches, and multidimensional ones include scattering diagrams and heat maps.

2. Measures of central tendency, measures of variability and correlation analysis. Measures of the central trend include the mean, median and mode, and measures of variability include variance and span. Correlation analysis allows us to understand the relationship between the data.

3. Data transformation – normalization or standardization.

Thus, exploratory data analysis is a necessary step in understanding the dataset in question, allowing us to understand the existing features and relationships within the features necessary to generate hypotheses, new features and understand their distribution.

In this paper, the Python programming language is used to conduct exploratory analysis, which is most often used when working with data.The purpose of this scientific work is to conduct an exploratory analysis of changes in the value of shares of foreign companies – Apple, Netflix, Amazon and Tesla.

During the work, the following tasks were completed:

Introduction to the Python language;

Exploring the library for data processing – pandas, and for data visualization – matplotlib;

Introduction to the interactive notebook for working with the Python runtime environment – Jupyter Notebook;

Exploratory data analysis;

When analyzing the dynamics of changes in the value of the company's shares, the following patterns were identified:

– The dynamics of changes in the value of shares are influenced by external events – for example, a crisis or a pandemic, the growing popularity of the industry.

– The dynamics of changes in the value of shares are influenced by internal factors – for example, the moment of presentation or announcement of new products, positive financial statements, inclusion in indices.

This analysis is preliminary and is necessary in order to generate new signs based on it in subsequent work, which partially explain the target variable – the change in the value of shares.

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Automated information system for checking and registering draft regulatory legal acts (Автоматизированная информационная система проверки и регистрации проектов нормативно-правовых актов)

Information systems that are designed to analyze unstructured information and intelligent text processing affect such parties as legal expertise (automated verification of legal requirements, risk analysis in contracts, anti-corruption expertise), document processing scenarios (processing and categorization of documents, various types of preliminary examination, automatic generation of standard documents).

To implement the process of preparation and registration of an NPA, an Aplan contractor was selected by order of the Ministry of Justice, in order to develop a draft IP for the preparation and registration of an NPA (conducting a legal anti-corruption examination at the Ministry of Justice of the Russian Federation) [2, p. 99] One of the main tasks in the development of IP is to improve the quality of the draft documents being prepared and check them for compliance with the requirements of legal technology, identify and correct typical errors in registration, references to legislation, positions and titles, names of organizations and divisions, bank details, etc.

The scope of the NPA Analysis Module is the activities of employees of the judicial authorities of the Russian Federation in the implementation of state registration of departmental regulatory legal acts and in conducting legal, anti-corruption examinations of draft laws and draft resolutions of the Government of the Russian Federation [3, p. 56]

Modern technologies of intellectual analysis of textual information provide enhanced capabilities for automated analysis of texts of draft laws, departmental regulatory legal acts, draft resolutions of the Government of the Russian Federation and accompanying documents submitted to the Ministry of Justice of the Russian Federation for legal and anti-corruption expertise.

The new improved system will contain a number of automatic checks of both the document itself and the certificates and visas adjacent to it, automatic allocation of key terms of the contract, risk analysis, search for recommendations in the database of legal consultations. It also provides for improving the quality of draft documents being prepared and checking them for compliance with the requirements of legal technology, identifying and correcting typical errors in registration, references to legislation, positions and ranks, names of organizations and divisions, bank details, etc.

With the help of the proposed information system, work with the draft regulatory legal act in the Government of the Russian Federation and the Ministry of Justice is reduced to 33 hours, which indicates the need to reengineer the existing system [1, p. 145]

Based on the above, it can be concluded that many operations are performed manually by employees, spending a lot of time and manpower on this, there is a risk of errors and incomplete verification of documents and draft regulations. The formation of requirements can also lead to large losses of information, based on the manual processing of NPA projects.

Comparing the results, it can be concluded that the time spent on checking and registering NPAs with the Ministry of Justice with the new system will be significantly reduced, which will relieve specialists and also help avoid manual errors in this work.

The formalization of the subject area in the form of a functional model is carried out on the basis of the IDEF0 technology, which is described below [4, p. 23]

The construction of a functional model according to the IDEF0 standard begins with setting a goal for judging the subject area under consideration and choosing the point of view from which we will consider it. The purpose is to describe the process of verification and registration of the draft NPA. Point of view – an employee of the Ministry of Justice.

After the survey, proposals were formed to automate the process of verification and registration of draft normative legal acts, namely: reengineering of the existing system, which performs automatic verification of document packages using modern technologies for intelligent processing of text information, which allows you to identify errors and shortcomings in the submitted draft normative legal acts, reduces labor costs for monitoring the passage of the required

legislation standard-setting procedures, reduces the risks of legal gaps and conflicts.

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Thickness measurement using the envelope method for doped polymethyl methacrylate films (Измерение толщины методом конвертов для допированных пленок полиметилметакрилата)

One of the important parameters when studying doped substances PMMA films is their thickness, which should be controlled and meet the requirements of specific devices. To measure film thickness, various methods are used, including the envelope method, which allows you to obtain information about film thickness using absorption and transmission spectra.

Conducting polymers are actively used in organic electronics [1]. Polymethyl methacrylate (PMMA) is one of the most common polymers that has many unique properties such as high transparency, mechanical strength and chemical resistance. Doping PMMA films

makes it possible to change their physical and chemical properties, which can be used in various applications, such as optical devices, sensors and microelectronics [2-3].

In this work, thin films of PMMA, phenolphthalein-doped PMMA and 3-benzolidenephthalide-doped PMMA were produced. Phenolphthalein and 3-benzolidenephthalide were used as dopants; the dopant concentration was 10 wt.% by weight of PMMA. Films were formed by centrifugation on a quartz substrate from a 10% solution in cyclohexanone. After applying the solution, the sample was subjected to air drying for 1 hour and then in a vacuum oven at 95 C to remove residual solvent.

Optical transmission and absorption spectra were measured on a Shimadzu UV-1800 spectrophotometer. The measurement range of transmission spectra is from 190 to 800 nm. The thickness of the resulting film was controlled by atomic force microscopy in hopping mode using NT-MDT Ntegra II equipment.

The envelope method, or otherwise called the Swanepoel method, is a popular method of analyzing transmission spectra to determine the optical properties of a material [2]. Swanepoel's method is applicable to any transmission spectrum showing noticeable interference fringes where well-resolved interference extremes are visible. It gives the same results as other analysis methods, but only provides refractive index values at wavelengths in the region where the interference fringes are detected.

If the thickness d is constant, then interference effects create a spectrum. As mentioned above, interference fringes were used to calculate film optical constants such as refractive index and film thickness.

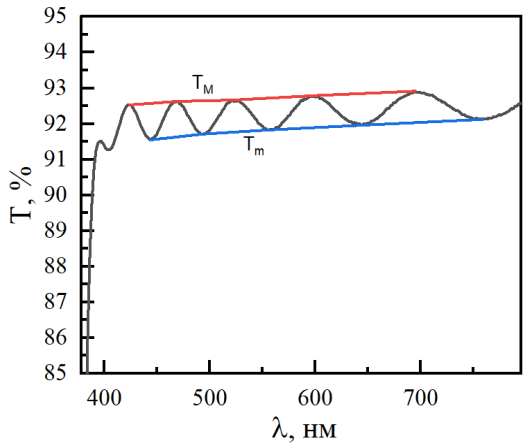

Fig.1. Transmission spectrum along with envelope curves.

The average theoretical thickness of PMMA films doped with

phenophthalein and 3-benzolidenephthalide, calculated using the Swanepoel method [2], is shown in Table 1. Doping of a PMMA film affects the thickness. A decrease in the thickness of organic films by approximately 59% in the case of doping with phenolphthalein and by 56% in the case of 3-benzylidenephthalide. This is apparently due to a decrease in the viscosity of the solution due to the presence of low molecular weight compounds and an improvement in the wettability of the substrate surface.

Table 1.

Thickness of PMMA films doped with Phenolphthalein and 3-benzenephthalide.

Sample	Thickness by envelope method, nm	AFM morphology method, nm
PMMA	2571,8	2653
PMMA+FF	1521,8	1751
PMMA+BF	1430,7	1451

Thus, the work presents studies of the transmission spectra of optically transparent submicron PMMA films with various dopants. The results show that the Swanepoel method is suitable for estimating the thickness of semiconductor materials and inorganic materials for organic films. The film thickness estimated by the Swanepoel method coincides with the experimental results obtained by atomic force microscopy.

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On fluid pressure in the fracture of hydraulic fracturing of horizontal wells (О давлении жидкости в трещине ГРП на горизонтальных скважинах)

In modern conditions, when a significant part of oil reserves is difficult to recover, the tasks related to fluid filtration in the bottomhole zone subjected to various influences are important. One of such problems is filtration around the well in the presence of fractures produced by hydraulic fracturing (see [1], [2]). Hydraulic fracturing technology is an innovative method of mineral extraction, which is based on the formation of a superconducting fracture in the formation. This process is carried out by injecting fluid under high pressure, which exceeds the strength limit, into the bottomhole of the formation, causing its fracture and formation of a fracture. Then, with the help of special additives, proppants (materials that fill the fracture and keep it from closing), the fracture is fixed and becomes highly conductive. Proppants and quartz sand, as well as other materials with particle size from 0.5 to 1.5 mm are used for rock fracturing.

The purpose of the work is to develop a mathematical model describing fluid filtration through a radial fracture of finite radius perpendicular to the well axis. Finding an approximate solution by the method of successive change of stationary states of the system of equations describing the above filtration.

At present, hydraulic fracturing in the operation of horizontal oil wells has been used quite often for the last 5-7 years, however, until now there is no clear-cut theory of fluid filtration in the fracture and its vicinity. The need for such a theory is dictated by the importance of determining the parameters of artificially created fractures (width, radius, permeability) and predicting the well flow rate under different operating modes.

It is assumed that the fracture is vertical, perpendicular to the well axis, fluid flows freely through the perforation holes in the wall from the formation to the well. The difference of the proposed model

from the known ones (see [3], [4]) is that along with the fluid flow between the fracture and the surrounding porous medium, we take into account that the fracture radius is finite. The model is represented as an integro-differential equation. We manage to construct an exact solution of this equation, but under the additional assumption that the crack is infinite. Previously, the solution was found in [3] only when neglecting the elasticity of the fracture of the fracturing crack.

It is also possible to find an approximate solution by the method of successive change of stationary states, i.e., under the assumption that at each moment of time the reservoir is divided into perturbed and undisturbed zones. This solution agrees well with the previously found exact solution. Therefore, we assume that if in the case of a finite fracture radius we also find a solution by the method of successive change of stationary states, it will differ little from the exact solution. At the same time, such a solution is convenient for practical application, since it does not require a large amount of machine time for calculations.

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On the use of gamma ray logging method in the study of wells (Об использовании метода гамма-каротажа при исследовании и скважин)

The purpose of the article is to substantiate the productivity of the method of natural radioactivity of rocks.

The relevance of studying the use of the method of natural radioactivity of rocks or gamma ray logging (GR) is due to the fact that it is one of the well-known and effective methods for geophysical studying wells in the geological, oil, coal and ore industries. Thanks to this method, it is possible to diagnose the structure of deposits, determine the geological structure of development objects, calculate reserves of oil and gas deposits, regulate the development and operation of fields, and also plan various technical production activities, including the drilling process. It is based on the measurement of natural gamma radiation emitted by rocks, which subsequently makes it possible to obtain information about the structure and properties of sedimentary and magmatic layers. It should be noted that modern technologies, instruments and other technical means are regularly improved for gamma ray logging, which as a result improves the accuracy and quality of the data obtained.

The logging speed is determined by the value of the permissible basic relative error. For measured quantities (counting rate), its value should not exceed ±6% for general and ±5% for detailed studies. The recommended research speed should not exceed

600 m/h and 400 m/h in terrigenous and carbonate sections, respectively.

When using the GR module as part of combined assemblies, the logging speed is determined by the speed of research by other WGS modules, if lower research speeds are set for them.

Geological problems solved with the help of an integral GR: 1) lithological division of sections; 2) determination of clay content of reservoirs; 3) indirect determination of porosity under favorable conditions; 4) in cased wells, GR are used to link perforation wells

and flow metering methods to the section; 5) separation of uranium, thorium ores, potassium salts.

The results of gamma ray logging values provide data on the types, types, structure and properties of rocks, as well as determine the volume and quantity of hydrocarbon reserves.

Thus, it should be emphasized that the GR is a guarantor for the effective development and exploitation of deposits of oil, coal, ore and other minerals.

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The use of IoT technology at the facilities of the oil and gas industry
(Использование технологии IoT на объектах нефтегазовой отрасли)

Companies in the oil and gas industry are continuously working to decrease production expenses. These expenses could be related to downtime of equipment, delays in decision-making, and ensuring high levels of industrial safety and workplace safety.

The application of Internet of Things (IoT) technology has the potential to decrease costs in the oil and gas industry, as well as in various other sectors. In oil and gas fields, IoT devices are utilized to monitor production levels, equipment performance, and more. This helps to reduce operating expenses and minimize the occurrence of accidents and incidents. IoT sensors, controllers, and tags can be installed on diverse equipment, even in challenging environmental conditions. By leveraging IoT technology and extracting real-time data from sensors, thorough control over industrial processes can be achieved. This enables prediction of equipment failures, minimizing downtime. A network of sensors can collect and analyze crucial indicators of production processes, allowing for effective management of facility workload and monitoring their condition. With knowledge

of equipment's real-time condition, maintenance activities can be performed proactively, significantly reducing the occurrence of unexpected shutdowns and breakdowns [2].

The main purpose of the Internet of Things technology is to solve the problems associated with the extensive collection of data on industrial processes. IoT devices are designed to provide efficient and accurate transmission, storage and visualization of various parameters and data. Equipped with intelligent sensors, these devices collect information, analyze data and can promptly notify designated personnel in the event of an emergency. This functionality allows remote monitoring of the entire system, predictive assessment of the condition of the equipment and ensure the safety of operations [1].

In the oil and gas industry, IoT devices are specifically designed to monitor and measure crucial parameters such as fluid production volumes, flow rates, temperature, pressure, and capacities, among others. By installing sensors and tags on transportation assets used in the fields, it becomes possible to monitor and receive alerts about potentially dangerous situations involving equipment or personnel. The implementation of IoT technology can elevate occupational safety and health standards to new heights.

It is important to highlight that IoT technologies have application across all stages of the oil and gas industry, ranging from geological exploration to the sale of petroleum products.

In general, the use of IoT technology at oil and gas facilities contributes to increased productivity, lower operating costs, improved safety and reduced environmental impact. The development and implementation of modern IoT solutions play an important role in the modern oil and gas industry.

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Study of features of fluid flow in microchannels with rectangular traps (Изучение особенностей течения жидкости в микроканалах с прямоугольными ловушками)

Microchannels are the functional component of microfluidic systems. The geometry and shape of microchannels influence the movement of particles and the deformation of droplets within these channels significantly [1]. These factors, in turn, impact the transport properties of substances inside the channels. Numerical modeling of multiphase flows in microdevices allows predicting fluid dynamics inside channels and optimizing the design of microfluidic systems.

In this study, numerical experiments were conducted to investigate the hydrodynamic flow features in a flat microchannel with rectangular caverns (traps). The fluid flow is described by the Stokes equations. The problem is considered at Reynolds number $Re < 1$ and steady-state conditions (T = constant). A detailed problem formulation is described in the study [2]. The problem is solved using the accelerated boundary element method (BEM). This approach has been successfully tested and applied for calculating a large number of droplets in an unbounded flow [3] and for modeling emulsion flow in microchannels [4].

The present work explores the peculiarities of viscous fluid flow in channels when the relative arrangement of traps changes. It is shown that as the displacement of traps from each other increases, the

velocity distribution pattern changes, forming a zigzag-shaped region of maximum velocity. As the channel walls are approached, the flow velocity decreases, and the velocity profile deviates toward the traps most significantly.

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A microfluidic approach to cell sorting (Микрофлюидный подход к сортировке клеток)

Microfluidics is a branch of science that studies the movement of liquid or gas in micro-channels with sizes from 1 micrometer to 1 millimeter, but usually their size is considered to be about 30-300 micrometers. This science operates with liquids on a micro level, what

significantly increases the accuracy and performance of the experiment [1].

The process of cell separation and sorting is a necessary step of sample processing in plenty of biological and medical analyses, due to the fact, that a huge amount of liquids, particularly blood, consist of heterogeneous population cells [2]. Thus, microfluidics offers such methods of cell sorting, retention and cultivation that are based on the properties like size, shape, density, deformability, electrical resistance, etc.

It is known, that blood consists of leukocytes, platelets, erythrocytes and some other cells, but if one suffers from cancer, his blood also consists circulating tumor cells (CTCs) [3]. CTCs appear in the bloodstream in the early stages of cancer as well as in its recurrence. This is the reason why the number of CTCs in blood is an essential growth rate of tumor process. According to the experiments, the level of CTCs can predict, whether the person with metastases will survive or not. As a matter of fact, CTCs level is crucial for both assess the prognosis of the tumor process, and for personalized therapy and treatment monitoring. Each of these cells can be detected in liquid with certain parameters. It is possible with the help of microfluidic devices, which are in fact a network of micro-channels etched in substrate material: glass, silicon or polymer, to be precise. These devices allow sorting, fixation and retention of certain particles [4].

Comparing to other CTCs detection methods microfluidic devices have a number of important advantages. Among them, for example, is the fact that they require small sample volume and hence the reagents, while classical CTCs detection needs from 1 to 10 milliliters of blood due to low concentration in blood. Moreover, provided with microdevices experiments have sufficient accuracy and performance.

Mostly deterministic lateral displacement (or just DLD) is used for blood analysis [5]. It separates the particles in in continuous stream with resolution up to 10 nanometers. This method implies that CTCs are bigger than red blood cells and lymphocytes. The DLD device consists of an array of posts in which each row is offset from the previous by a certain distance. Also, they have gaps denoted as G, which form a number of streamlined flows. With the help of those

gaps it is possible to determine the displacement of each cell perpendicularly to the primary flow.

To reduce the time and resources for design the microfluidic devices and providing the experiments numerical modeling is widely used. It gives an opportunity to analyze and predict the behavior of liquids in the microdevice before conducting the laboratory tests. One of the methods used in the numerical modeling is the boundary element method (BEM). Its main advantage is the possibility to apply it for modeling deformable particles and complex structures [6]. Unlike the finite difference method and the finite element method BEM has quite a high accuracy for few classes of problems. It is also noteworthy, that BEM reduces the dimensionality of the task and hence simplifies the problem and the process of obtaining its solution a lot.

At present, there is a huge amount of diverse microdevices beeing constructed. However, despite the fact that, according to scientists, they can detect even single CTC in the bloodstream, microfluidic devices have not already been implemented in the clinical practice.

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Phototransistors made from organic thin-film materials (Фототранзисторы из органических тонкопленочных материалов)

One of the areas of application of multilayer polymer thin-film materials is the development of new phototransistors for memory cells [1-3]. In the future development of organic electronics, it is necessary to create a variety of devices, such as displays, integrated circuits, sensors, etc. These devices will be ultra-thin, light, flexible and transparent, which will open up new prospects that are not available for traditional silicon-based electronics. One of the promising devices in the field of organic electronics is an organic transistor (OFET) with a transport layer no more than ten nanometers thick, where charge carriers are controlled by changing the charge density in an electric field. A sample structure of a phototransistor based on polyindole films is shown in Fig. 1.

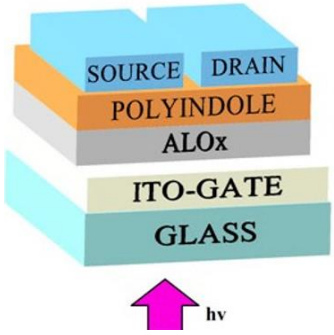

Fig. 1. Phototransistor structure

During the creation process, glass was used as a substrate, coated with a conductive layer of indium tin oxide (ITO) as a gate. Before the formation of the necessary films, the substrate was annealed in a muffle furnace. AlOX films with a thickness of 400 nm were used for the dielectric. The polyindole film was formed by centrifugation from the corresponding solution, and the residual solvent was removed by heating in a muffle furnace. Then, using the thermal spraying method in a vacuum installation, two aluminum electrodes (source and drain) with a thickness of 500 nm were deposited. The distance between the

contacts was 50 μm, and their length was 2 mm. The formation of a polyindole fragment in the polymer chain led to an increase in the rigidity of the structure, affecting the physicochemical characteristics of MPIn. The electronic spectrum of MPIn reveals one absorption peak at 269 nm, which is typical for this class of polymers. The literature reports photoluminescence of various polyindole derivatives in the range of 430–470 nm. However, it is noted that the synthesized MPIn exhibits a bathochromic shift compared to other types of polyindoles previously studied. It is also known that polyindoles exhibit photoluminescence due to their conjugated structure, and the formation of an indole fragment in the polyaniline chain leads to an increase in the luminescence intensity of MPIn.

To analyze photoconductivity, current-voltage characteristics (CV characteristics) were measured under ultraviolet irradiation with a wavelength of 350 nm. The dark current of the polyindole films was approximately 1 nA. Under the influence of ultraviolet radiation, the photocurrent increased by three orders of magnitude compared to the dark current. The energy of ultraviolet quanta was 3.4 eV, which is comparable to the band gap. This led to the formation of electron-hole pairs and an increase in the conductivity of MPIn films.

Next, families of output and transfer current-voltage characteristics of phototransistors were obtained and studied. An analysis of the current-voltage characteristics of these transistors showed that in the absence of irradiation, the currents in the phototransistors are approximately 1 nA. The mobility of carriers in the active layer μ of the fabricated OPTs was estimated using formula (1):

$$I_{DS} = (W/L)\mu C(U_G - U_{th})U_{DS}, \quad (1)$$

where W is the channel width, L is the channel length, C is the capacitance per square area of the AlOX gate dielectric (for a thickness of 400 nm C = 8.9 nF/cm2), UG is the gate voltage, UDS is the drain-source voltage, and Uth — threshold voltage. The calculated carrier mobility is μ (MPIn) = 0.016 cm2 V–1 s–1, which is comparable to the mobility for this class of compounds.

The results obtained are related to the photoconductivity of new thin films that are derivatives of polyindole. Measurements of absorption and photoluminescence spectra were carried out, which indicated a bathochromic shift of the synthesized MPIn compared to previously studied other types of polyindoles. A study of the

photoconductive properties of thin polyindole films was carried out, taking into account the conditions of their preparation and surface morphology. Thin-film phototransistors based on MPIn thin films were also fabricated, followed by evaluation of characteristics such as quantum yield and carrier mobility. The studied form of polyindole has good solubility, which makes the production of electronic components compatible with modern technologies of printed organic electronics. All measurements were carried out under atmospheric conditions.

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Thin film organic photoresistors (Органические тонкопленочные фоторезисторы)

Organic optoelectronics is a rapidly growing field of research which aims towards the development of a new generation of electronic devices that are lightweight, flexible and transparent. Among such devices, organic phototransistors and organic light-emitting devices

such as lasers and light-emitting diodes stand out [1-5].

A distinctive feature of thin-film OPRs is their ability to be fabricated from organic polymeric materials such as triphenylamines (TPD), polyphenyls (PPI), and polythiophenes (PTh). OPRs can be used to convert light energy into electrical energy without the use of semiconductor materials. Important parameters of such devices include light sensitivity (P) and responsivity (R).The P value is defined as the ratio of photocurrent to dark current:

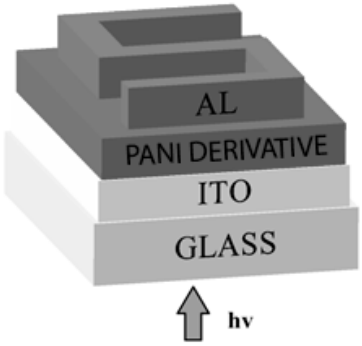
$$P = \frac{I_{ph}}{I_{dark}} = \frac{I_{illum} - I_{dark}}{I_{dark}} \qquad (1)$$

The value of R is defined as the ratio between the generated photocurrent and the incident optical power (P_{opt}); hence, the sensitivity R can be calculated as:

$$R = I_{ph} P_{opt} = \frac{I_{illum} - I_{dark}}{\alpha E_{opt}}, (2)$$

At that, the area of the device did not exceed 0.12 cm2

As part of the research conducted, several samples of photoresistor devices were fabricated. Glass was used as a substrate. Aluminum electrodes were applied to the glass plate from above by thermal sputtering in a vacuum chamber on a ВУП-5 unit with a thickness of about 400 nm, the gap was created using a shadow mask. One example of such device is the design obtained as follows: a glass substrate with an ITO conductive layer was cleaned and subjected to oven drying. The polyindole film was then deposited from solution on top of the ITO by centrifugation.



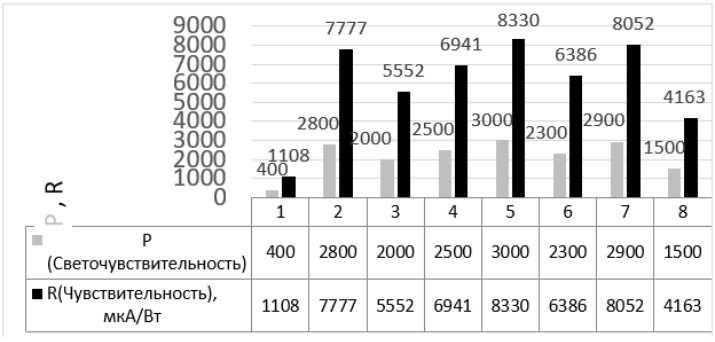


Fig. 1. Structure of photoresistor based on polyaniline derivative film.

Fig. 2. Diagram of photosensitivity and sensitivity of samples.

A film of PANI derivatives was deposited in the region of the 200 μm gap between the electrodes by centrifugation from a DMFA solution (0.1 g/mL). The obtained layer was subjected to thermal

annealing to remove the residual solvent by heating to 110°C for 20-25 min. The photoresponse kinetics of thin-film structures based on polyindole was investigated. The results are shown in Fig. 3.

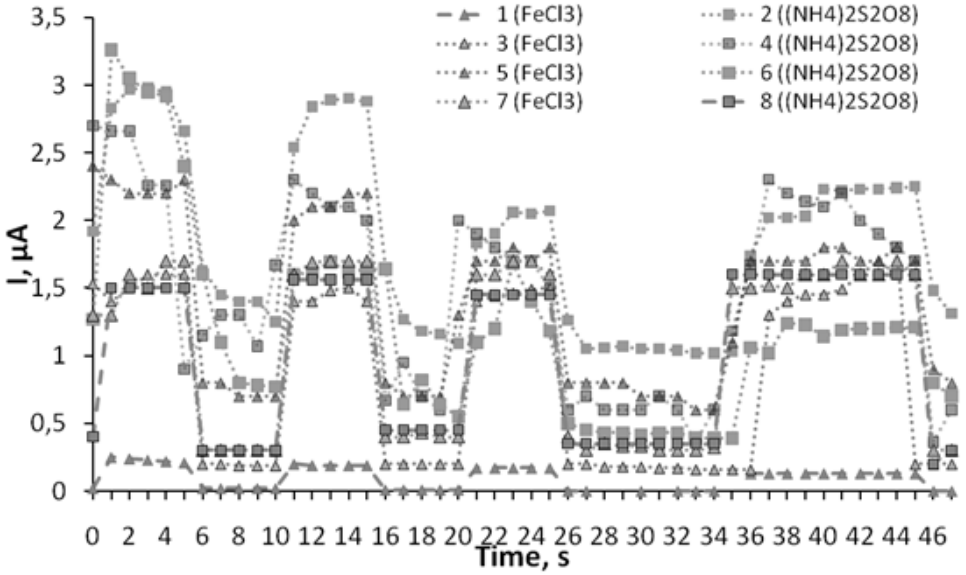


Fig. 3. Dependence of current on irradiation time at a voltage of 10 volts and a distance from the radiation output from the fiber optic cable to the sample of 10 mm.

The results of this research are of considerable practical interest for the development of new optrons and photosensors based on poly-2-(1-methylbut-2-en-1-yl)aniline. The light sensitivity of the photoresistive structures was evaluated, which was P1=400, P2=2800, P3=2000, P4=2500, P5=3000, P6=2300, P7=2900, P8=1500, and the sensitivity of the obtained samples was measured: R1=1108 μA W-1, R2=7777 μA W-1, R3=5552 μA W-1, R4=6941 μA W-1, R5=8330 μA W-1, R6=6386 μA W-1, R7=8052 μA W-1, R8=4163 μA W-1. All measurements were carried out under normal conditions - atmospheric air, which is an advantage of the studied photoresistive structures compared to most experimental structures on other compounds, when it is necessary to work in a chamber with inert gas or dry nitrogen.

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Determination of the closure pressure based on geophysical field surveys (Определение давления смыкания трещины по данным ПГИ (промыслово-геофизических исследований))

In recent years, oil companies have focused on reducing the current level of water availability and increasing oil production. This is due to the fact that the share of hard-to-recover oil with a heterogeneous reservoir structure has increased in the reserves balance. The problem with flooding in oil fields is that it is not always possible to achieve an even distribution of pressure and flow of oil within the reservoir. This may result in some oil remaining in the field and not being extracted, reducing development efficiency and production. Achieving a uniform flow profile in the development of oil fields is a pressing challenge requiring an integrated approach and the application of various technologies and methods.

The aim of the work is to determine the closing pressure of the fracture based on the development of GGP data in injection wells at established injection modes.

In the development of oil fields, injection into productive

horizons is common. Technogenic cracks occur when the injection pressure exceeds the bursting pressure. Fractures of an auto-fracture (hydraulic fracture) can be a continuation of fracture fractures created by the fracture process and increase the area of the formation [1.2].

To determine the clamping pressure of a crack, several steady-state tests with a gradual increase in pressure are required and the corresponding values are fixed in the diagrams. The method involves finding the closing pressure by approximating the ID points before and after the auto-fracture crack. The coordinate of the intersection point of the approximating lines along the axis of the ordinate is the desired clamping pressure.

Analysis of data on cross-plots of flow pressure shows that the sign of the presence of auto-fracture in the injection well is the nonlinear behavior of the indic-torn diagram, as shown in Figure 1.

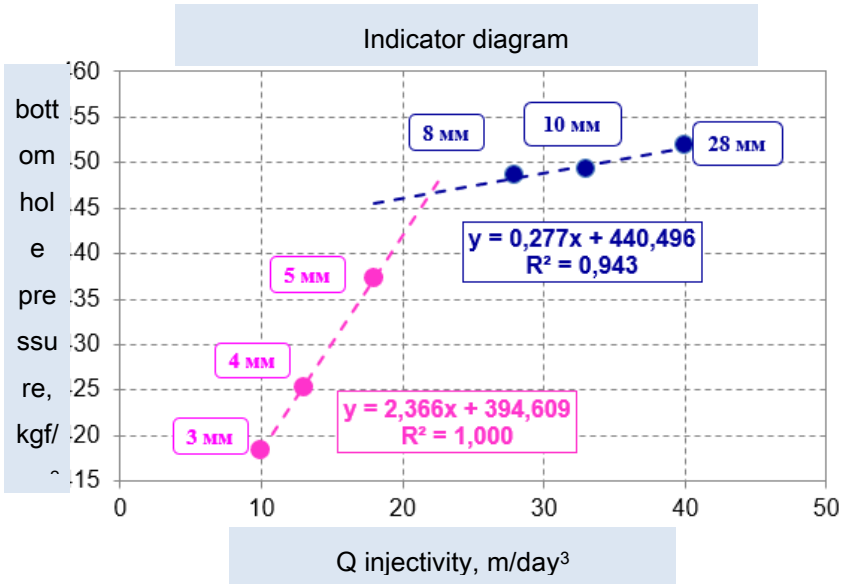

Figure 1 - Indicator diagram to determine the closure pressure of a crack

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Numerical study of the features of single-phase fluid flows in a porous micromodel (Численное исследование особенностей течений одно-фазной жидкости в пористой среде)

The following parameters and environment influence fluids in porous media, hence the need to carefully consider hydrodynamic processes under different microscale conditions. The presence of liquids is influenced by many physical parameters and environmental features, so there is a need to organize hydrodynamic processes in various conditions [1].

When solving applied problems arising in the oil industry, as well as when creating micro-heat exchange devices and laboratory chips, it is important to take into account the complex geometry of porous and fractured structures, which represents a pressing problem in hydrodynamics.

The work considers the slow flow of a viscous incompressible fluid in a flat rectangular microchannel, inside which non-deformable columns are distributed in various ways, representing a micromodel of double porosity. around stationary, unchanging objects inside a flat microchannel. The flow velocity is quite low, Reynolds number $Re < 1$, inertial forces can be neglected, fluid dynamics are described by the Stokes equations and the continuity equation.

The movement of the liquid is carried out due to the pressure difference specified in the section of the microchannel under consideration. The adhesion condition is set on the channel walls and the surface of non-deformable elements, and the periodicity condition is set at the channel inlet and outlet. To solve the problem, a software module based on the boundary element method (BEM) was used. A numerical approach based on BEM is effective in solving three-dimensional problems in infinite domains or domains with complex geometries, as in this case. The main advantage of this method is that there is no need to discretize the entire three-dimensional region, since

all calculations of physical parameters are associated only with the boundaries of the regions under consideration [2].

Streamlines and velocity fields of liquid flow inside a microchannel with complex geometry were obtained. The coefficients of porosity (m = 0.8) and absolute permeability were calculated for models with inclusions of round (k = 2.94 D) and square cross sections (k = 2.86 D). It is shown that the permeabilities in the two considered geometric variations differ significantly while maintaining the porosity coefficient of the medium.

In a channel with cubic elements, the deviation is more significant compared to a channel with cylindrical elements. This is due to the fact that when liquid flows around the corners of an element of square cross-section, the hydraulic resistance increases, and therefore the flow velocity decreases and the flow rate decreases. All other things being equal, the fluid flow rate in the models differs, therefore, the permeabilities of the media are also not equal. Eventually, it was revealed that changes in the internal geometry of the porous medium affect both the flow patterns and the integral characteristics of the medium. The total porosity of both models remained unchanged and was equal to 0.8. To determine the absolute permeability of the medium, the Darcy equation was used. It was found that when the shape of elements changes from cylindrical to cubic, the permeability of the medium decreases by 2.7%. This is due to the redistribution of flow and the formation of additional hydraulic resistance in a model with less streamlined elements.

The proposed method and research results can also be used to study current problems associated with the study and development of methods for influencing single- and multiphase flows in media with different porosity scales.

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Optimization of the hydrodynamic properties of the bubble barrier to increase its efficiency (Оптимизация гидродинамических свойств пузырькового барьера для улучшения его эффективности)

Plastic is a relatively cheap, convenient and affordable material. Polymers can be found everywhere today: in computers and cars, in medicine and in everyday life. Their irrational use has led to pollution of the environment with plastic.

Since plastic does not decompose, its recycling is difficult and creates environmental problems. The irony is that plastic was created to protect nature and its resources, since it can be used instead of wood or stone to protect rare species of animals.

Let's turn our attention to the pollution of the world's oceans, as this topic is one of the main environmental problems at the moment. Due to its colossal size, its cleaning is almost impossible. why not fix the problem at the very beginning of its occurrence, as this will significantly reduce the effort spent on cleaning up the ocean and simplify the task of preventing this problem in the future. Every year, 100,000 marine animals die from becoming entangled in plastic – these are just the creatures we find.

Rivers and canals are the main cause of environmental pollution. From here, a large amount of garbage ends up in the world's oceans, as human waste is dumped into waterways. 70% of our garbage settles in the ocean ecosystem, 15% floats to the surface and 15% settles on our beaches.

Most of the waste from human activities settles on our waterways, causing enormous damage to the environment and people. Marine flora and fauna are entangled in plastic, ships are damaged, and microplastics are becoming increasingly dangerous to the health of the smallest and largest organisms.

How can we stop this? The creators of the Great Bubble Barrier (TGBB) project came up with the idea to limit the flow of plastic into the ocean by filtering it out of rivers using a bubble curtain. A bubble

curtain is created by fixing a perforated tube at the bottom of the river and passing air through it. Air bubbles rise to the surface, dragging water with them, and form a plume, which is formed due to the buoyancy of the bubbles. Upon reaching the surface layer, the trapped water flows out, moving away from the bubble screen.

This idea is very environmentally friendly, as it does not require such huge costs for the introduction and use of this technology, which would greatly simplify the task of cleaning the ocean from debris and would improve our lives many times over.

In this article, we would like to talk about the value and necessity of a bubble barrier, for which we used data from previous research in this area. By defining these parameters, we could learn how to implement a bubble barrier around the world.

Our next goal was to find out the hydrodynamic properties of the bubble barrier and how to improve them and simplify its operation. Taking into account the physical properties of liquids, gas bubbles, namely compressed air, we can find solutions to optimize the operation of the curtain.

The creators of the bubble barrier, Francis Zoet, Ann Marike Evelins and Philip Earhorn, discovered such types of garbage in rivers and river deltas as styrofoam, cigarette butts, wrappers and even a Christmas tree. Just imagine its power and capabilities.

To optimize the barrier from a physical point of view, let's consider the diffusion of gases because there is a displacement of molecules from a high-pressure zone (inside the bubble from the air) to a low-pressure zone (surrounding the bubble, water). We will also pay attention to viscosity, since the curtain creates additional ductility in water, which affects its fluidity and ability to transfer heat.

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Microfluidic technologies for studying filtration in porous media (Микрофлюидные технологии для изучения фильтрации в пористых средах)

There is a great interest in modern science and industry in studying filtration behavior in porous media such as soils, rocks, and biological tissues.

The management of filtration processes in these media is of great importance in many fields, including geology, the oil and gas industry, pharmaceuticals, and biomedicine. The effectiveness and accuracy of filtration studies significantly depends on the ability to obtain accurate and high-quality data on the processes occurring in porous media.

In recent decades, microfluidic technologies have been widely recognized as a powerful tool for studying filtration processes. Microfluidics combines technologies based on the use of microscopic channels and structures that can effectively simulate filtration processes in porous media at the micro level. This allows researchers to obtain detailed data on the flow of liquids, the interaction of substances with surfaces, and other phenomena.

We were tasked with creating an experimental setup consisting of a microfluidic chip and a core strip.

An experimental installation combining a core strip and a microfluidic chip is a device designed for the study and analysis of microstructures of materials. The core strip is a technology that allows you to create thin layers of material with high precision and control of their thickness. A microfluidic chip, on the other hand, is a small plate with microchannels that allow you to control the flow of liquid at the nanoscale.

Combining these two technologies makes it possible to study the structures of materials at the micrometer scale. The experimental setup provides the possibility of combining a layer of porous material with microfluidic channels for analysis and manipulation of liquid samples.

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Resistive thin film sensor for ammonia vapor (Резистивный тонкопленочный датчик на пары аммиака)

This work discusses newly synthesized polyaniline derivatives poly 2 - [(2E)-1-methyl-2-butene -1 - yl]aniline (P1) and poly 2 (cyclohex -2-en-1-yl)aniline (P2), characterized by fairly high solubility and good film-forming properties. A study was carried out on the solubility, particle size and surface morphology of thin films of new polyaniline derivatives. Based on thin films of these polyaniline derivatives, ammonia vapor sensors were manufactured and their characteristics were measured [1-4].

Multilayer structures of resistive sensors were obtained based on thin films (Fig. 1). In resistive sensors, a glass-ceramic substrate was used as a substrate. Aluminum electrodes were deposited on top of the glass-ceramic substrate by thermal spraying in a vacuum chamber on a VUP 5 installation with a thickness of about 400–500 nm; the gap was created using a shadow mask. For some samples, a film of polymer P1 was applied to the gap area between the electrodes of 50 μm, and for others P2, by centrifugation from solution. The ohmic nature of the contacts was proved by measuring their current-voltage characteristics. The homogeneity of the polymer surface in the working area of resistive sensors is confirmed by AFM and SEM studies. The resulting layer was subjected to thermal annealing to remove residual solvent by heating to 150°C for 20–25 minutes.

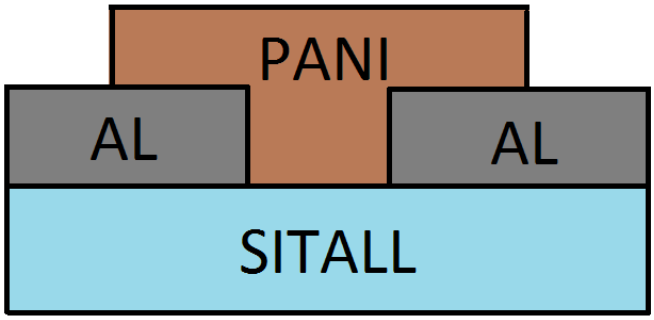

Fig.1. Structure of thin film resistive sensor

The response of the sensors to NH3 was assessed by the change in the passing current with the change in the concentration of ammonia vapor.

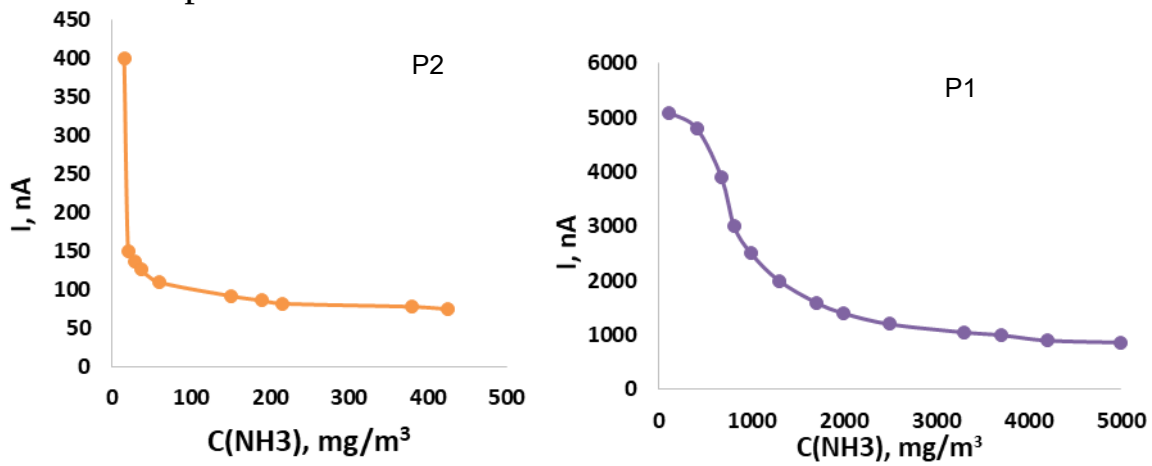

Fig.2. Dependence of the current flowing through films P1 and P2 on the concentration of ammonia vapor.

Films of polyaniline derivatives react to the presence of ammonia vapor in the environment by reducing the flowing current (Fig. 2). The results obtained are explained by protonation/deprotonation of the polymer chain. An increase in the concentration of ammonia in the medium leads to a decrease in the degree of doping. It is assumed that when the polymer interacts with NH3, ammonia molecules absorb protons from PANI, forming energetically favorable ammonium (NH4+), as a result of which PANI deprotonates and the conductivity decreases.

The use of new PANI derivatives as a detecting element of the sensor makes it possible to create thin films with the surface developed and highly permeable to the analyte. The results showed that samples P2 and P1 have high sensitivity, fast response and recovery times. Thus, they are of great practical importance in sensors for detecting ammonia vapor in air.

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Organic thin-filmn humidity sensors
(Тонкопленочные органические датчики влажности воздуха)

Measuring humidity is important for a wide range of industrial applications, including pharmaceuticals, food , medicine and electronics. Some moisture sensors have been developed on the basis of the reversible interaction between material and water vapor, so that they function like gas sensors. It has been recently reported that the use of nanostructures such as nanoparticles, nanotubes, nanofibres and polymer nanocomposites as moisture -sensitive materials can significantly improve the performance of moisture sensors. These nanostructured materials are dominated by surface effect due to high surface to volume ratio, which is useful for the development of

moisture sensors and gas sensors [1-4].

New functional nanomaterials and composites based on polyaniline are being investigated. In this work thin films of organic materials - fullerenes (C60), polyanilines (PANI) and polyimide were investigated.

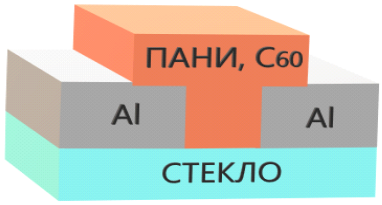

Figure 1: Structural diagram of the resistive sensor

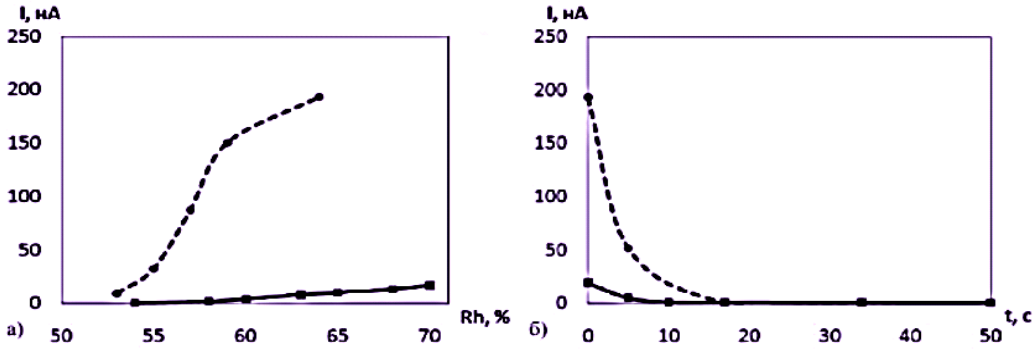

Figure 2: Characteristics of resistive sensors (dotted line - C60 film; solid line - PANI film): current dependence on air humidity (a), current dependence on time at a sharp decrease in air humidity (b).

Figure 2 shows the current dependence on humidity and time at a sharp decrease in air humidity for resistive sensors based on thin films of polyaniline and fullerene C60. The resistive sensors obtained on the basis of C60 have higher current values at humidity change compared to sensors on PANI films (Figure 2, a). The results of determining the speed of relative humidity sensors are shown in Figure 2, b. The response time of the sensors is not more than 2-3 s, which is a good indicator for electronic hygrometers.

It can be assumed that the interaction of the polymer chain with water molecules proceeds similarly to the process of doping the polymer with acid.

Resistive sensors obtained on the basis of C60 have a greater increase in current when humidity changes compared to PANI. The positive characteristics of the obtained absorption sensors of air humidity based on polyimide films include linear dependence of capacitance on relative humidity, small hysteresis (not more than 1-

2%), high steepness of characteristics and small time constant.

Thin films with developed surface area and permeable to analyte provide high sensitivity and measurement accuracy. Due to their low inertia and fast response time, these sensors can be used in a wide range of applications related to air humidity measurement under different conditions.

Thus, summarising the study it can be concluded that the use of new PANI derivatives as a detecting element of the sensor is one.

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The energy spectrum in the layered structure of the skyrmion lattice (Энергетический спектр в слоистой структуры решетке скирмионов)

The study of magnetic skyrmions is essential for progress in the field of magnetism and magnetic materials, as they are key elements

for the development of new forms of magnetic memory and logic devices. Skyrmions, which are topological excitations with non-integer spin, have the properties of quasiparticles. The appearance of skyrmions and inhomogeneities in the magnetic structure affects the spectrum of spin waves, giving it a non-trivial shape.

In this work we consider a system consisting of two identical layers, separated from each other by the interlayer antiferromagnetic interaction J_3. The structure of one layer represents the symmetry of a simple cubic lattice. At lattice sites, the spins interact with each other using ferromagnetic exchange interaction with the parameter J_1 for the nearest neighbors and antiferromagnetic exchange with the parameter J_2 for the next nearest neighbors along the y axis. The external magnetic field is directed along the y-axis. To study the ground state of the system and determine the type of long-range order, we will use Hamiltonian (1), which describes the interaction of spins in the system. To do this, we will assume that θ is the angle between the two nearest adjacent spins in the y direction.

$$H = -2J_1 \sum_{i,j} \vec{S}_i \cdot \vec{S}_j - 2J_2 \sum_{i,i'} \vec{S}_i \cdot \vec{S}_{i'} - 2h \sum_i S_i^y - J_3 \sum_{i,i'} \vec{S}_i \cdot \vec{S}_{i'} \#(1)$$

where $\vec{S}_i$ is the spin occupying the i-th site of a simple cubic lattice, h is the magnitude of the magnetic field applied along the y direction perpendicular to the plane (xz) of the lattice, J_1 is the ferromagnetic interaction between two nearest spins $\vec{S}_i$ and $\vec{S}_j$ (NN), J_2 – antiferromagnetic interaction for the next nearest neighbors (NNN), J_3 is antiferromagnetic interaction between two identical layers.

The vector spin wave spectrum is a way of representing the spin wave energies in the physical system being studied. Without a magnetic field, all spin states have the same energy and are distributed evenly across energy levels. Turning on the magnetic field results in the appearance of two sublevels with different energies, which makes the spectrum more pronounced and allows one to observe a distinct peak at a certain energy.

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Studying the effect of anisotropy on the lattice of skyrmions (Изучение влияния анизотропии на решетку скирмионов)

One of the interesting properties of magnetic skyrmions is their stability and the ability to move through the crystal lattice without energy expenditure. This makes them potentially useful for creating devices with low power consumption and high storage density. They have the property of topological protection, which means that they can retain their shape and properties under small external disturbances. This makes them resistant to defects.

The presence of defects in the magnetic and crystalline structure: non-magnetic inclusions, regions with anisotropy and magnetic atoms of various types have a significant effect on the structure, dynamics and stability of skyrmions. Non-magnetic inclusions and regions with altered anisotropy create additional barriers and inhomogeneities, which leads to a change in the magnetic configuration of the skyrmion and a redistribution of its magnetic moment. In the case of weak anisotropy, the magnetic moment is more freely oriented in space, which allows the skyrmions to remain stable without significant changes in their configuration. However, with strong anisotropy, skyrmions experience significant energy barriers when changing their structure or orientation, which makes it difficult to manipulate them, but also provides high stability.

In this work, we consider a two-layer structure, at the boundary of which, with different ordering, a fairly strong magnetoelectric interaction can arise, promoting the formation of skyrmions and states in which skyrmion lattices are formed. This bilayer consists of a

frustrated magnetic film with a triangular lattice and a ferroelectric film, where the spins in the magnetic film are modeled by the Heisenberg Hamiltonian in the presence of the Dzyaloshinsky–Moriya interaction. When modeling, we will consider the size of the system N×N×L with linear transverse size N = 60 and thickness L=L1+L2=2, where L1 is a frustrated magnetic film, and L2 is a ferroelectric film. Periodic boundary conditions in the film plane are imposed on the system.

Interesting effects have been found related to changes in the ground state energy profile caused by competing interactions without the inclusion of a magnetic field.

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The essence of multistage hydraulic fracturing (Сущность многостадийного гидроразрыва пласта)

Multistage hydraulic fracturing (MHF) is an innovative technology in the field of oil and gas production that has changed the way hydrocarbons are extracted from hard–to-reach formations. This method of development makes it possible to efficiently extract oil and gas from the bowels of the earth, which were previously considered unprofitable or difficult to exploit.

MHF is based on the use of hydraulic fractionation, a process in which, under the influence of high pressure, water and propant are injected into the formation to create cracks and increase the permeability of the rock. However, unlike classical hydraulic fracturing techniques, MHF allows this process to be carried out on several sections of the reservoir, creating many hydraulic fractures associated with the main horizontal wellbore.

Advantages of MHF:

1. Increase in production: MHF significantly increases the contact area of the well with the reservoir, which contributes to an increase in hydrocarbon production.

2. Cost-effectiveness: Since one well can service multiple wells, infrastructure costs are reduced, making MHF projects more economically profitable.

3. Reducing environmental impact: Since the MHF allows more oil and gas to be extracted from a single well, the number of wells and, consequently, the environmental impact are reduced.

Challenges and risks of using technology:

1. Water resources management: The use of large volumes of water for MHF can cause problems with water resources management and impacts on local aquifers.

2. Earthquakes: In some cases, the MHF has been associated with an increase in the number of earthquakes in the region, which raises questions about security and stability.

MHF continues to attract the attention of oil companies and engineers exploring new methods to optimize the process to make it more efficient and safer. At the same time, research is continuing on the impact of MHF on the environment and society as a whole, in order to develop regulatory measures and standards that ensure sustainability and environmental safety when using this technology.

Multistage hydraulic fracturing represents an important step towards more efficient and sustainable oil and gas production. However, for its successful implementation, both economic and environmental aspects must be taken into account in order to ensure a balanced and sustainable approach to the development of energy resources.

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Numerical study of fluid flow in double porosity micromodel (Численное изучение течения жидкости в микромодели двойной пористости)

One way to account for the zonal heterogeneity of oil reservoirs is to apply the double porosity model, which assumes that the reservoir consists of a matrix, which is a porous medium, and solid inclusions [1]. One of the most important factors to consider when modelling fluid flow in porous media is the geometry of the structure. The aim of this work is to apply a numerical module based on the three-dimensional boundary element method (BEM) to study the features of fluid flow in a structural model of porous media at the micro-level. The slow flow of a viscous incompressible fluid (Re<1) in a microchannel with two scales of porosity is considered. All processes take place under isothermal conditions and are described by the Stokes equations. To form the second scale of porosity with equal number of columns, their spatial distribution was varied. The total porosity of the microchannel remained unchanged. The accelerated boundary element method (BEM) is applied to solve the set three-dimensional problem in a region with complex geometry.

The influence of parameters of the double porosity micromodel on the fluid flow structure has been investigated using an efficient numerical approach. The results obtained can be used for verification of models describing flows in media with double porosity. Such models are used to describe filtration in rocks, technological processes of fibre composites manufacturing and other applied problems. In addition, the study of flows in such structures is an important task related to improving the efficiency of heat exchangers for microelectronic devices.

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Hydraulic fracturing
(Гидроразрыв пласта)

Obtaining useful natural resources invariably becomes more complicated over time. Deposits are being depleted, so there is a need to improve the production of hydrocarbons. Hydraulic fracturing is one of the most effective ways to intensify fluid extraction. The point is to introduce a liquid into the productive reservoir under high pressure, which entail the rupture of the reservoir and the formation of cracks, the lengths of which reach tens of meters and the width of several millimeters. To prevent cracks from closing, propane is added to the injected liquid.

The described operation increases permeability. By connecting, the cracks become conductors of oil and gas between remote areas of the formation, thus they increase the reach zone and simplify the transfer of fluids to the well. For more efficient extraction of minerals, there is a need for new mathematical models of fluid filtration.

There are various models of fractures of hydraulic fracturing. S.A. Khristianovich and Yu.P. Zheltov in their works proposed the propagation of a two–dimensional crack, assuming that the crack is vertical, the vertical cross-section has a rectangular shape - KGD model. T.K. Perkins, L.R. Kern and R. Nordgren in their works considered a different model: vertical crack, vertical section it has an ellipsoid shape – PKN model. There are also radial models and various modifications of these models.

Thus, hydraulic fracturing acts as a technology that allows for more efficient extraction of hydrocarbons from the bowels of the earth. For the development and improvement of this technology, additional research and development of new filtration models are required. Hydraulic fracturing contributes to the intensification of oil production, increases well productivity, and increases the inflow interval.

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The effect of the methyl ester group on the sorption of Mn^{2+} ions by histidine-containing pectins (Влияние метиловой эфирной группы на сорбцию ионов Mn^{2+} гистидинсодержащими пектинами)

Currently, environmental pollution is of particular importance. Pollution of atmospheric air, wastewater, groundwater, and soil with heavy metal ions poses a huge danger to human health. In this regard, the problem of developing sorbents capable of efficiently extracting heavy metal ions, in particular manganese ions, is more urgent than ever [1-3].

The development of new effective, biologically active and environmentally safe biosorbents and technologies based on them is an urgent task. Its solution is possible due to the formation of new functional groups on polysaccharide matrices which are capable of firmly binding heavy metal ions. The main purpose of this work is to study the effect of the methyl ester group on the sorption activity of the pectin-methyl ester histidine complex.

The acidity of the medium is one of the most important parameters of the sorption process, since it has a decisive influence on ion exchange and complexation, electrostatic interactions during physical adsorption, and the charge of the sorbent surface. To establish the nature of the influence of medium acidity on the sorption of transition metal ions by polysaccharide sorbents based on pectin (PC) and to determine the optimal range of pH values, the process of distribution of Mn^{2+} cations in the system “PC-His-aqueous solution of manganese (II) salt” and “PC- His-OMe-aqueous solution of manganese (II) salt” depending on the pH of the environment is studied. The dependence of the degree of extraction of Mn^{2+} ions by the PC-His and PC-His-OMe complex on the acidity of the aqueous phase is extreme, with a sorption maximum in the neutral pH range

(Fig. 1).

In the low pH region, the absence of sorption of Mn^{2+} ions is caused by the fact that the sorption centers of the sorbent compete between Mn^{2+} and H^{+} ions. As the pH of the medium increases, the number of sorption centers on the sorbent increases, which leads to an increase in the size of the sorption capacity. In the maximum region, the sorption-active groups of the sorbent are in a dissociated state (CO-). In the highly alkaline pH region, manganese (II) hydroxide precipitate is formed.

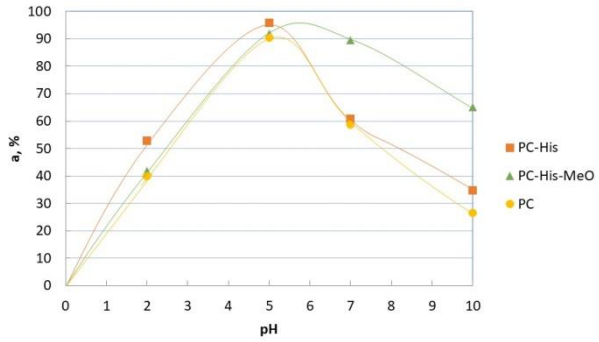

Fig. 1. Dependence of the degree of extraction of Mn^{2+} ions by pectin sorbents on the pH of an aqueous solution

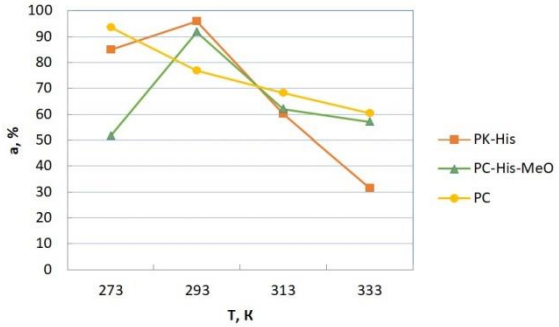

Fig. 2. Dependence of the degree of extraction of Mn^{2+} ions by pectin sorbents on the temperature of the aqueous solution.

A research of the effect of temperature on the sorption properties of modified pectin with respect to Mn^{2+} ions (Fig. 2) showed that with an increase in temperature in the range from 293 to 333 K, the degree of extraction of Mn2+ ions by pectin decreases markedly. Results indicate an exothermic effect of the process of sorption of Mn^{2+} ions by a modified polysaccharide. A decrease in sorption with increasing temperature may be caused by a weakening of the bonds of heavy metal ions with active sorption centers of polysaccharide materials and an increasing tendency of metal ions to desorb from the surface of the material into solution.

Thus, the sorption properties of pectin and pectin modified with histidine and histidine methyl ester have been studied. The optimal parameters of the sorption process (pH =5-7, T = 293 K) on the studied polymer matrices were selected. It was found that modification of PC with histidine methyl ester leads to an increase in sorption activity in a neutral and alkaline medium compared with the PC-His complex and to a decrease in this parameter at low (293 K) temperatures.

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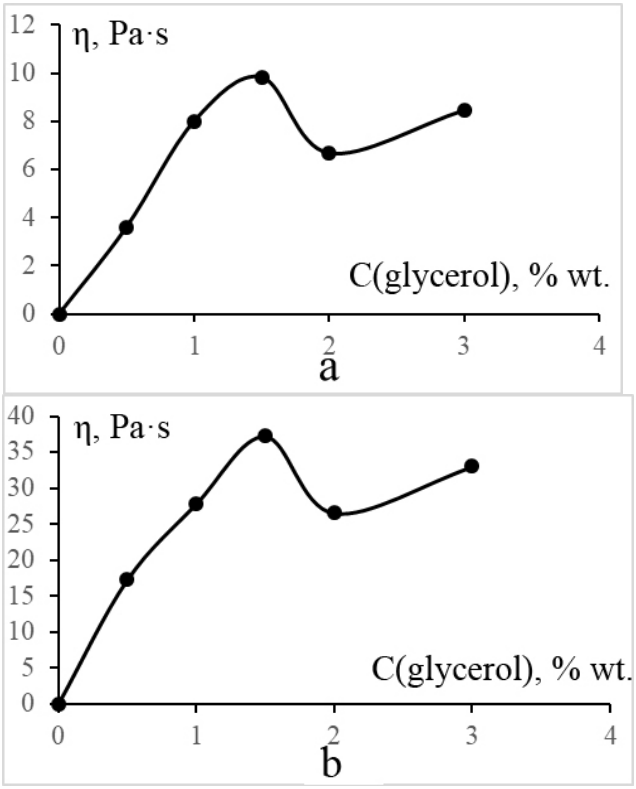
Influence of the initial solutions composition on the properties of porous polymer films based on the sodium salt of N-succinylchitosan
(Влияние состава исходных растворов на свойства получаемых пористых полимерных пластин на основе натриевой соли N-сукцинилхитозана)

Nowadays, researchers have proposed various polymeric wound healing materials as a viable alternative to traditional textile dressings. Among them, films based on natural biocompatible polymers such as chitosan and its derivatives have found the most use. However, all currently proposed polymeric wound-healing films have significant disadvantages that complicate their active application. One of such disadvantages is the possible loss of film integrity during transportation or operation due to insufficient mechanical strength of the material. The promising way to eliminate these disadvantages is

the use of modifying additives and polymer blends. The aim of this study was to investigate the influence of the composition of initial mixtures of sodium salt of N-succinylchitosan (SC) with sodium salt of carboxymethylcellulose (CMC) and glycerol on the physical and mechanical characteristics of the obtained wound-healing coatings.

The films were obtained by freeze drying and lyophilization of polymer solutions of various compositions: 3% wt. of SC, 1-1.5% wt. of CMC, 0.25-2% wt. of glycerol. We evaluated the influence of the rheological behavior of solutions of SC and CMC mixtures with the presence of glycerol, on the physicochemical and mechanical properties of the obtained porous films (see figure).



Relation between viscosity of polymer mixture solutions (a – 3% wt. SC, 0.9% wt. CMC; b - 3% wt. SC, 1.5% wt. CMC) and the glycerol content of the system.

The analysis of viscosity dependence on glycerol content in the system indicates that the viscosity of the solution decreases when glycerol content in the solution is increased over 1.5% wt., probably due to the change in the type of supramolecular formations. These results correlate with the results of tensile tests of films, where a similar sharp deterioration of elastic and strength properties is observed when the glycerol content in the system increases above 1.5% wt.

In conclusion, we showed the possibility of controlling the mechanical properties of composite materials based on sodium salt of succinyl-chitosan by introducing glycerol into the system and by varying the ratios of components in the mixture.

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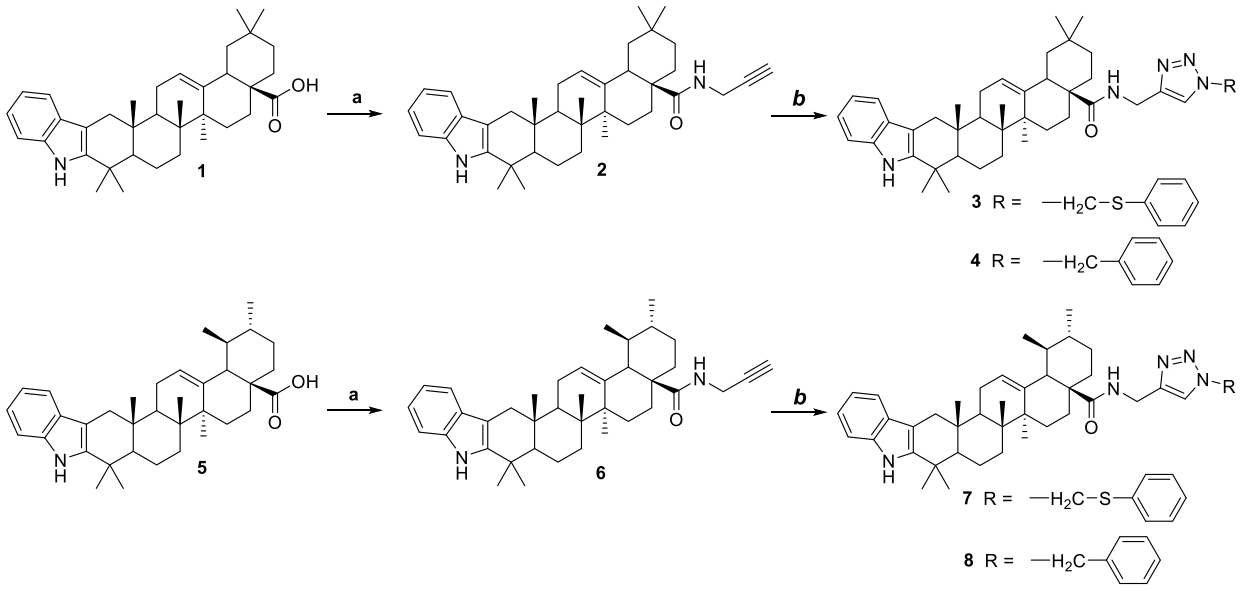
Synthesis and biological activity of 1,2,3-triazolyl derivatives of 2,3-indolo-oleanolic and ursolic acids (Синтез и биологическая активность1,2,3-триазолильных производных 2,3-индоло-олеаоловой и урсоловой кислот)

Alkynyltriterpenoids belong to the class of biologically active compounds with anti-inflammatory, antiviral, antihyperglycemic, and antitumor activity. Their modification by introducing a triazole ring can improve their pharmacological properties, due to an increase in hydrophobicity and an improvement in the pharmacokinetic profile [1].

This paper presents the synthesis of four new triazole derivatives of triterpene acids. 2,3-indole-triterpene acids 1 and 5, obtained from 3-oxo by the Fischer reaction, were used as starting compounds. By the reaction of 1 and 5 with propargylamine through the intermediate formation of acyl chloride, alkynylamides 2 and 6 were obtained with a yield of 86%. Further, by Cu-catalyzed 1,3-dipolar cycloaddition of the obtained alkynes with azidomethylphenyl sulfide or benzylazide in the presence of $CuSO4 \cdot 5H2O$ and sodium ascorbate, the target 1,2,3-

triazolyl derivatives 3,4,7 and 8 were obtained with a yield of 56-62%. The NMR spectra of the obtained compounds contained signals in the range δ7 m.d. (1H), δ122 and δ128 m.d. (13C) corresponding to hydrogen or carbon atoms of the triazole cycle.

The results of biological tests revealed the leading compounds with antidiabetic and antiviral activity: 1,2,3,4-tetrazolyl-indolooleanolic acid showed alpha-glucosidase inhibitory activity with an IC50 value of 1.15 μM; 1,2,3-triazolyl anhydrous oleanolic acid was the most active against cytomegalovirus with EC50 <0.05 μM (SI >81).



Reagents and conditions: (a) 1. $(COCl)_2$, Et_3N, CH_2Cl_2, 2 h. 2. Propargylamine hydrochloride, Et_3N, CH_2Cl_2, 40℃, 2 h; (b) Azidomethylphenyl sulfide or benzylazide, $CuSO_4 \cdot 5H_2O$, sodium ascorbate, CH_2Cl_2-H_2O, 60℃, 5h

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Study of the ability to chiral MOF recognition based on copper and 3-amino-1H-1,2,4-triazole-5-carboxylic acid hydrate (Изучение способности к хиральному распознаванию MOF на основе меди и гидрата 3-амино-1H-1,2,4-триазол-5-карбоновой кислоты)

Many biochemical processes occurring in a living organism are asymmetric, hence the human body, which is also chiral, is specific to drugs that exhibit optical properties. For example, if one enantiomer has a therapeutic effect, then the second one can cause a negative effect on the body. However, the problem of isolating optically pure substances from their racemic mixtures has not been completely solved. As a result, the development of new chiral motionless remains an urgent task in chemistry.

To date, all existing chiral stationary phases are based on the molecular mechanism of Davankov chiral recognition [1]. In such phases, recognition occurs due to the three-point interaction of the chiral selector with the enantiomer. Such stationary phases have low selectivity and low operating concentrations, so their use in preparative chromatography is limited.

However, chirality is not limited to the molecular level, it also exists at the supramolecular level. It was previously established that homochiral enantiomorphic crystals obtained in the Viedma maturation mode were capable of chiral recognition and separation. They showed separation in the area of high concentrations. But such stationary phases have a low specific surface area. Therefore, the transition to surfaces capable of forming supramolecular chiral structures with a large specific area is of interest.

Previously, chiral MOF was synthesized from achiral compounds [2]. Chirality occurs due to the fact that the right pores are 14 Å in size, and the left ones are 4.9Å, the left pores are small, and organic molecules are unable to penetrate such pores.

It has been shown that the stationary phase is capable of chiral recognition of limonene enantiomers. The highest selectivity reached a

value of 1.42 at the temperature of 150˚C. The difference was confirmed by statistical analysis of the adsorption values by the t-test method. The isotherms were approximated by the Dubinin-Radushkevich equation. It is used to describe microporous sorbents. However, the stationary phase was unstable: over time, the selectivity dropped to 1.1, then the selectivity disappeared. This behavior may be due either to the instability of chiral pores, or to the fact that limonene enantiomers, having penetrated deep into the pores of the sorbent, cannot be desorbed in the gas chromatography mode.

Thus, a copper-based chiral stationary phase was created, which showed the ability for chiral recognition.

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Micro- and nanocomposite films for organic electronics (Микро- и нанокомпозитные пленки для органической электроники)

Nanocomposite materials [1-3] based on conductive polymers and various carbon micro- and nanoparticles are of great interest due to their practical application in electronic devices of flexible electronics, such as organic LEDs, logic and solar cells, biomedical devices, sensors, as well as field-effect transistors. This interest arises as a result of improved electrical properties, design flexibility, and the possibility of large-scale production.

The purpose of this research was to study the electrophysical

properties of new nanocomposite films based on the chitosan-chitosan succinamide polyelectrolyte complex (PEC) with the addition of various carbon materials: single-walled carbon nanotubes (SWCNT), graphene oxide (GO), Carboblack C and Carbopack. Composites were obtained by adding 0.003 g of SWCNT and GO to 1 ml of PEC, 0.002 g of Carboblack C and Carbopack. The surface of the composite was studied using atomic force microscopy. In the images obtained, it was seen that the addition of a modifier contributes to the formation of a heterogeneous rough structure. The study was carried out by electrochemical impedance spectroscopy and cyclic voltammetry in standard solution $[Fe(CN)_6]^{4-/3}$. After the addition of carbon particles to the PEC, the current peaks on the voltammogram increased compared to the pure PEC. The PEC/SWCNT composite is the most effective because it has a low charge transfer resistance and an effective surface area.

Based on the results obtained, the proposed composites have sufficient characteristics to create a transistor effect and are applicable as an active layer in field-effect transistors.

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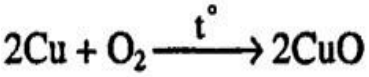
Aspartame: The hidden threat
(Аспартам: скрытая угроза)

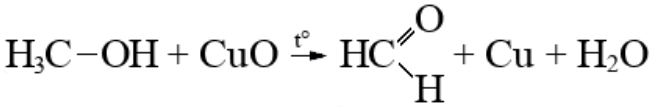
Aspartame (E951) is a sugar substitute. It is allowed in most countries as a food supplement. However, in the human body, aspartame is hydrolyzed and one of the products of hydrolysis is methanol, which is further oxidized to formaldehyde. Methanol and formaldehyde are banned and recognized as the strongest poisons. Then this sweetener is not harmless to humans [1].

Aspartame has a low calorie content and low price. An interesting feature of aspartame is to gradually reveal its taste. And the sweetness after eating it lasts much longer. But the aqueous aspartame solution still has some unnatural taste and is unpleasant to many. The strong sweetness of aspartame allows you to add it in microscopic quantities and thereby significantly reduce the caloric content of the product, which is very important for people who struggle with excess weight. This additive is much sweeter than sugar and other sweeteners, so a small amount is required to use it. My goal was to prove the presence of methanol in aspartame, which is then converted into formaldehyde.

At the beginning of the experiment, the sweetener «Diet Lite» containing aspartame was dissolved in hot water. Then a qualitive reaction to methanol was carried out. The copper wire is calcined in the flame of an alcohol burner until a black coating of divalend copper dioxide (CuO) forms on it [3].



Then the wire was dipped into an aspartame solution with a coating. The wire was cleaned. Copper is reduced from copper dioxide, and metanal is converted into methanol, a peculiar smell of formaldehyde is felt [1].



To confirm the presence of formaldehyde in the solution, a qualitive reaction was performed. Divalent copper hydroxide was

prepared [1].

$$CuCl_2 + 2NaOH = 2NaCl + Cu(OH)_2\downarrow$$

Freshly prepared copper hydroxidy was added to the resulting solution and carefully heated. The colour of the copper hydroxide precipitate will change from blue to dark-red. What colour change is associated with the formation of copper monoxide, which proves the presence of an aldehyde group in the substance under study [4].

$$HC(=O)H + 4Cu(OH)_2 \xrightarrow{t^\circ} CO_2 + 2Cu_2O + 5H_2O$$

A chemical experiment has shown that it is valid when heated above 30°C, such toxic substances can be found in products containing aspartame like methanol and formaldehyde. Since the human body temperature is above 30°C, it should be concluded that aspartame as a source of toxic substances is harmful to human health [3].

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Structure and conformational isomerism of Cu(II) chelated phenylalaninates (Структура и конформационная изомерия хелатных фенилаланинатов Cu(II))

In order to study the structural features and conformational composition, chelated bis-phenylalaninate Cu(II) were synthesized: [Cu(S,S-phe)2] and [Cu(S-phe)(R-phe)]. It turned out that the

involvement of optically active phenylalanine, or in the form of a racemic mixture, in the complexation reaction significantly affects the conformational composition of the resulting compounds [1].

It is known that during the formation of mixed-ligand amino acid complexes of transition metals, metal ions bind to ligands by N,O chelation, forming two five-membered cycles [2-4].

Using various physico-chemical methods of analysis – X-ray phase analysis, IR spectroscopy of MDTIR, as well as quantum chemical modeling, it was found that the conformational composition of the formed compounds, in addition to the absolute configuration of the chiral center of the amino acids, is significantly influenced by the spatial location of the ligand, and the position of the substituent – R – in the ligand. It was found that the conformational isomerism of chelate rings is realized for bis-phenylalaninates Cu(II), which manifests itself in the form of "boat" and "chair" conformations.

Patterns in the implementation of the structure of Cu(II) complexes with phenylalanine have been established, depending on the absolute configuration of the chiral center of the ligand; as well as patterns in the appearance of the "boat" or "chair" conformation. This implementation of the structure can be associated with three factors arising from the optically active carbon atom: tetrahedral geometry, the absolute configuration of the chiral center (R,S), as well as the spatial arrangement of the ligands relative to the complex framework.

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Cycloaminomethylation of hydrogen peroxide derivatives using 1,3,5-triaryl-1,3,5-triazinanes
(Циклоаминометилирование производных перекиси водорода с помощью 1,3,5-триарил-1,3,5-триазинанов)

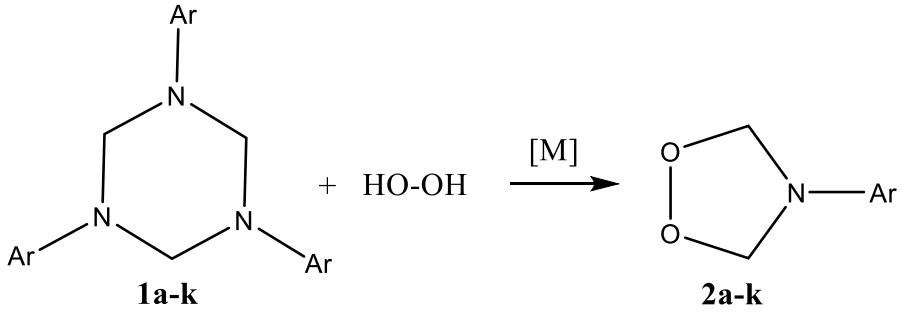
The widespread use in medical practice of natural and synthetic heteroatom-containing cyclic peroxides as medicines stimulates research on the development of effective and technologically advanced methods for obtaining new classes of heteroatom-containing peroxides, especially N-containing ones, which are of exceptional interest for the creation of modern domestic innovative drugs for the treatment of human cancer diseases.

Recently, a peroxide ring recycling method has been developed, which makes it possible to obtain eight- and eleven-membered macroperoxides with practically quantitative yield having antitumor activity. It was found that the three-component heterocyclization of bis(hydroperoxy)cycloalkanes with formaldehyde and arylamines, also bis-hydroperoxides with bis(methoxymethyl)arylamines in the presence of lanthanide catalysts leads to the production of macrocyclic eight-membered diperoxides. In continuation of the ongoing research, this paper proposes a new method based on the reaction of bis-hydroperoxides with triazinanes. We selected triazinanes as an aminomethylating agent because they are stable and readily available analogues of formadimines that easily enter into heterocyclization reactions.

In continuation of our research in the field of synthesis of azaperoxides of various structures and studying their biological activity [1-3], as well as in order to develop new effective methods for the production of N-aryl-1,2,4-dioxazolidines, N-arylhexaoxazadispiralkanes, N-aryltetraoxazaspiralkanes, and we performed cycloaminomethylation of OH acids (H2O2), R2C(O2H)2 using 1,3,5-triaryl-1,3,5-triazinanes, under conditions developed by us earlier [1-5]. After conducting preliminary experiments, we found that the reaction of cycloaminomethylation of hydrogen peroxide with

1,3,5-triaryl-1,3,5-triazinanes 1a-k with the participation of catalysts based on d- and f-elements leads to the synthesis of target N-aryl-1,2,4-dioxazolidines 2a-k with the highest yields and selectivity (Scheme 1)

Scheme 1



1a-k **2a-k**

Ar = *o*-ClC_6H_4 (**a**), *m*-ClC_6H_4 (**b**), *p*-ClC_6H_4 (**c**), *o*-FC_6H_4 (**d**), *m*-FC_6H_4 (**e**), *p*-FC_6H_4 (**f**), *o*-BrC_6H_4 (**g**), *m*-BrC_6H_4 (**h**), *p*-BrC_6H_4 (**i**), *p*-$NO_2C_6H_4$ (**j**), *p*-$CH_3C_6H_4$ (**k**)

Lanthanide salts, including those fixed on the surface of γ-Al2O3, showed high selectivity of action in the above reactions, therefore they were chosen by us as catalysts [1-3]. Essential solvents are optimal, in 3 hours the yield of 2a peroxide was 89 and 85%

Under the conditions described above [5 mol. % SmCl3/γ-Al2O3, 20°C, 3 h] 1,3,5-tris(o-,m-,p-chlorophenyl, o-,m-,p-fluorophenyl, m-,p-nitrophenyl)-1,3,5-triazinanes 1b-k were involved in the cycloaminomethylation reaction with hydrogen peroxide to obtain corresponding 4-aryl-1,2,4-dioxazolidines 2b-k with yields of 80-92%.

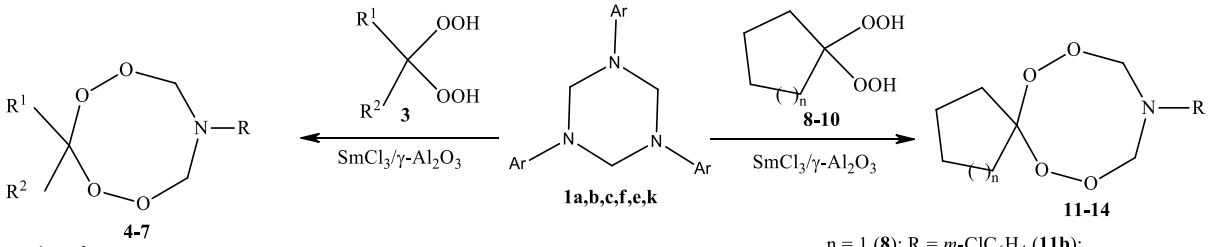
To establish the structure of 4-aryl-1,2,4-dioxazolidines 2b-k, one-dimensional 1H, 13C and two-dimensional NMR spectrometry (HSQC, COZY, HMBC), as well as maldi-toff-toff mass spectrometry were performed. As expected, in addition to the signs of an aromatic substituent, a signal of the methylene group of a five-membered cycle is detected between heteroatoms O, N. For example, in the 1H and 13C NMR spectra of substance 2g, signs were found in this part of the spectrum at δ=5.1 m.d. and δ=78.7 m.d., respectively.

In order to use the developed method for the synthesis of N-containing cyclic monoperoxides to obtain cyclic eight-membered azadiperoxides, we carried out the reaction of 1,3,5-triaryl-1,3,5-triazinanes 1 with dihydroperoxyalkanes 3-5 and dihydroperoxycycloalkanes 14-16 (Scheme 2).

Under the developed conditions, 1,3,5-tris(m-,p-chlorophenyl, p-fluorophenyl, o-bromophenyl, p-nitrophenyl, p-methylphenyl)-1,3,5-

triazinanes 1b,c,f,g,j,k react with 2,2-dihydroperoxyadamantane 3 to form 7'-arylspiro{adamantane-[2,3']-(1',2',4',5',7'- tetraoxazocane) 4-7 with outputs of 85-96% (scheme 3). Thus, the method of constructing cyclic peroxides developed by us has become a convenient tool for the synthesis of azadiperoxides. Thus, dihydroperoxycycloalkanes 8-10 also readily react by cycloaminomethylation with 1,3,5-triaryl-1,3,5-triazinanes 1b,c,f to produce eight-membered azadiperoxides 11-14 with yields of 87-91% (Scheme 2)

Scheme 2

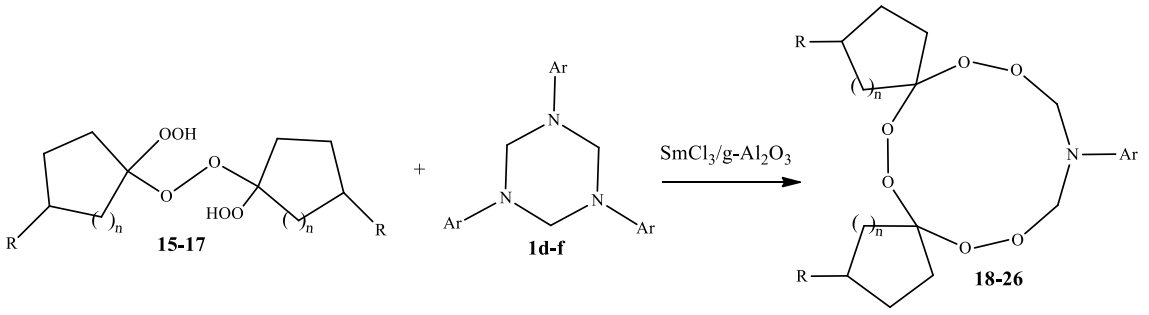


$R^1 = R^2$ = 2,2-Adamantyl (**3**): *m*-ClC_6H_5 (**4b**), *p*-ClC_6H_4 (**5c**), *m*-FC_6H_4 (**6e**), *p*-$CH_3C_6H_4$ (**7k**)

n = 1 (**8**): R = *m*-ClC_6H_4 (**11b**);
n = 2 (**9**): R = *m*-ClC_6H_4 (**12b**), *p*-ClC_6H_4 (**13c**)
n = 3 (**10**): R = *p*-FC_6H_4 (**14f**)

In order to expand the scope of this method, as well as to clarify the probability of this interaction in the presence of other hydroxyacids, 1,1'-peroxybis(1-hydroperoxycycloalkanes) 15-17 were involved in reacting with 1,3,5-triaryl-1,3,5-triazinanes 1 under the developed conditions. Thus, using the SmCl3/γ-Al2O3 catalyst, we were able to synthesize 11-membered N-containing triperoxides 18-26 with yields of 76-88% (Scheme 3).

Scheme 3



n = 1, R = H (**15**): *o*-FC_6H_5 (**18d**), *m*-FC_6H_4 (**19e**), *p*-FC_6H_4 (**20f**);
n = 2, R = 4-CH_3 (**16**): *o*-FC_6H_5 (**21d**), *m*-FC_6H_4 (**22e**), *p*-FC_6H_4 (**23f**);
n = 3, R = H (**17**): *o*-FC_6H_5 (**24d**), *m*-FC_6H_4 (**25e**), *p*-FC_6H_4 (**26f**)

Azaperoxides, like many natural and synthetic peroxide compounds, exhibit various biological activities, including antiparasitic and antitumor [6-9]. Based on these data, the azadiperoxides obtained by us were studied at the Institute of Organic Chemistry. We established their high cytotoxic activity on the example of tumor cell lines Jurkat, K562, U937 and normal fibroblasts.

Artemisinin was used as a comparison drug.

Thus, we have developed a new method for the synthesis of five-, eight- and eleven-membered azaperoxides based on cycloaminomethylation of hydrogen peroxide, heme-bishydroperoxides and peroxybis(hydroperoxycycloalkanes) with triaryltriazinanes under the action of a heterogeneous catalyst SmCl3/γ-Al2O3.Cytotoxic activity of tetraoxazocanes against four cell lines has been established.

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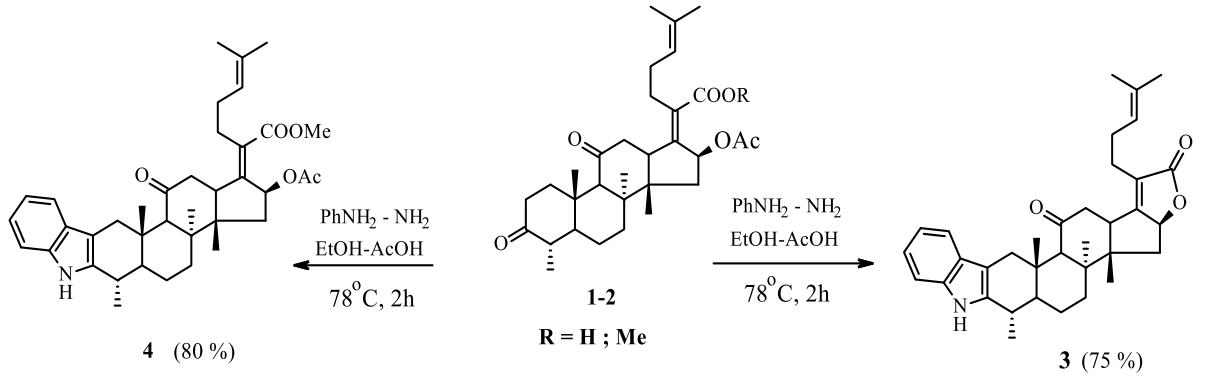
Synthesis and antibacterial activity of fusidane triterpenoids indole derivatives
(Синтез и антибактериальная активность индолпроизводных фузидановых тритерпеноидов)

Triterpenoids belong to natural compounds where a special place is occupied by fusidane triterpenoids, all representatives of which exhibit to various extend antibiotic properties against gram-positive bacteria [1]. The only representative of the class of natural compounds that was applied in clinical practice is fusidic acid. On the other hand, it is known that the indole cycle is a part of many natural and synthetic biologically active compounds [2], with an antimicrobial effect. In this regard, the synthesis of indoles based on fusidane triterpenoids and the study of their antibacterial properties are of interest.

Indole synthesis was carried out by the Fischer reaction, in which 3,11-dioxic derivatives of FC **1** or its methyl ester **2** were used as starting compounds. Diketone **1** or **2** was involved in the reaction with 3 eq. phenylhydrazine in a mixture of dry EtOH and icy AcOH, 1:0.1. As a result of the reactions, derivatives **3** and **4** with yields were isolated 75 and 80%, respectively.



Screening of antibacterial activity showed that indole derivatives of FC at a concentration of 0.25 mcg/ml showed antimicrobial activity, inhibiting the growth and reproduction of 100% gram-positive bacteria *Staphylococcus aureus*, which is comparable to the

antibacterial effect of a native antibiotic. Thus, the research results indicate the prospects of searching for new classes of antibacterial drugs among indole derivatives of fusidic acid.

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Synthesis of benzofused nitrogen- and oxygen-containing heterocycles
(Синтез бензконденсированных азот-, кислородсодержащих гетероциклов)

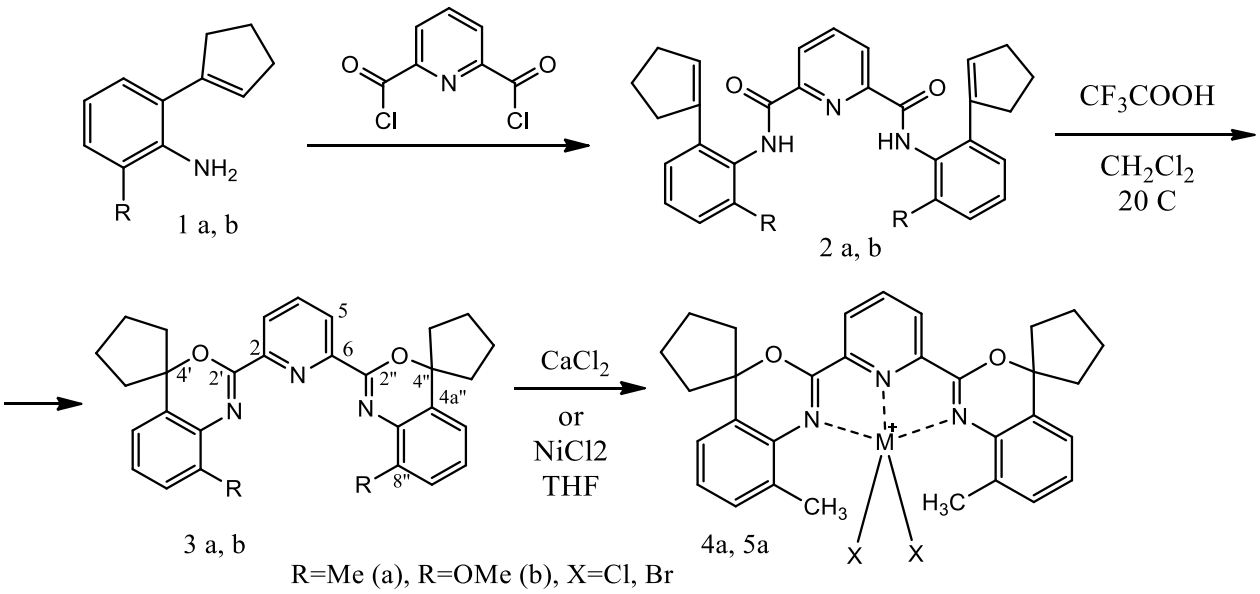
The synthesis and study of the properties of aryl-fused heterocycles, including nitrogen- and oxygen-containing heterocycles, is an attractive area of research in organic chemistry. Among these compounds, representatives have been found that exhibit various types of biological activity, additives to polymeric materials that improve their properties, and there are metal complexes whose ligands are heterocycles from this series.

Among these heterocycles there are compounds that inhibit reactions occurring in cells, antithrombotics, analgesics, as well as modulators of certain processes occurring in the human nervous system. Some compounds from this family are also found in natural sources, for example, the alkaloid inducamide C. Therefore, research aimed at finding new and convenient ways to obtain such heterocycles and identifying representatives with high beneficial indicators is relevant. We are conducting research on the synthesis of benzofused N,O-heterocycles, such as 1,3- and 3,1-benzoxazines, oxazoloisoindolone derivatives from available reagents.

Heterocycles of the 1,3-benzoxazine series have taken their rightful place in research in polymer chemistry. It is believed that the 1,3-benzoxazines studied in this area are quite stable compounds under ordinary conditions. When they come into contact with active particles in various media, they can undergo polymerization with opening of the oxazine ring. This occurs due to the rupture of the C2–O carbon–oxygen bond with the subsequent formation of a new N–C bond. Therefore, such heterocycles are often studied to obtain new polymer materials, as well as nitrogen-doped microporous carbon from polybenzoxazine resins for carbon dioxide capture. Complexes are also known where 1,3-benzoxazine is present in the organic ligand. These heterocycles can also find application as a means of protecting metals from various types of corrosion. In light of the high interest of researchers in compounds that change their photochromic properties under the influence of various factors, 1,3-benzoxazines are attractive as starting substances for the preparation of analogues based on them, spiro-linked with pyrans, which are sensitive to changes in environmental conditions. Attention to these compounds is also due to potential fungicides. Therefore, we have conducted research on the synthesis of some representatives from this series.

It is known that Schiff bases obtained from 2,6-disubstituted pyridine derivatives are used as ligands for non-ferrocene catalysts for olefin polymerization and, as a result, attract the attention of a wide range of researchers. We have conducted research on the synthesis of a new type of ligand, which is 2,6-dibenzoxazine-substituted pyridine. To do this, we synthesized their amides 2a, b by condensation of ortho-(1-cyclopenten-1-yl)-6-R-anilines 1a, b with pyridinedicarboxylic acid dichloride. Acid-catalyzed cyclization of the resulting amides under the action of trifluoroacetic acid occurs at room temperature and leads to dibenzoxazines 3a, b. From these dibenzoxazines we obtained cobalt and nickel complexes 4a and 5a. In our opinion, these complexes may be promising for use as catalysts, for example, for polymerization. The composition and structure of the synthesized substances were also determined by elemental analysis and spectral data.

Scheme 1



R=Me (a), R=OMe (b), X=Cl, Br

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Separation of menthol racemate in the stationary phase based on γ-glycine (Разделение рацемата ментола на неподвижной фазе на основе γ-глицина)

The problem of separating racemic mixtures has arisen since Pasteur discovered the phenomenon of chirality [1]. The purpose of racemate separation is the preparative or semi-preparative isolation of an enantiophilic substance, since one of the enantiomers in the racemic mixture can have a negative effect on the human body. One of the ways to separate racemic mixtures is chiral chromatography. However, there are a number of limitations for the use of chiral stationary phases for the preparative isolation of optically pure substances: low selectivity, low operating concentrations of the separated components [2]. Therefore, it is of interest to create new chiral stationary phases for the separation of racemic mixtures.

Recently, a supramolecular mechanism of chiral recognition and separation was discovered. With this mechanism, it is not a single molecule that is recognized, but a layer of molecules. Therefore, separation is carried out only in the area of high concentrations. Such a chiral recognition mechanism is carried out on enantiomorphic crystals. Enantiomorphic crystals exist in the form of racemic mixtures. However, the method of Viedma maturation has shown the possibility of shifting the chiral equilibrium and obtaining homochiral crystals. Such crystals include γ-glycine crystals, which have shown enantioselectivity with respect to the enantiomers of limonenes and pinenes under gas chromatography conditions.

The paper proposes a chiral stationary phase for the separation of menthol racemate based on homochiral crystals of γ-glycine deposited on silica gel. Homochiral crystals were obtained by the method of Viedma maturation. When studying the adsorption of menthol enantiomers from solutions by static adsorption, a significant difference in the values of adsorption between enantiomers was found. The capacity of the monolayer differed by 10 times. In comparison with D-menthol, L-menthol is practically not adsorbed by glycine. The high enantioselectivity of γ-glycine crystals with respect to menthol

enantiomers made it possible to create a method for semi-preparative menthol isolation. A 50 cm long glass column was filled with modified γ-glycine silica gel of 0.25-0.5 mm fraction. Next, a sample of menthol racemate with a concentration of 350 mg/l was administered. Chloroform is passed through the column using a perilstatic pump. Eluate samples at the outlet of the column were taken in a volume of 4 ml and then analyzed on an Atago AP-300 polarimeter (Atago, Japan). It was found that the angle of rotation of the plane of polarized light for the eluate samples from 8 to 24 ml is negative, while for the samples from 44 to 60 ml it is positive. Consequently, there was a semi-preparatory separation of menthols.

Thus, a column based on homochiral crystals of γ-glycine deposited on silica gel was created, capable of semi-preparative separation of menthol racemate.

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Studying the ability of crystals with supramolecular chirality to recognize enantiomers using the example of $CsCuCl_3$ (Изучение способности кристаллов с супрамолекулярной хиральностью к распознаванию энантиомеров на примере $CsCuCl_3$)

Currently, there is growing interest in finding new opportunities for the isolation of enantiopure substances. These substances are widely used in medicine due to the fact that one of the enantiomers

can have a therapeutic effect, while other may not have it or even does harm. The development of phases for the separation of enantiomers based on the classical recognition mechanism has lost the potential for research, due to the fact that in recent years it has not been possible to discover a phase more suitable than cyclodextrins [1].

Therefore, there is an interest in finding sorbents that work according to different principles. Systems with supramolecular chirality may be of interest. The element of asymmetry in this case is not limited only to the carbon atom, but is observed at a higher level of the hierarchy.

The paper studies $CsCuCl_3$ crystals, which do not possess an asymmetric carbon atom, but, crystallizing, have a chiral spatial symmetry group. The crystals were obtained by the method of Viedma maturation. Isotherms were obtained for pure crystals by gas chromatography methods. Kinetic dependences were removed by adsorption from solution. In this case, an increase in the specific surface area of the sorbent was required. Taking into account this necessity, crystals were grown on the surface of ASG silica gel.

The study of adsorption isotherms on the obtained $CsCuCl_3$ crystals under gas chromatography conditions showed that the studied crystals are capable of recognizing α-pinenes, the maximum selectivity coefficient was 1.22. At the same time, differences in the adsorption of limonene enantiomers were insignificant and almost linear.

The study of the ability to separate menthol enantiomers during a kinetic experiment by adsorption from solution showed a coincidence of the adsorption curves up to the achievement of a monolayer with adsorption equal to 45 mmol/g. Differences were observed in both regions of the kinetic curve: both in the equilibrium and kinetic regions.

In the course of this work, it was shown that $CsCuCl_3$ crystals are capable of chiral recognition.

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Determination of the linear viscoelasticity region for polylactide and polycaprolactone melts (Определение области линейной вязкоупругости для расплавов полилактида и поликапролоктона)

In recent years, biodegradable polymers have attracted great interest due to environmental problems associated with the accumulation of non-recyclable polymer waste. The use of polylactide (PLA) and polycaprolactone (PCL) seems to be very promising as a replacement for traditional plastics [1]. The balance between the conditions for obtaining polymeric materials (mainly rheological characteristics) and the complex of formed properties should be fundamental in obtaining polymeric materials. The aim of this work was to study the rheological characteristics of PLA and PCL melts, namely the determination of linear viscoelasticity conditions. Rheological studies were carried out on a modular dynamic rheometer "Haake Mars III" at a temperature of 100°C in the case of PCL and 190°C in the case of PLA in dynamic (oscillation) mode. In the oscillation mode, a variable shear stress with a small amplitude was applied to the sample $\tau(t) = \tau_0 e^{i\omega t}$ and its deformation recorded $\gamma(t) = \gamma_0 e^{(i\omega t+\delta)}$ with a phase shift of δ relative to the stress is recorded.. The angular velocity ω is related to the oscillation frequency as follows: $\omega = 2\pi f$ where frequency f is given in Hz (1 Hz = cycle/s); the dimension ω -1/s. The total resistance of the specimen to the applied strain, called the complex modulus G^*, is defined as follows:

$$G^* = G' + iG'' = \frac{\tau_O(t)}{\gamma_E(t)}$$

In this equation, the quantities G' and G'' are denoted:

$G' = G^* cos\delta = \frac{\tau_0}{\gamma_0} cos\delta$ is the modulus of accumulation;

$G' = G^* sin\delta = \frac{\tau_0}{\gamma_0} sin\delta$ – modulus of losses.

Since tests in oscillation mode should be performed in the region of linear viscoelasticity, initially, on the basis of the dependences of the storage and loss modules on the stress amplitude obtained at a constant oscillation frequency, the optimum values of the amplitude corresponding to unchanged values of the modules are determined, the so-called region of linear viscoelasticity, which was and is done in this work.

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Evaluation of rheological behavior of polylactide/chitosan composite
(Оценка реологического поведения композита полилактида с хитозаном)

Polylactide (PLA) is a biodegradable polymer derived from lactic acid or lactide. It is a promising material for household, medical and agricultural applications due to its high biodegradability and biocompatibility. PLA is of great interest because its production is a highly ecological process, as the monomers for PLA production are synthesized from natural renewable sources. However, the biodegradation rate of PLA is low.

Adding other biopolymers can be a way out of this problem.

Blends based on PLA and polysaccharides are of great interest. If biomedical use of composites is envisaged, it is promising to use polymeric additives such as chitin (ChT) and chitosan (ChTZ), which have a complex of valuable properties [1]. By varying the amount of ChT or ChTZ added to the composition, it is possible to modify not only the biodegradation rate of the material, but also its rheological properties.

Rheological studies of PLA/ChTZ composites were performed on a Haake RheoWin MarsIII laboratory rheometer in oscillatory mode over a range of oscillation frequencies from 0.1 to 100 Hz at 190°C. Shear frequency was found to have a strong influence on the viscosity of the PLA melt, and as it increases, the viscosity values decrease rapidly.

The relationship between shear frequency and viscosity is non-linear, exhibiting pseudoplastic behavior typical of polymer melts. This can be explained by the fact that at high temperatures the bonds between the molecular chains become weaker due to the high amplitude of vibration of the molecules, leading to a smooth flow of the melt. There is also a regular increase in viscosity with increasing ChTZ content in the composition.

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Problematics of theoretical and practical air research (Проблематика теоретического и практического исследования воздуха)

Airborne laboratory research - this large range of research methods, to study atmospheric pollution in more detail in real time and in different areas of the planet.

Emission sources can vary in power, altitude and temperature of substances. Examples are industrial plants (chemical, metallurgical, etc. factories), or the emission of a pollution source above 50 meters [1].

Applied air laboratory research problems include various concepts related to meteorology, climate, hydrology, geophysics and ecology. The effects of metrological conditions manifest with different temperature range in different ways. The dispersion capacity depends on the vertical distribution of temperature and wind speed [2]. Unstable compounds increase most often during summer and daytime.

Air quality has a direct impact on health and the overall health of the environment. This is one of the important tasks of solving the problems of atmospheric air and work zone air research. Vaporization and accumulation of chemicals, gases, dust, and other harmful factors can negatively affect health.

Air pollution is a serious environmental problem that affects the health of millions of people around the world. It is caused by the emission of harmful substances into the atmosphere from sources such as car exhausts, industrial activities and the burning of fossil fuels.

The impact of air quality on public health is wide-ranging and can be very serious. Short-term exposure to high levels of air pollution can lead to respiratory diseases such as asthma, bronchitis and pneumonia. It can also exacerbate existing diseases such as chronic obstructive pulmonary disease (COPD) and respiratory allergies.

Long-term exposure to air pollution has been linked to more serious health problems, including cardiovascular inflammation, lung cancer, and even premature death. Studies have shown that negative air pollutants can also affect cognitive function and increase the risk of disease such as dementia and Alzheimer's disease, fetal developmental problems and premature birth.

In addition to direct health effects, air pollution can also contribute to climate change and environmental degradation.

Atmospheric conditions play an important role in determining air quality. Changes in factors such as temperature, humidity, wind speed and weather conditions can affect the amount of pollutants present in the air [3].

Technology and innovation play a critical role in improving air quality by developing more efficient and cleaner solutions for energy production, transportation, and industrial processes. The following are

some ways in which technology and innovation are contributing to improved air quality: alternative energy sources, electric vehicles, and air quality monitoring.

Strategies and measures to combat air pollution:

- Investments in clean technologies (energy sources)
- Regulation and control (monitoring) of emissions of harmful substances into the atmosphere
- Use of ecological transportation
- Information campaigns, propaganda and involvement of the population in environmental actions and programs [4].

Monitoring is becoming more and more relevant in the modern world, related to control and air quality, but faces a number of problems: lack of assessment in many regions of the world, technical problems of implementation, imperfect legislation, heterogeneity of emission sources.

The consequence of climate-induced changes in air composition has a significant impact through the emission of greenhouse gases and changes in pollutant levels. Combating climate change through mitigation and adaptation strategies is critical to preserving air quality and human health.

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Voltamperrometrical sensors based on aminocyclotic complexes of Cu (II) and Zn (II) for discovering and defining propranolol enantiomers (Вольтамперометрические сенсоры на основе аминокислотных комплексов Cu (II) и Zn (II) для распознавания и определения энантиомеров пропранолола)

Propranolol, 1-[(1-Methylethyl)amino]-3-(1-naphthalenyloxy)-2-propanol is a beta-adrenoblocker used to treat high blood pressure, angina pectoris (chest pain), cardiac arrhythmias, angina and other cardiovascular diseases. Propranolol is a chiral compound, which means that it has two optical isomers that differ in the configuration of atoms in space. These enantiomers are called S-propranolol and R-propranolol.

The enantiomers of propranolol differ in their pharmacologic activity. For example, R-propranolol has more pronounced activity with respect to antiarrhythmic action, whereas S-propranolol is more active with respect to beta-adrenoblocking action. Therefore, the development of simple and highly efficient sensors for their recognition is a high priority.

In this work we considered α-amino acids (S-Ala, S-Phe) and chelate complexes based on them as chiral selectors in the development of sensors for the recognition of propranolol enantiomers. The best results were achieved using as modifiers: [Cu(S-Ala)$_2$]-[Cu(S-Phe)$_2$] и [Zn(S-Ala)2(H_2O)]-[Zn(S-Phe)2(H_2O)]. We believe that this result is due to both the high affinity of the complexes for the proproanolol enantiomers and their diastereomeric nature, in contrast to individual amino acids, which contain only one optically active center. From differential-pulse voltammetry, we determined the difference in oxidation potentials ΔE_p = 20 mV and ΔE_p = 20 mV, as well as the enantioselectivity coefficients i_{pS}/i_{pR} = 1.37 and i_{pS}/i_{pR} = 1.12 for GCE/PEC-[Cu(S-Ala)$_2$]-[Cu(S-Phe)$_2$] and GCE/PEC-[Zn(S-Ala)$_2$(H_2O)]-[Zn(S-Phe)$_2$(H_2O)], respectively (Fig. 1).

The analytical performance of the composite sensors was studied: the linear range of detectable concentrations was maintained between 2.5×10^{-5} and 1.0×10^{-3} mol/L on the GCE/PEC-[Cu(S-Ala)$_2$]-

[$Cu(S\text{-}Phe)_2$] sensors and between 5.0×10^{-5} and 1.0×10^{-3} mol/L on the GCE/PEC-[$Zn(S\text{-}Ala)_2(H_2O)$]-[$Zn(S\text{-}Phe)_2(H_2O)$] sensors. The detection limit was 0.90 μM for S-Prp and 1.24 μM for R-Prp on GCE /PEC-[$Cu(S\text{-}Ala)_2$]-[$Cu(S\text{-}Phe)_2$]; 0.78 μM for S-Prp and 0.87 μM for R-Prp on GCE /PEC-[$Zn(S\text{-}Ala)_2(H_2O)$]-[$Zn(S\text{-}Phe)_2(H_2O)$].

The sensors have been successfully tested for the determination of propranolol enantiomers in biological fluids. The relative standard deviation for the determination of propranolol enantiomers in urine ranges from 1.9-2.5 %, in blood plasma - from 2.1-3.5 %.

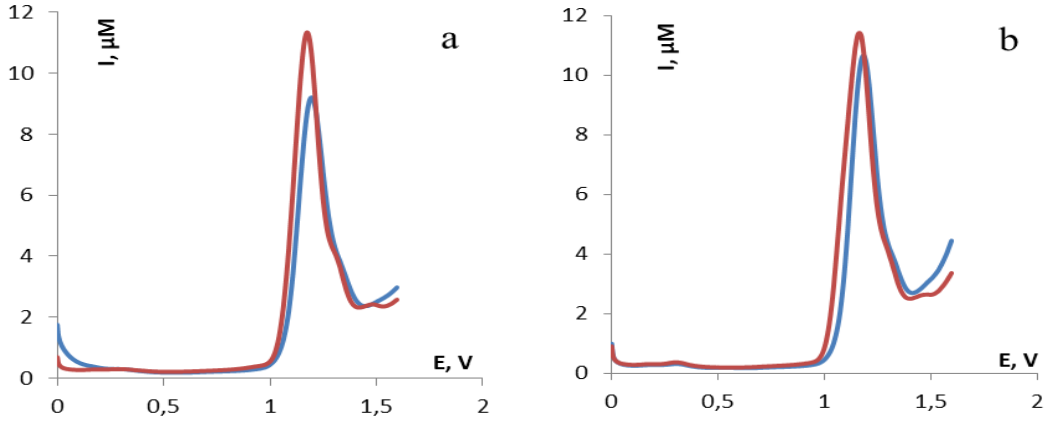

Fig. 1. Differential-pulse voltammetry of 1 mM solutions of R- and S-Prp on (a) GCE/PEC-[$Cu(S\text{-}Ala)_2$]-[$Cu(S\text{-}Phe)_2$] and (b) GCE/PEC-[$Zn(S\text{-}Ala)_2(H_2O)$]-[$Zn(S\text{-}Phe)_2(H_2O)$], (0.05 M sulfuric acid, potential scanning rate 0.2 V/s).

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Enantioselective voltammetric senser based on Co(III) complex and 1,2-cyclohexanediamine (Энантиоселективный вольтамперометрический сенсор на основе комплекса Co(III) и 1,2-диаминоциклогексана)

Recognition and detection of biologically active enantiomers in medicine, pharmaceuticals, chemistry and other fields is an important task for modern analytical chemistry. An electroanalytical chemistry propose a solution – enantioselective voltammetric sensors modified

[1] with chiral selectors.

As a sample for probing was peaked a tryptophan (Trp) [2]. The working electrode introduced by paste electrode (PE) with graphitized carbon black modified by different chiral selectors.

To modifying was used Co(III) complexes as well as cyclic diamines: Λ(R,R)-Co-Cl, Λ(R,R)-Co-PF_6, Δ(S,S)-Co-Cl, (1R,2R)-cyclohexanediamine, (1S,2S)-cyclohexanediamine[1].

The best recognition results was registered by PE/Λ(R,R)-Co-Cl: I_D/I_L = 1.36, ΔE = 35 mV. So Λ(R,R)-Co-Cl chiral selector was chosen for further investigation.

The linear range of concentration is from $1.0 \cdot 10^{-6}$ to $5.0 \cdot 10^{-4}$, $LOQ_{L\text{-}Trp}$ – $9.09 \cdot 10^{-7}$ $LOQ_{D\text{-}Trp}$ – $6.65 \cdot 10^{-7}$, $LOD_{L\text{-}Trp}$ – $2.73 \cdot 10^{-7}$ $LOD_{D\text{-}Trp}$ – $1.99 \cdot 10^{-7}$. The reproducibility of measurements is did not exceed 5.0% and measurement error less than 3.3%.

Designed senser equally has high-performance, and in some cases even better compared to introduced in databases. The most important benefit of presented senser is stability during storage for 12 days (sensers introduced in databases stable just for 5-7 days).

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Optimization of the reaction conditions of tert-butanol with aqueous formaldehyde in the presence of H-forms of synthetic zeolites (Оптимизация условий реакции трет-бутанола с водным формальдегидом в присутствии Н-форм синтетических цеолитов)

The main method of isoprene monomer production in industry is the dioxane method: in the first stage, the condensation of formaldehyde with tert-butanol occurs in the presence of an acid catalyst, forming 4,4-dimethyl-1,3-dioxane (DMD). Then, in the second stage, the latter undergoes thermo-catalytic decomposition to isoprene. The advantage of this method is the high purity of isoprene, but a significant drawback is the low selectivity of the process - the formation of up to 30 mass % of by-products in the first stage (hydrogenated pyrans, 1,3-diols, etc.). This fact is likely due to the multi-channel nature of the Prins reaction.

It was previously theoretically established that the formation of the target DMD from formaldehyde monomers occurs via the Price scheme through a linear transition state, while in the case of the more reactive formaldehyde oligomer, it occurs through a cyclic transition state. Therefore, solving the problem of increasing the selectivity of DMD formation boils down to establishing a method for selecting conditions to form a cyclic transition state through which the interaction of formaldehyde oligomers with tert-butanol takes place.

It is known that porous materials promote the formation of the cyclic transition state of the Prins reaction and the selective formation of 1,3-dioxanes [1].

The optimal molar ratio of tert-butanol to formaldehyde, providing a selectivity of ~95 mass% for 4,4-dimethyldioxane-1,3, is ~1:1 or 1:2 [2]. The nature of the change in conversion and yield values of the target product when using both types of H-zeolites remains similar to 2-methylpropene.

The optimal conditions for conducting the reaction of aqueous formaldehyde with tert-butanol in the presence of zeolites in the H-

form are: reaction time (150-180 minutes), reaction temperature (170-190°C), content of NaA zeolite (5-6 mass%), reagent ratio (tert-C4H9OH / CH2O = 1:1 and 1:2); selectivity to 4,4-dimethyldioxane-1,3 is 94-95 mass%.

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Merkmale der Gewinnung von Materialien auf Basis von Polylactid
(Особенности получения материалов на основе полилактида)

In den letzten Jahren haben biologisch abbaubare Polymere wie Polylactid (PL) aufgrund der Umweltprobleme, die mit der Ansammlung nicht abbaubarer Polymerabfälle verbunden sind, großes Interesse bei Forschern geweckt [5]. PL kann aufgrund seiner Eigenschaften wie hohe mechanische Festigkeit, Transparenz, biologische Abbaubarkeit und Biokompatibilität als Ersatz für Kunststoffe eingesetzt werden [2-3]. Aus diesem Grund wird es in verschiedenen Bereichen eingesetzt, darunter in der Lebensmittelverpackung (Getränkeflaschen, Behälter usw.), in der Automobilindustrie (3D-Druck, Ersatzteile) und in der Medizin (Wundverbände, Arzneimittelverabreichungsgeräte) [6]. PL verfügt über vielfältige physikalische und mechanische Eigenschaften, die unter anderem von den Bedingungen für die Materialgewinnung aus PL abhängen. Folglich ermöglicht die Auswahl der Herstellungsbedingungen für Materialien basierend auf PL

(Temperatur, Druck, Mischzeit), Proben mit den gewünschten Eigenschaften zu erhalten [1-4]. Ziel der Arbeit war es daher, die Merkmale der Beschaffung von Materialien auf Basis von PL zu untersuchen.

Bei der Durchführung unserer Forschungsarbeit verwendeten wir U-Boote der Marke L175 (Produktdatenblatt Luminy). Der Verarbeitungsprozess erfolgte in der Schmelze auf einem Laborplastographen „PlastographEC“ (Brabender, Deutschland). Die in der Plastographenkammer verbrachte Zeit variierte zwischen 5 und 40 Minuten, die Temperatur von 190 bis 210°C. Das Pressen erfolgte auf einer automatischen hydraulischen Presse „AutoMH-NE“ (Carver, USA) bei 190°C. Der Schmelzflussindex (MFI) wurde unter den in GOST 11645–73 geregelten Bedingungen auf einem Extrusionsplastometer mi2.2 (Göttfert, Deutschland) bestimmt. Zugversuche der resultierenden Materialien wurden auf einer Universalprüfmaschine „ShimadzuAGS-X“ (Japan) durchgeführt.

Aus der Analyse der erhaltenen Daten lässt sich Folgendes feststellen. Erstens stimmt mit der MTR-Wert eines PLs, dass nicht der Plastifizierungsstufe unterzogen wurde (MTR = 12,0 g/10 Min.), überein, das einer Plastifizierung mit minimaler Einwirkung (Temperatur etwa 180°C) unterzogen wurde. Zweitens: Je höher die Temperatur in der Mischkammer des Plastographen, desto höher sind die MFI-Werte der PL-Proben. Ein deutlicher Anstieg der MFI-Werte wird erst bei Temperaturen über 200°C beobachtet. Drittens führt die zusätzliche Einwirkung der Proben während des Pressvorgangs zu einem leichten Anstieg des MFI, selbst bei Temperaturen unter 200 °C. Ein Anstieg des PFRs weist auf fortlaufende Zerstörungsprozesse unter dem Einfluss thermomechanischer Effekte hin.

Als nächstes wurden die physikalischen und mechanischen Eigenschaften der PL-Folienproben analysiert. Es wurde festgestellt, dass die niedrigsten Werte für Zugspannung und Elastizitätsmodul bei Proben beobachtet werden, die bei einer Temperatur von 180°C hergestellt wurden. Offensichtlich reicht diese Temperatur nicht aus, um die anfänglichen Kristallite im PL vollständig zu zerstören, und sie wirken als Spannungskonzentratoren. Die bei 190°C gewonnenen Proben zeichnen sich durch höchste Festigkeit und Steifigkeit aus. Eine Druckerhöhung in der Presse beeinflusst auch die physikalischen und mechanischen Eigenschaften von Materialien. Die Maximalwerte des Elastizitätsmoduls, der Bruchspannung und der Bruchdehnung

werden bei einem Druck in der Presse von 1000-5000 kgf beobachtet. Erst eine Druckerhöhung in der Presse um mehr als 5000 kgf führt zu einer Abnahme der Werte des Elastizitätsmoduls und der Bruchspannung. Die Werte der Bruchdehnung hängen geringfügig von den Pressbedingungen ab.

Daher sollten im Hinblick auf die Gewinnung von Materialien auf PL-Basis die folgenden Bedingungen für die Gewinnung von Proben als optimal angesehen werden: Temperatur in der Plastifizierungs- und Presszone 190°C, Druck in der Presse 1000–5000 kgf, unter denen Prozesse nicht ausgeprägten Zerstörungen haben, die physikalisch-mechanischen Eigenschaften aber befriedigende Daten besitzen.

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Voltammetric sensor based on Nano-MFI zeolite for recognition of tryptophan enantiomers (Вольтамперометрический сенсор на основе наноразмерного цеолита MFI для распознавания энантиомеров триптофана)

Many amino acids that make up living organisms exist in the form of two optical isomers, which are sometimes completely different in their biological functions or even contradict each other. One such amino acid is tryptophan (Trp). Tryptophan or β-(β-indolyl)-α-aminopropionic acid is an essential and vital amino acid of plant origin, consisting of two optical isomeric forms: L- and D-enantiomers [1]. Trp is a biochemical precursor of metabolites that significantly affect the physiology of a living organism, including the functions of the gastrointestinal tract, immunity, metabolism and nervous system [2], therefore, L-Trp deficiency in the body leads to a number of negative consequences, such as sleep disturbance, severe weight loss, tooth loss and a number of mental disorders [3].

Classical methods for determining and recognizing enantiomers of biologically active substances are circular dichroism, capillary electrophoresis, chromatography, etc. However, when using these methods, problems arise such as low sensitivity, the use of expensive equipment, and low productivity for routine analysis. As an alternative to these methods, enantioselective voltammetric sensors (EVS) are currently widely used [4-6], which have high selectivity and sensitivity, low cost and the possibility of rapid detection of enantiomers of biologically active molecules.

Conventional electrochemical sensors are not able to distinguish between enantiomers, so they need to be modified with chiral selectors. There is a whole range of compounds used as chiral selectors. These are organic molecules and complexes based on them, chiral polymers, supramolecular structures that form chiral domains, various cavitands - molecules capable of forming host-guest complexes, which include cyclodextrins and cucurbiturils. As well as

inorganic chiral selectors, such as quartz, diamond, chiral carbon nanotubes.

In this study, a novel voltammetric sensor based on a composite paste electrode of graphitized thermal carbon black Carboblack C and nanoscale MFI zeolite was developed for rapid and reliable recognition and determination of tryptophan (Trp) enantiomers.

The electrochemical and analytical characteristics of the sensor were studied. The charge transfer resistance (Ret = 15.5 ± 0.2 kΩ) and the effective electrode surface area (A = 7.8 ± 0.2 mm^2) were calculated. It has been established that when determining the enantiomers of tryptophan, the linear dependence is preserved in the concentration range from $5 \cdot 10^{-5}$ to $1 \cdot 10^{-3}$ M. The detection limits are calculated to be $4.98 \cdot 10^{-7}$ and $3.20 \cdot 10^{-7}$ and the lower limits of the determined concentrations are $1.66 \cdot 10^{-7}$ and $1.07 \cdot 10^{-6}$ for L- and D-enantiomers of tryptophan, respectively. Data obtained by differential pulse voltammetry show that on unmodified PE the analytical signals of L- and D-Trp oxidation have virtually no differences. With the addition of PE/Nano-MFI, a difference is observed in the analytical signals in both peak currents (ipD/ipL = 1.58) and oxidation potentials of Trp enantiomers (ΔE = 20 mV), which is associated with the difference in the interaction energies of the enantiomers with the chiral selector. The proposed sensor exhibits greater sensitivity to D-Trp. This sensor has been tested for the determination of tryptophan enantiomers in biological fluids: human urine and blood plasma. The relative standard deviation in all cases does not exceed 4.2%. The accuracy of the determination is not lower than 97%.

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Studying the voltammetric behavior of electrochemical systems with metal electrodes in the presence of traces of aniline (Исследование вольтамперометрического поведения электрохимических систем с металлическими электродами в присутствии следов анилина)

Cyclic voltammetry method to study a behavior of electrochemical systems with metal and glass-carbon electrodes in solution low concentration of polyaniline was applied.

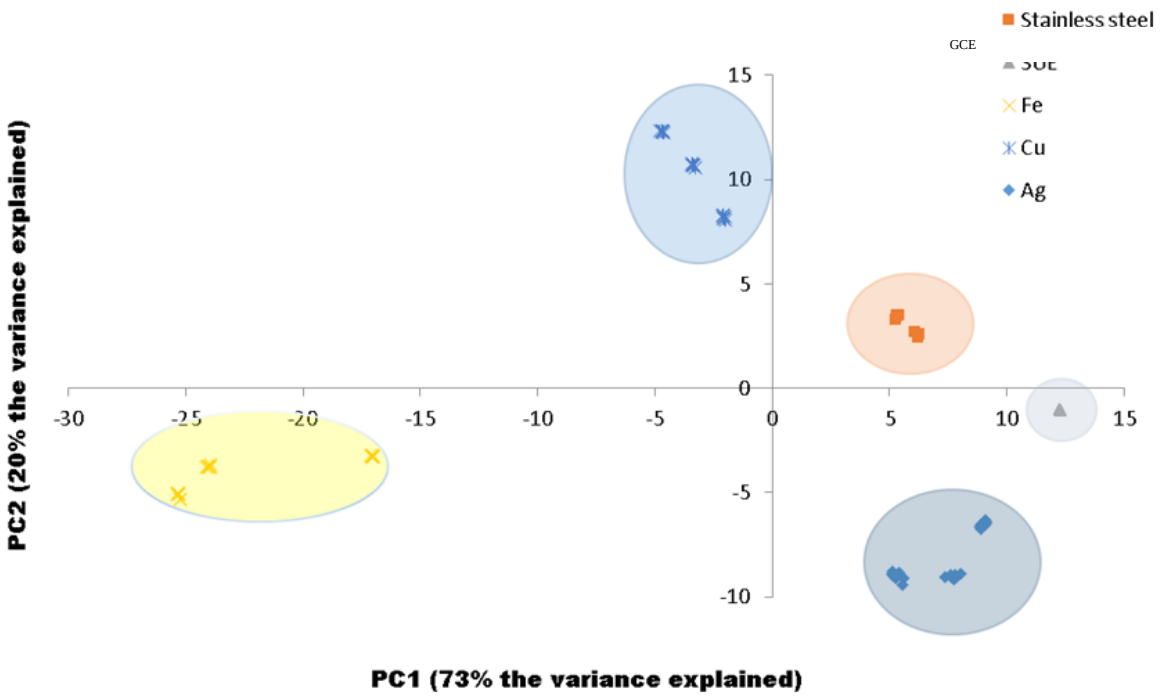

Fig. 1. Graph of calculations of voltammograms of metals and GCE according to the data of the last ten cycles of VAG registration

Using the principal component method (fig. 1), it was shown that the voltammetric behavior of these electrochemical systems during the indicator reaction of aniline electropolymerization is different. Fig.1 shows that under conditions of repeatability of voltammogram recording each electrode forms the basis for time series of currents with the formation of triple clusters unique in location on the count graph, obtained at the stage of 390-400 VAG recording cycles. In fact, this model reflects the final state of “life” of sensory systems. The proximity of the three clusters of each electrode to each other indicates good reproducibility of signals and repeatability of the dynamics of “aging” of the sensors during their mechanical regeneration.

On the left in the third quarter on the score chart in fig. 1 there is Fe cluster, the extreme right position along PC1 is occupied by a glassy carbon electrode cluster. Along the second main component, the uppermost position is occupied by Cu, and the lower by Ag, the intermediate position along the PC1-PC2 diagonal is occupied by the cluster of the stainless-steel electrode. The first principal component, as noted above, is directed along the change in the total electrical conductivity of the sensory systems. Consequently, from right to left along PC1, the total amount of electricity passing through the

electrodes under study increases. This is due to the difference in the resistance of the metals themselves, and the difference in the resistance of the resulting polymer film and its electrochemical activity in the presence of nanoparticles of metals and metal oxides formed during repeated redox cycles. The total explained variance using four principal components was 98.8%. Thus, there are at least four generalized factors that determine the characteristics of the electropolymerization of aniline on solid electrodes of different nature. In this case, three factors are qualitative, except for electrical conductivity, modeled by the first PC.

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Reaction of peroxyl radical of tetrahydrofuran with α – tocopherol
(Реакция пероксильного радикала тетграгидрофурана с α – токоферолом)

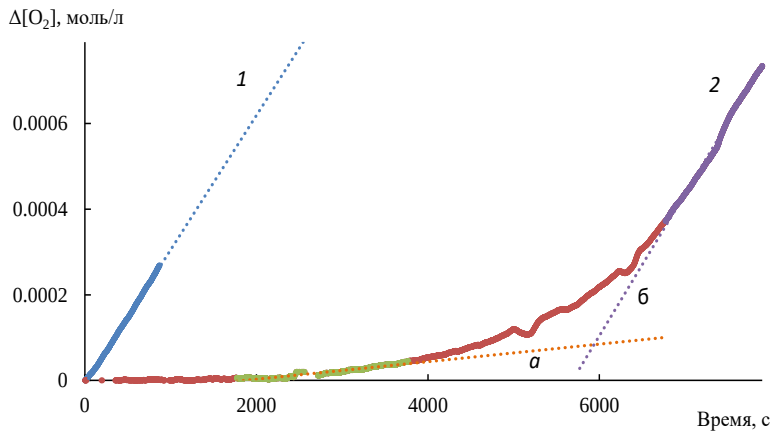
The study of the properties of inhibitors is of great interest. α-Tocopherol is a natural antioxidant and has a very high reactivity towards peroxyl radicals. It is often used as a classical inhibitor of radical-chain oxidation of organic compounds.

Various methods are used to test antioxidants, but the most reliable is the method based on radical-chain oxidation of the substrate. As a result, peroxyl radicals are generated. By adding the substance

under investigation to the system, the rate constant of its reaction with the peroxyl radical can be measured. Typically, the substrate is an organic hydrocarbon. However, there are a large number of potential hydrocarbon insoluble antioxidants. To investigate such substances, tetrahydrofuran was recently proposed as a substrate.

In the present work, the rate constant of the peroxyl radical reaction of tetrahydrofuran (THF) with α-tocopherol at 30°C was measured. For this purpose, 2,2'-azo-bis-isobutyronitrile (AIBN)-initiated oxidation of THF with air oxygen was carried out. The liquid-phase oxidation under the conditions of our experiment proceeds by a radical-chain mechanism with a quadratic chain break. The reaction kinetics was monitored by oxygen uptake using a manometric differential apparatus. The figure shows a typical oxygen uptake kinetic curve in the absence and presence of α-tocopherol. It can be seen that the inhibited oxidation proceeds with an induction period (τ), which was determined from the point of intersection of two lines: the tangent to the initial oxygen uptake rate (a) and the tangent to the uninhibited part of the kinetic (b) (figure).

To calculate the rate constant for the reaction of the peroxyl radical of THF with α-tocopherol (k_7), the kinetic dependences of oxygen uptake were treated in the coordinates of the equation $\Delta[O_2] = -k_2 \cdot (k_7)^{-1} \cdot [RH] \cdot \ln(1 - t/\tau)$. From the experimental data it follows that $k_7 = (4.0 \pm 1.1) \cdot 10^5$ l mol^{-1} s^{-1}.



Kinetic dependences of oxygen uptake during AIBN-initiated oxidation of THF, (1) without inhibitor, (2) with α-tocopherol ($2.0 \cdot 10^{-5}$ mol/l). Reaction conditions: [THF] = 8.2 mol/l, [AIBN] = $3.7 \cdot 10^{-2}$ mol/l, 303 K.

The work was carried out in accordance with the research plan of the Ufa Institute of Chemistry of the Russian Academy of Sciences, the state registration number of the topic in the unified state accounting information system is 122031400255-3.

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Synthesis of macrocyclic diazatry peroxides and their cytotoxic activity (Синтез макроциклических диазатрипероксидов и их цитотоксическая активность)

Recently, we have shown the possibility of synthesizing cyclic azatriperoxides by the catalytic reaction of heptaoxadispiroalkanes with monosaminated hydrazines, α, ω-diamines. Synthesized peroxides are effective inducers of apoptosis in Jurkat, K562, U937, Fibroblasts. The results obtained indicate that hydrazine derivatives with two nucleophilic centers react with hexadispiroalkanes in the NH2 group without involving a less nucleophilic NH center. We tried to involve a symmetrical hydrate with identical nucleophilic centers in the developed reaction with heptaoxadispiroalkanes. However, all attempts to carry out this reaction under conditions of [5 mol% Sm(NO3)3•6H2O, 20oC, 6 h] were unsuccessful. Along with the symmetric hydrazine, aldazine 1 was obtained, which also failed to be involved in the reaction with heptaoxadispyroalkanes. It was found that the symmetricaldazine1 is involved in the analysis- the heterocyclization reaction with 1,1'-peroxy-bis-(1-hydroperoxycycloalkanes) 2-4 with the formation of previously unknown macrocyclic conjugated diazatriperoxides 5-7 (scheme).

Reaction of 1,1'-peroxy-bis-(1-hydroperoxycyclohexane) 2 sequimole quantities of 1,2-bis- (4-methoxybenzylidene) hydrazine 1 under conditions (~20ºC, THF, 6 h) with the participation of 5mol.% Sm(NO3)3•6H2 as a catalysis leads to 15,18 bis-(4-methoxy)-6,7,13,14,19,20-hexaoxa-16,17- diazadispiro[4.2.48.85]icosan 5 with an output of 84%. When replacing the Sm(NO3)3•6H2O catalyst with other salts and lanthanide complexes [La(NO3)3, TbCl3*6H2O, Ho(NO3)3*5H2O, DyCl3*6H2O, NdCl3], the yield of the target product 5 decreases to 60-65% (Table 1).

Under the developed conditions [5 mol % Sm(NO3)3•6H2O, 20oC, 6h] 1,1'-peroxy-bis-(1-hydroperoxycycloalkanes) 3,4 interact with 1,2-bis-(4-methoxybenzylidene)hydrazine 1 with the formation of diazadispiroalkanes 6,7 outputs 68 and 73%, respectively.

Azaperoxides exhibit high biological activity. In this regard, the macrocyclic diatriperoxides obtained for the first time were studied for their cytotoxic activity against the cell lines of the fibroblasts Jurkat, K562, U937 (Table 2).

It was found that the synthesized diatriperoxides 6, 7 exhibit a cytotoxic effect on all selected tumor cell lines in a wide range from 4.56 to > 500 microns. Peroxide 6 showed the strongest cytotoxic activity.

Scheme

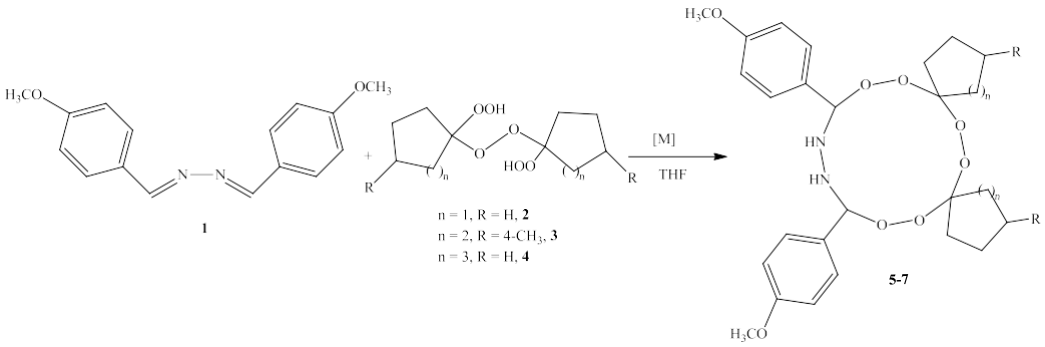

Table 1

Influence of the nature of the central catalyst atom on the yield of 15.18-bis-(4-methoxy)-6,7,13,14,19,20-hexaoxa-16,17- diazadispiro[4.2.48.85]icosan 5

№	Catalyst	Yield (**5**), %	№	Catalyst	Yield (**5**),%
1	$Sm(NO_3)_3 \cdot 6H_2O$	84	8	$InCl_3$	46
2	$SnCl_4$	68	9	$ZnCl_2$	45
3	$La(NO_3)_3$	66	10	$AlCl_3$	40
4	$Ho(NO_3)_3 \cdot 5H_2O$	64	11	$FeCl_3 \cdot 6H_2O$	33
5	$TbCl_3 \cdot 6H_2O$	60	12	$CuCl_2 \cdot 5H_2O$	30
6	$DyCl_3 \cdot 6H_2O$	60	13	-	-
7	$NdCl_3$	60			

Table 2

Cytotoxic activity of azaperoxides in vitro 6,7,
measured on tumor cell culture (Jurkat, K562, U937, Fibroblasts) (μM).

Compound	Jurkat (IC50,μM)	K562 (IC50,μM)	U937 (IC50,μM)	Fibroblasts (IC50,μM)
6	4.56±0.28	5.69±0.43	6.77±0.21	49.28±1.13
7	22.56±0.37	39.82±0.41	45.13±0.53	189.49±3.57

Thus, based on the conducted research, it can be concluded that the heterocyclization of 1,1'-peroxy-bis-(1-hydroperoxycycloalkanes) with aldazine under the action of lanthanide catalysts is a method for the synthesis of macrocyclic hexaoxadiazadispiroalkanes. The high cytotoxic activity of new macro-cyclic azatriperoxides against cancer cells Jurkat, K562, U937 and Fibroblasts has been shown.

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Linear flexo-electro-optical effect of nematic liquid crystals oriented by a photosensitive polymer (Линейный флексоэлектрооптический эффект нематических жидких кристаллов, ориентированных с помощью светочувствительного полимера)

The active use of nematic liquid crystals (LC) in the manufacture of displays, microlenses, and phase-shifting devices is associated with the ability to control the orientation of their molecules using an electric or magnetic field. A local Fredericks transition is possible if the LC molecules are not tightly bound to the substrate, and therefore the binding energy for them should have low values [1].

In [2], we found that for a 5CB liquid crystal uniformly aligned by the light-induced orientation method using polyvinylcinnamate as an orientant, the concentration of conducting ions is 5 times lower

than for than for an LC oriented by the classical rubbing method.

In this regard, it was decided to determine the coupling energy and tilt angle of the molecules for the hybrid-oriented MBBA liquid crystal layer (Methoxybenzylidene-n-butaniline).

The MBBA was placed between two glass plates coated with indium and tin oxide. To ensure the planar alignment of the LC, one of the plates was coated with polyvinylcinnamate, which was then exposed to linear polarized light for 15 minutes. The second plate was treated with a 2% solution of dimethyloctadecyl [3-(trimethoxysilyl)propyl] with ammonium chloride (DMOAP), which is used to create homeotropically-oriented LC layers.

After assembling the cell, its thickness was measured using the spectral method and amounted to 13.9 microns. After filling the cell with liquid crystal, it was connected to an alternating current source. During the experiment, the MBBA layer was observed via an electron microscope. The optical stroke difference was measured by the birefringence compensation method using the tilt of the calcite plate of the Berek compensator. The experiment was conducted at a temperature of ~23°C. Readings were taken 3 minutes after each voltage change to establish equilibrium.

Calculated by the method [3], the angle of inclination of the molecules was 61.5°, the coupling energy was 4.63*10-4 erg/cm2. The value of the coupling energy is quite low, which confirms the presence of an electrically controlled birefringence for the MBBA layer oriented using a photosensitive polymer

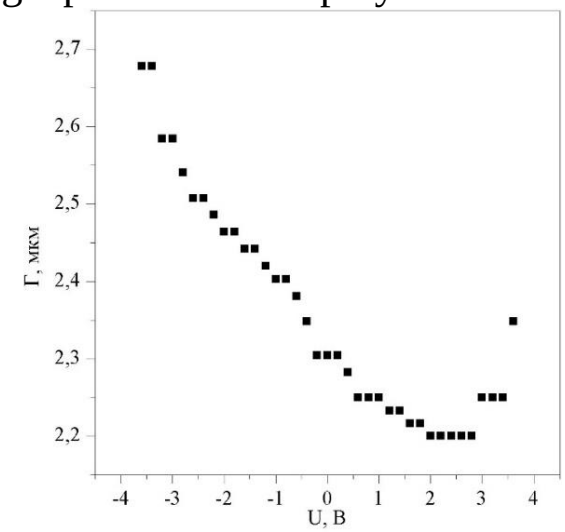

Figure 1. Dependence of the stroke difference on the voltage for a hybrid-oriented MBBA

The dependence of the optical difference of the stroke on the voltage (Fig.1) is consistent with the literature sources [3]. The

observed distortion of the texture of the MBBA layer when an electric field is applied is a consequence of the linear flexoelectrooptic effect, which is an electrically controlled birefringence.

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Synthesis of the dammaran type oxytriterpenoids (Синтез окситритерпеноидов ряда даммаран)

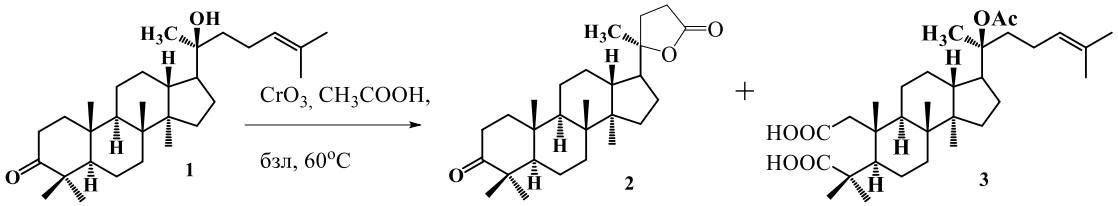
Dammaran triterpenoids (DT) are widely distributed in various medicinal plants and are of great interest in research and development of new drugs. Studies have shown that among the chemical derivatives of terpenoids, compounds with nitrogen-containing heterocyclic framework play a significant role, they are more stable and have more pronounced biological activity compared to the native structure.

Dipterocarpol [(20S)-20-hydroxydammar-24-en-3-one] and its

derivatives have various activities (anticancer [1], antiviral [2-5], immunostimulatory [6-7]). Taking into account the high prospects of DT as pharmacologically valuable agents, as well as the raw material availability of dipterocarpol, we carried out its chemical modification and evaluated the antiviral activity of the obtained derivatives.

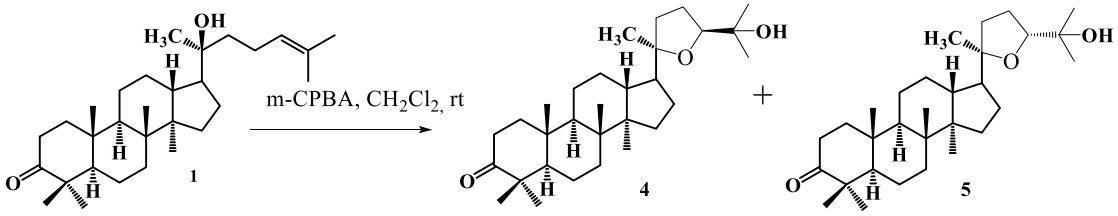
Dipterocarpol 1 was isolated from the resin of the tropical tree Dipterocarpus alatus growing in Vietnam. Oxidation of dipterocarpol 1 with chromic anhydride in a benzene-acetic acid mixture resulted in lactone 2 and 2,3-seco-dic acid 3. The formation of the latter is the result of oxidation of dipterocarpol along ring A.

Scheme 1



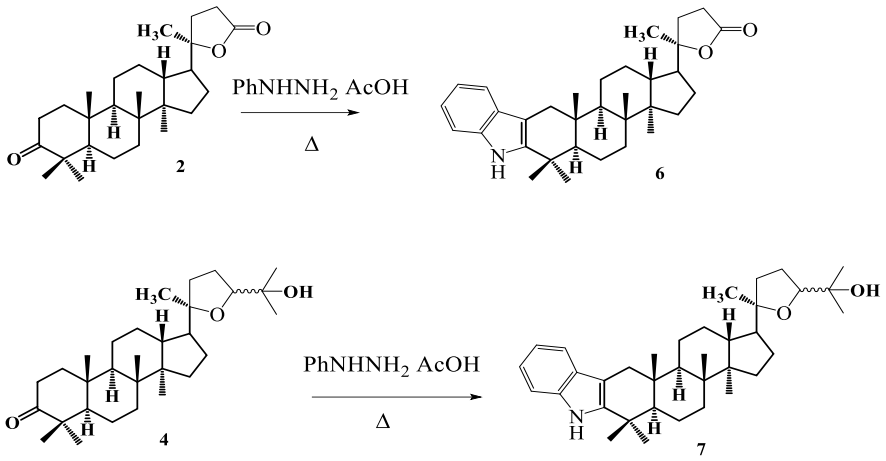
Interaction of dipterocarpol with m-chloroperbenzoic acid (m-CPBA) in dry methylene chloride resulted in an equimolar mixture of (20S, 24S)-epoxy-dammar-3-one-25-ol and (20*S*, 24*R*)-epoxy-dammar-3-one-25-ol 4, 5 in a 1:1 ratio (Scheme 2).

Scheme 2



Indoles 6 and 7 were obtained by the Fischer indolization reaction of compounds 2, 4 by boiling with phenylhydrazine in acetic acid (Scheme 3).

Scheme 3



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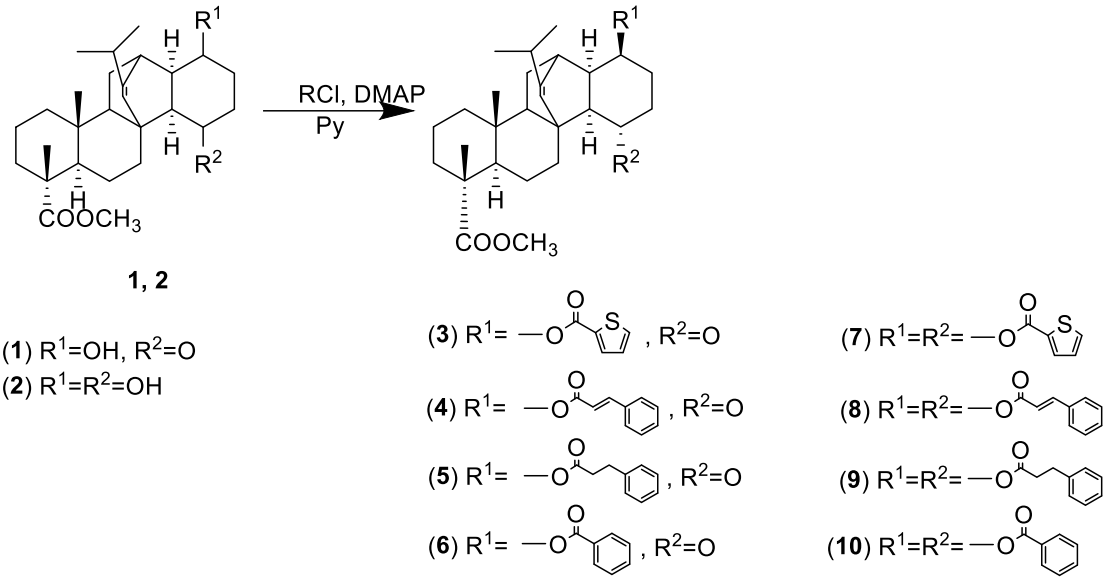
Acylation of hydroxy derivatives of methyl dihydroquinopimarate with chlorohydrides of heterocyclic and aromatic carboxylic acids (Ацилирование гидрокси-производных метил дигидрохинопимарата хлорангидридами гетероциклических и ароматических карбоновых кислот)

Abietin diterpenoids, the main metabolites of oleoresin, attract the attention of scientists involved in the search for new biologically active agents, due to their synthetic capabilities and a wide range of biological activity [1-3]. In this regard, the chemical modification of diterpene molecules with subsequent bioscreening of the obtained compounds is currently relevant for the creation of new highly effective agents of a wide range of pharmacological action.

One of the most common methods of modification of natural compounds is the acylation reaction. It was previously shown that the acylation of hydroxyl derivatives of dihydroquinopimaric acid of methyl ester with the introduction of the diterpene backbone of the furanoic fragment into the C1 and C4 positions leads to compounds with acetylcholinesterase activity [4]. The aim of this work was the acylation of hydroxyl derivatives of methyl dihydroquinopimarate with chlorohydrides of biologically important heterocyclic and aromatic carboxylic acids.

As a result of the interaction of methyl esters of 1β-hydroxy- and 1β,4α-dihydroxy- 2,3-dihydroquinopimaric acid 1,2 with chlorohydrides of 2-thiophenecarboxylic, cinnamic, hydrocinnamic and benzoic acids, a series of new acyl derivatives of abietane diterpenoids 3-10 was synthesized (Scheme 1).

Scheme 1



The acylation process was carried out by boiling in an absolute pyridine in the presence of 4-dimethylaminopyridine, which acts as a catalyst and acceptor of the released hydrogen chloride. The yield of target products 1-10, depending on the nature of the substituents, varied between 85-93%. The structure of the obtained diterpene derivatives is confirmed by NMR spectroscopy and mass spectrometry data.

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Development of compositions of difficult combustible materials on the basis of polypropylene in the presence of halogen-free flame retardants (Разработка композиций трудногорючих материалов на основе полипропилена в присутствии безгалогеновых антипиренов)

Polypropylene (PP) is a polymer that has good resistance to thermal decomposition, but it is easily combustible. When burned, polypropylene spreads to form flammable droplets and produces significant amounts of heat and smoke. Flame retardants are used to protect the material from fire.

Flame retardants are substances that are added to polymers to increase their fire resistance. They are divided into several groups, each of which acts in its own way.

Some of them form passive protection by preserving unsaturated bonds, thus preventing thermal decomposition of the polymers. Others, such as bromine or phosphorus-based additives, exhibit active/passive protection by releasing chemical compounds that make it difficult for the material to burn.

Thus, the purpose of this study is to select a flame retardant additive to improve the flame retardant properties of polypropylene and to study the physical and mechanical properties of the obtained compositions.

The following results were obtained during the study of halogen-free additives:

1. The conditions under which there is a satisfactory mixing of components of PP-based compositions and flame retardants with a uniform distribution of fillers over the volume of the material have been selected.
2. It is established that at increase of the content of flame retardant in the polymer composite material there is an increase of the maximum torque at rotation of rotors in the mixing chamber of the

plastograph and decrease of the melt yield index in comparison with the value of the maximum torque of the individual PP, and, consequently, to some complication of processing of the composite material.

3. Increasing APP content in polypropylene composite leads to a decrease in tensile strength.

4. At the analysis of physical and mechanical properties it is established that the filling of polypropylene composites with flame retardant leads to deterioration of strength characteristics and insignificant growth of the elastic modulus of the composite, which indicates an increase in the stiffness of the material.

5. According to the results of fire resistance tests of PP-based compositions in the presence of APP and chalk, the following formulation characterized by the shortest damping time of 30 s is recommended for implementation: PP-65%/APP-25%/CaCO3-5%/zinc borate -5%

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Development of compositions of combustible materials based on ABS-plastic in the presence of halogen-free flame retardants (Разработка композиций трудногорючих материалов на основе АБС–пластика в присутствии безгалогеновых антипиренов)

ABS plastic (ABS) is a thermoplastic polymer created from readily available components: acrylonitrile, butadiene and styrene. It has a high level of strength, impact resistance, heat resistance and abrasion resistance.

When burned, ABS emits harmful gases such as carbon monoxide, nitrogen oxides, carcinogenic dioxins and furans. When heated, it can also ignite and support the combustion of other materials, so it is important to handle and store it safely.

It is important to keep in mind that the addition of halogen-free flame retardants can affect some material properties such as color, heat resistance and strength. Therefore, the components for a new composition should be carefully selected and tested to ensure that they meet the required characteristics.

Thus, the aim of this study is to select a flame retardant additive to improve the flame retardant properties of ABS and to study the physical and mechanical properties of the obtained compositions.

The following patterns were obtained during the flame retardant selection process:

1. When increasing the percentage of flame retardant in the polymer composite material, there is an increase in the maximum torque of rotation of the rotors in the mixing chamber of the plastograph compared to the value of the maximum torque of individual ABS, and, as a consequence, to some complication of processing of the composite material.

2. As the percentage of flame retardant increases, the melt flow index decreases, which implies an increase in the viscosity of the composite.

3. Increasing the percentage of flame retardant reduces the tensile strength, consequently worsening its mechanical properties, and is also characterized by a low value of relative elongation at break, with the material becoming more brittle as the flame retardant content increases.

4. When analyzing the deformation properties, it was found that the filling of ABS with flame retardants leads to a slight increase in the elastic modulus of the composite, which indicates an increase in the stiffness of the material.

5. In addition to a very short damping time, a pronounced coke formation effect and a complete absence of burning droplets are observed.

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Study of rheology of polylactide composition with chitosan (Изучение реологии композиции полилактида с хитозаном)

Polylactide (PLA) has attracted tremendous scientific interest because its production is an extremely environmentally friendly process, as the monomers for synthesis are derived from renewable plant resources. However, the biodegradation rate of PLA is low. The addition of other biodegradable polysaccharides can be a salvation in this situation. In this context, blends based on PLA and chitosan (ChTZ) are of great interest. By varying the amount of ChTZ incorporated into the PLA matrix, it is possible not only to modify the biodegradation rate of the material, but also to regulate its rheological properties, which is an important feature for industrial production. Rheological studies of PLA and ChTZ composites were performed on a Haake RheoWin MarsIII laboratory rheometer in oscillatory mode in a range of oscillation frequency from 0.1 to 100 Hz at 190°C. The viscosity results are summarized in Figure 1.

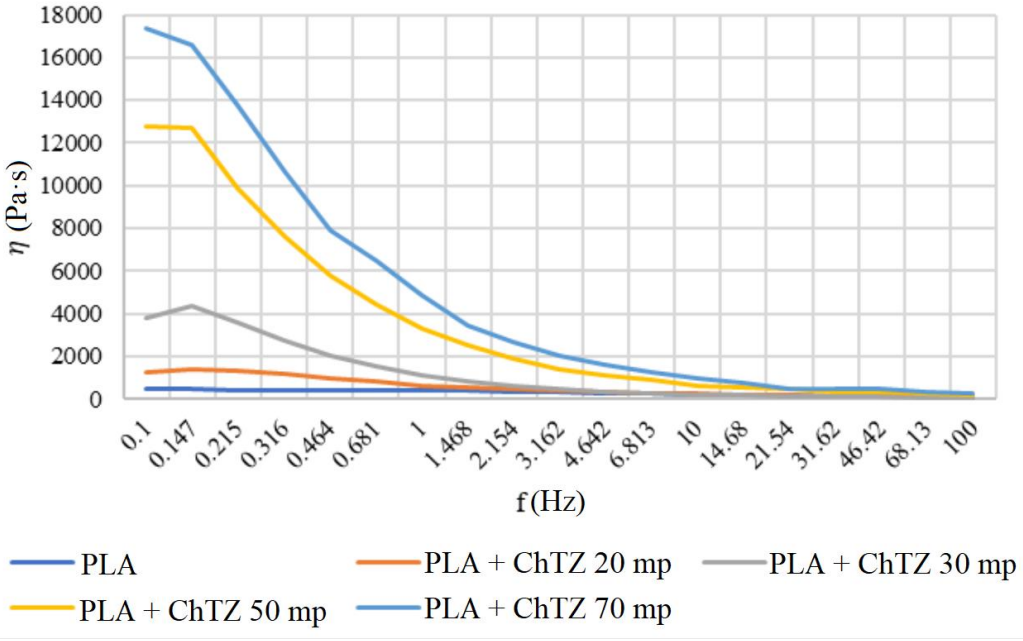

Figure 1. Dependence of the viscosity value on the oscillation frequency at different composition of the composition

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Comparison of rheological characteristics of PLA/ChT and PLA/ChTZ compositions
(Сравнение реологических характеристик композиций ПЛА-ХТ и ПЛА-ХТЗ)

Today polylactide (PLA) is one of the promising materials for every day, medical and industrial applications. It is a highly bio-degradable, bio-compatible and thermoplastic polymer with satisfactory mechanical strength and transparency, but its biodegradation rate leaves much to be desired. The use of blends of PLA with polysaccharides is one of the easy ways to handle this difficulty. Chitin (ChT) or chitosan (ChTZ) is often used as an additive. The variation of additives in PLA allows controlling the biodegradation rate of the material and its rheological characteristics. Differences in the rheological properties of ChT and ChTZ-based composites can be seen in Figure 1. The studies were carried out on a Haake RheoWin MarsIII rheometer in oscillation mode.

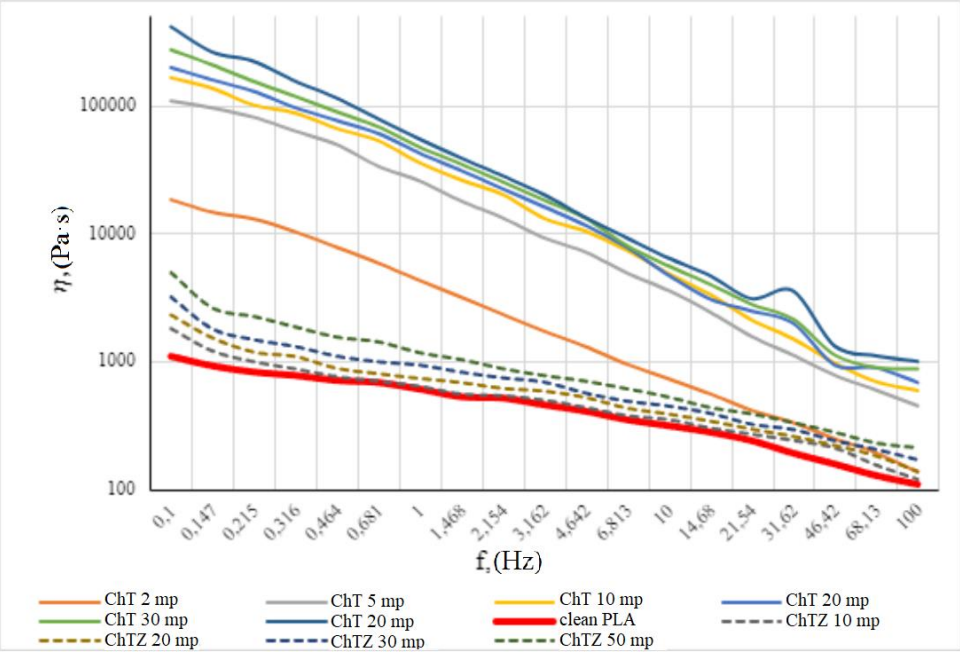

Figure 1. Dependence of complex viscosity of PLA/ChT and PLA/ChTZ melts on oscillation frequency.

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Diels-alder adduct of levoglucosenone and isoprene in approaches to the loganin (Аддукт Дильса-Альдера левоглюкозенона и изопрена в подходах к логанину)

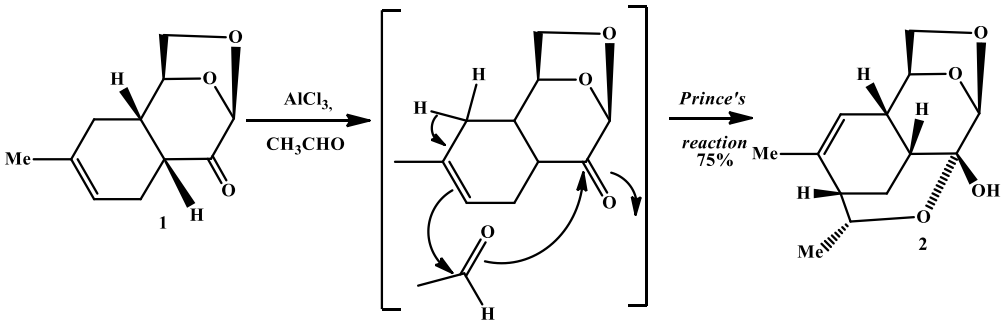
Diels-Alder adducts of levoglucosenone and 1,3-dienes are widely used in the synthesis of biologically active compounds and their analogues. For example, a complete synthesis of an analog of eleutesides has been developed from the Diels-Alder adduct of levoglucosenone and piperylene; prostaglandin precursors have been obtained on the basis of an adduct with cyclopentadiene [1].

Previously, transformations of the cyclohexene ring into functionalized cyclopentanes, which are promising in the synthesis of a wide range of iridoids, were studied in our laboratory on the basis of Diels-Alder adducts and 1,3-dienes [2].

It is known that the loganin iridoid has antibacterial, cytotoxic and other types of activity, therefore its synthesis is an urgent task. Given the fact that loganine is methylcyclopentanol cis-articulated with δ-lactol, a convenient starting compound for its preparation is the Diels-Alder adduct of levoglucosenone and isoprene.

To this end, the possibilities of the intermolecular Ene-reaction of the Diels-Alder **1** adduct with acetaldehyde in the presence of $AlCl_3$ were initially studied.

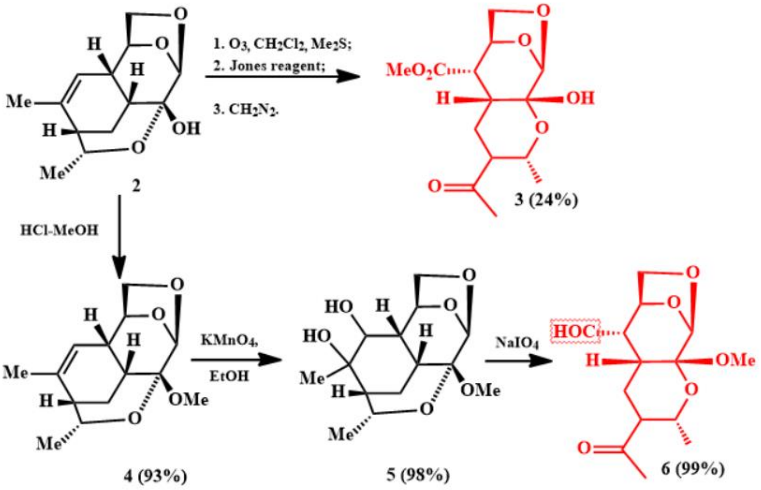
Scheme 1



The reaction resulted in a semiquetal **2**. In all likelihood, at the first stage, under the action of $TiCl_4$, the Prince reaction between

adduct 1 and acetaldehyde is realized, which is accompanied by isomerization of the double bond and intramolecular esterification of the ketofunction by the formed hydroxyl group (Scheme 1).

Scheme 2



Ozonolytic cleavage of the double bond in semiquetal **2**, subsequent stages of reduction of Me_2S ozonides, Jones oxidation and etherification led to the desired ether **3**. An alternative method of cleavage of the cyclohexene ring in ketal **4** by Wagner oxidation of the double bond using $KMnO_4$ in EtOH at 0 °C with a yield of 98% led to vis-diol **5**. Ketoaldehyde **6** was obtained by periodate cleavage of glycol **5** by the action of $NaIO_4$ with a total yield of 90% in 3 stages (Scheme 2).

Thus, the synthesis of key compounds **3** and **6**, which will be used to produce loganine, has been carried out. The structure of the ob tained levoglucosenone derivatives is confirmed by NMR spectroscop y and mass spectrometry data.

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Секция 2

ПРОБЛЕМЫ ПРОФЕССИОНАЛЬНОЙ КОММУНИКАЦИИ

ГУМАНИТАРНЫЕ НАУКИ

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Intercultural communication as a key aspect of modern professionalism: current challenges and prospects (Межкультурная коммуникация как ключевой аспект современного профессионализма: актуальные вызовы и перспективы)

These days globalization of multinational companies results in intercultural communication that is becoming now one of the key aspects of modern professionalism. More and more people are working with colleagues, partners and clients from different countries and cultures, which requires them to be able to effectively communicate and cooperate with people who have a different cultural background and mentality.

Intercultural communication includes not only knowledge of the language, but also an understanding of the cultural characteristics, customs and values of other peoples. This helps to avoid misunderstandings, conflicts and mistakes in communication, as well as establish trusting and productive relationships in the workplace. In modern business, where efficiency and results are important, the ability to work with people of different cultures becomes a necessary skill for any professional. Teams in international companies usually consist of representatives from different countries. It is necessary to be able to find a common language with colleagues from different cultures in order to successfully complete their tasks. In addition, intercultural communication helps to improve the quality of work and creativity of the team. Sharing experiences and ideas with

representatives of other cultures helps to see problems and tasks from different viewpoints and can lead to new concepts and solutions. There are a number of methods and tools available to develop intercultural communication skills, such as trainings, seminars, courses and media materials. It is also useful to have work or study abroad experience in order to better understand the peculiarities of other cultures and adapt to them. Intercultural communication is becoming increasingly important in today's world, where globalization and migration lead to people from different cultures and countries encountering each other on a daily basis. However, despite all the benefits that intercultural communication can bring, there are a number of challenges and problems faced by participants in this process.

One of the main challenges of intercultural communication is differences in culture and values. Each culture has its own unique customs, traditions and norms of behaviour, which may be incomprehensible or even cause conflicts among representatives of another culture. For example, in some countries, direct questions and frank statements are welcome, while in others it may be perceived as impolite or even insulting. Another challenge to intercultural communication is the language barrier. The inability to speak a common language can make it difficult to understand and lead to misunderstandings. In addition, even with a common language, problems may arise due to additional linguistic nuances that may be incomprehensible to foreigners.

An important aspect of intercultural communication is also the ability to take into account cultural differences and be tolerant of other opinions and points of view. This requires people to be empathetic, open and ready for dialogue. Without these qualities, intercultural communication can become a source of conflict and misunderstanding. Nevertheless, despite all the challenges, there are also prospects for the development of intercultural communication. With the development of technologies and means of communication, people are becoming more accessible to each other, which makes it easier to communicate and share experiences. In addition, there are more and more programs and initiatives aimed at improving cultural literacy and communication skills in a multinational environment.

Thus, intercultural communication plays an important role in the modern world and professional activity. Professionals with this skill

have an advantage over other candidates in the job market and can successfully build a career in an international environment.

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The Future of AI: Development Trends and the Impact on Society (Будущее искусственного интеллекта: тенденции развития и влияние на общество)

Humanity is constantly developing and improving. In a post-industrial society, people develop technologies in order to automate not only manual work but also brainwork. The creation of artificial intelligence can be considered as confirmation of this fact.

Artificial intelligence is a branch of computer science that develops methods and means for computer solutions of intelligence tasks which traditionally were solved by people. The article deals with the main development trends of AI and its impact on the modern society.

We can point out the following **trends of the development** of artificial intelligence:

1. Currently, neural networks that are capable of learning and making decisions based on data are being developed more and more. Due to the compute capacity increase, neural networks become more complex and efficient.
2. AI comes into use in many fields, including medicine, finance, transportation, and education. For example, in medicine, AI is used to diagnose diseases and plan treatment, in finance – to analyze data and to predict trends, in transport – to optimize routes and to operate vehicles, and in education – to create personalized course of studies and knowledge evaluation.
3. Modern intelligent systems allow to automate management and decision-making processes. An example is the control system of an unmanned vehicle that uses AI to process data from cameras and sensors, as well as to take decisions about speed and direction of movement.
4. The development of artificial intelligence raises a number of ethical and social challenges for the society, such as data security, discrimination and potential threats to jobs. In this regard, it is necessary to develop standards and norms that ensure the safety and ethics of using AI in the society.

The use of AI has a great **impact on our society**:

1. Labor productivity has increased. The use of AI makes various processes in various areas of activity more efficient. This enables enterprises to reduce costs and to improve their competitiveness.
2. Changes in jobs and professions take place. The development of AI can make many traditional occupations automated. AI also creates new job opportunities that were previously unavailable. New professions appear like data analysts and software developers.

In conclusion, the future of artificial intelligence is closely connected with advancements in technology and social changes. Therefore, it is essential to consider the ethical and social aspects of AI use in order to ensure its safe and successful implementation of AI systems for public welfare.

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Der weltweite Einfluss der deutschen Kultur (Всемирное влияние немецкой культуры)

Die deutsche Kultur hat eine reiche und komplexe Geschichte, die die Welt auf vielfältige Weise beeinflusst hat. Seit den frühen Migrationen der deutschen Stämme bis heute hat sich die Kultur der Nation unter dem Einfluss zahlreicher Ereignisse und Kräfte gebildet, die in ihrer Identität eine unauslöschliche Spur hinterlassen haben.

Die Amtssprache Deutschlands ist Deutsch, das auch zu den 23 Amtssprachen gehört, die von der Europäischen Union verwendet werden. Darüber hinaus ist Deutsch neben Französisch und Englisch eine der Arbeitssprachen der Europäischen Kommission. Das Christentum ist der vorherrschende Glaube in Deutschland, es wird von 47% der Bevölkerung bekennt, während der Islam 4% ausmacht. Etwa 5% halten sich an andere Religionen und 9% entscheiden sich dafür, ihre Zugehörigkeit nicht preiszugeben. Bemerkenswert ist, dass 35% sich selbst als nichtreligiös betrachten oder sich selbst als Agnostiker bezeichnen [2, s. 18].

Die Religion hat einen starken Einfluss auf die deutsche Kultur und Tradition gehabt, und Weihnachten ist der größte Feiertag. Mehrere Veranstaltungen gehen dem Weihnachtsfest voraus. Was auf der ganzen Welt populär geworden ist [3, s. 156].

Insgesamt beherrschen rund 100 Millionen Menschen weltweit die deutsche Sprache, wobei etwa 80 Millionen sie als zweite Sprache sprechen. In den EU-Ländern können etwa 18% der Bevölkerung (etwa 90 Millionen Menschen) Deutsch sprechen [4, s. 78].

Traditionelle Getränke und Essen haben momentan einen Weltruf. Currywurst ist sehr beliebt, es ist ein sehr beliebtes Schnellgericht (mit Pommes Frites) sowie ein typisches Gericht der Woche in den meisten Schul- und Firmenrestaurants im ganzen Land. Das Oktoberfest ist das größte Bierfest der Welt. Es findet jedes Jahr von Ende September bis Anfang Oktober in München statt. Das Festival hat dazu inspiriert, ähnliche Feste auf der ganzen Welt zu veranstalten.

In Deutschland wirkten große Philosophen, Soziologen und andere Prominenten. Hier lebten Klassiker der Welt, wie Bach und Beethoven, sie trugen den Übergang der klassischen Musik zu einer der bekanntesten Richtungen der Weltmusik. Derzeit finden in Deutschland viele Musikfestivals statt, von elektronischer Musik bis hin zu Hip-Hop und Rock'n'Roll. Das größte Musikfestival in Deutschland, das auch eines der größten der Welt ist, ist das Rock am Ring Festival, das Künstler und Interpreten sowie Musikliebhaber aus der ganzen Welt zusammenbringt.

Einige der bekanntesten architektonischen Stile Deutschlands umfassen die Architektur der Ottonen und Karolingischen, die der römischen Architektur vorausgegangen sind. Andere bedeutende Stile sind Gotik, Barock und Renaissance. Deutschland spielte auch eine entscheidende Rolle im Stil der frühen Moderne und in der Entwicklung von Bewegungen.

Die Polygraphie ist eine der größten Erfindungen unserer Zeit. Johann Gutenberg druckte 1456 in Mainz die erste Bibel der Welt.

Diese Tatsachen zeugen von großem Einfluss der deutschen Kultur nicht nur auf die Entwicklung von Deutschland, sondern auch auf die Kulturen der ganzen Welt.

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The origin and transformation of the vampire image (Зарождение и трансформация образа вампира)

The vampire is one of the most popular characters in popular culture. Albeit this image has been formed in folklore for centuries, an image that can be found in nowadays popular culture didn't have many common features with the folklore image. The purpose of this work is to consider legends about vampires and transformation of the image of the vampire.

Many cultures have legends about vampires or vampire-type creatures. In this work were presented only European myths and beliefs, because vampire legends of Asia and America are less represented in popular culture. Moreover, these myths are interesting due to their originality and require further research. All the myths, which were represented in this work, have common features in the image of the vampire. Firstly, a vampire is often a dead human, who needs to drink the blood of living people. In some legends vampire-type creatures don't drink the blood of their victims. Instead of it they may take their life energy (for example, Scandinavian folklore demon Mare takes energy from her victims, causing the sleep paralysis episode) or somehow take their life. It might be connected with the belief, common for many cultures. According to this belief, the death of the human is caused by the theft of his soul or one of his souls by another dead human [1, c. 364]. This belief is presented by Vladimir Propp in his work "Historical Roots of the wonder tale" as a "death-theft". This idea also can explain vampire's ability to send epidemics in some legends.

The centuries-old image of the vampire has changed in 100 years. In 1816 Goethe wrote the ballad "The Bride of Corinth". One of the characters of the ballad is a young woman, who became a vampire after her death. She "drew the life-blood" [2] from her husband's heart in order to continue the existence. However, one of the most important works that formed the modern image of the vampire is "The Vampyre"

by John William Polidori. This short story in the genre of gothic fiction represents to the reader a new image of the vampire – is a nobleman Lord Ruthven. The story aroused success and caused a lot of imitations. Despite the fact that the new image of the vampire gained popularity, the legends about vampires were the source of inspiration for the horror stories authors for some time. For example, Aleksey Tolstoy uses elements of folklore tales in his story "The Family of the Vurdalak". The combination of real historical facts, folklore tales and author's ideas was used in Bram Stoker's novel "Dracula". "Dracula" is one of the most important books in relation to the transformation of the vampire's image in literature tradition and popular culture. Many Stoker's ideas were used in subsequent books and films. Some of these ideas were developed by other authors. The current image of the vampire might be changed in the near future.

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Telegram messenger as a tool for student interactions with representatives different cultures (Мессенджер Telegram как инструмент для взаимодействия студентов с представителями разных культур)

According to data for 2024, the number of active users on Telegram is about 800 million people per month. This means that approximately 9.9% of the world's population uses this messenger every month. [1]

Next, let's move on to a review of the messenger and how it can help a university student find friends from any corner of the planet, as well as improve their language skills.

Telegram messenger is an excellent tool for interacting with representatives of different cultures. Thanks to its functionality, the ability to send messages in different languages and call each other for free, users can comfortably communicate with people from different countries without spending resources on it.

You can communicate with representatives of other cultures and countries in conversations and on various forums. In addition to free groups, the Telegram platform allows you to create paid language clubs, including those with native speakers. Here you can not only practice, but also find future friends.

A huge advantage of the Telegram platform is the ability to conduct free broadcasts that anyone can attend! Compared to ZOOM, in which you need to pay for a subscription, or suffer from interruptions and reconnections, you can simply connect to the broadcast and broadcast it for as long as necessary.

But not all people are ready to communicate by telephone or broadcast. If a person is not mentally prepared to communicate with foreigners and considers his language level to be insufficient, he can always use Telegram channels that suit his interests and language level.

But not all people are ready to communicate by telephone or broadcast. If a person is not mentally prepared to communicate with foreigners and considers his language level to be insufficient, he can always use Telegram channels that suit his interests and language level.

Telegram has many channels with useful content in various languages. In them you can find both information on grammar, vocabulary, and pictures with memes and slang. Materials are published in various formats: video, audio, posts, articles or broadcasts, so each user can find something that is really interesting to him.

In addition to language practice, Telegram has many channels and groups dedicated to different cultures. For example, you can join channels about the traditions and customs of different peoples.

Also worth noting is the message translation feature, which allows you to translate texts into other languages without the need to use third-party applications. Therefore, if your knowledge is imperfect, you can always translate unfamiliar words without looking at Google

Translator. But to use this function, you need to connect Telegram Premium, which costs 2,299 rubles per year. Of course, this subscription can help students learn the language: it is an opportunity to publish stories that will help you become closer with a foreign friend, translation of not only audio, but also video messages (circles). Therefore, if your friend sends you such an SMS, you don't have to worry and use a translator!

Telegram is truly a great tool for students to interact with people from different cultures. Telegram developers are also constantly adding new features and improving the application. For example, speech recognition, which allows users to translate voice messages into other languages, is a relatively new feature. Thus, thanks to the transformations, Telegram will be able to become the best platform for communication and learning foreign languages.

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Russian education in the contemporary context: Ufa University of Science and Technology (Российское образование в современном контексте: Уфимский Университет науки и технологии)

Modern society is impossible without the obligatory and immutable rules of educated, intellectually developed people who are able to create and multiply the educational, industrial, cultural and moral potential of the country, and do everything to improve the future of Russia.

One of speakers, tutor of the bachelor's students, spoke in detail to a large student and teaching audience, expressing his point of view on various issues of educational and methodological, socio-economic and moral-ethical components of education while giving their own strong arguments and other words about the institute. Having paid much attention to these and other important issues of the education system and leisure time of students, gradually some detachment on the part of students "melted away", young men addressed a number of actual questions.

At the final stage of the meeting of students with the directorate of the Institute of Technologies and Materials, Yuldash Gamirovich Khusainov gave the floor to his deputy for education and educational work of the Institute, Irina Shaykhutdinova.

She told and showed by means of the presentation how scientific and educational, methodological, socio-economic and moral and ethical components are implemented in the work of a particular department of the university. Thanks to the opening of large diverse student clubs and sections at the university: scientific and experimental, sports, dance, theater, music studios, the university immediately became a leader in many positions, both at the university itself and beyond. For a full and expanded life of students, *Alma mater* has spacious gyms equipped with the latest demands, large playgrounds for theater, music and other groups, and free territories.

It is the combination of the two prestigious universities of the Republic of Bashkortostan – The Bashkir State University and Ufa State Aviation Technical University, which will lead to significant results both within the republic and beyond will attract more applicants from various regions of the country and abroad who want to continue their studies and receive a full-fledged modern education in one of the most modern educational institutions in modern Russia! Thus, the program of the meeting of the stuff with the contingent of students, which was expanded and saturated in every sense of the word, was held at a high professional level!

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The role of education and media in the preservation and transmission of cultural values and traditions to new generations (Роль образования и медиа в сохранении и передачи культурных ценностей и традиций новым поколениям)

Education and media play a huge role in preserving and transferring cultural values and traditions to new generations. Modern society is facing the challenges of globalization, migration and technological development, which leads to the threat of loss of national and cultural identity. In such a situation, it is important that education and the media act as tools that contribute to the preservation and transmission of ancestral heritage.

Education is the basis for the formation of each person's worldview and values. In educational institutions, children study the history of their country, traditions and customs of the people, which allows them to realize their belonging to a certain culture. Education promotes the formation of cultural capital and respect for cultural heritage. In addition, education is designed to develop tolerance and respect for differences between people of different cultures.

Media, in turn, play a huge role in shaping public opinion and influence people's opinions and values. Through various media platforms, you can spread information about cultural traditions, show historical films and programs, and talk about cultural heritage. The media influence people's opinions and their ideas about their own culture and the culture of other nations.

The rapid development of technology and social networks allows media to reach a wide audience and thereby effectively transmit cultural values and traditions to new generations. Open access to information about the culture and history of their country contributes to the formation of civic and cultural identity among young people.

The preservation and transfer of cultural values and traditions to new generations is an important task for any society. This allows us to preserve the unique aspects of culture and history, passing them from

one generation to another. In order to ensure the successful preservation and transfer of cultural values and traditions, it is necessary to create special programs, events and educational projects aimed at familiarizing young people with the heritage of their people. These can be museum expositions, exhibitions, lectures, workshops, festivals and other events. It is also important to maintain respect for cultural traditions, to teach the new generation to appreciate their history, language, music, art and other aspects of culture. This will help preserve the uniqueness of each nation and enrich society with a variety of cultural expressions.

Thus, education and media play a key role in preserving and transferring cultural values and traditions to new generations. Modern society should actively use these tools to preserve cultural heritage and form a civic and cultural identity among young people. The preservation and transfer of cultural values and traditions to new generations plays an important role in the formation and development of society. By maintaining their culture and heritage, people can enrich themselves spiritually and preserve values that will help them preserve their identity and multiply their cultural heritage for future generations.

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Ways of improving the quality of adaptation of the company's personnel (Способы совершенствования качества адаптации персонала предприятия)

Professional adaptation is the process of adapting a newly hired employee to the new conditions of their work environment. It is a consequence of the stage of obtaining new people to work, who have passed successfully through the selection procedures. The main goal of the adaptation process is to introduce the employee to the organization as soon and as efficiently as possible, mainly by informing of the patterns of behavior required. Personnel adaptation is an essential process, which includes adaptation of employees to the content and conditions of labour activity, as well as to the social environment of the organization. Adaptation is one of the constituent parts of personnel management.

The purpose of adaptation is to form two types of motivation in a person: external and internal. The external one is connected with economic benefits: receiving annual bonuses and good salary. Internal motivation gives an opportunity to develop within the company, helps to join the corporate culture and become a part of it.

The adaptation strategy of personnel includes the employee's going through several types of adaptation stages with the help of the methods and tools used in this process. There is no universal strategy.

Professional adaptation. The essence of this type is that the specialist learns the specifics of work in his profession with the specifics of this particular organization.

Social adaptation. The employee needs to understand as quickly as possible how to interact with new colleagues, what level of subordination is approved, what is accepted and what is not.

Psychological adaptation. This type of adaptation involves getting used to the regime of work and rest, frequency of contacts with management and clients, dress code, level of tension, concentration in the process of performing work operations.

Procedural adaptation. This can include adapting personnel to the ways of generating their own income, frequency of payments,

internal rules, procedures for professional development and reporting, methods of team feedback and corporate rituals.

Adaptation will have maximum impact when it is analysed and improved.

To achieve this effect, the correctly implemented adaptation process should enable the employee to get to know the organization in its various aspects - its objectives, structure, rules, procedures, prevailing habits, motivational system principles. It should also outline the scope of tasks and expectations related to work at a given position, introduce to other employees, with whom the newly hired person will cooperate in the future and familiarize the employee with the methods of work used in the organization to carry out tasks. In conclusion we can state that there are working tools and techniques to make adaptation process smooth and comfortable for both sides.

ЕСТЕСТВЕННЫЕ НАУКИ

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The use of forests for recreational activities in the forestry of Salavat district
(Использование лесов для рекреационной деятельности в Салаватском лесничестве)

Recreational functions of the forest are a complex of positive effects of the forest and the forest environment on human health, depending primarily on forest vegetation conditions and natural ecological and biological features of the forest phytocenosis.

The forestry of Salavat district is located in the northeastern part of the Republic of Bashkortostan. Its length from north to south is 130 km, from east to west – 120 km. The central estate of the forestry is located in the village of Maloyaz, at a distance of 183 km from Ufa. The area of the forestry makes up 170287 hectares (01.01.2023).

The territory of the forestry has a high potential for recreational

activities due to its historical, cultural and natural attractions. This district was the birthplace for the national hero of the Bashkir people Salavat Yulaev. It has unique natural resources such as caves, nature reserves, rivers, lakes and mineral waters. In addition, this area is part of the Yangan-Tau Geopark under the auspices of UNESCO. All this makes it attractive for tourists who can enjoy cultural and educational tourism and preserve the natural and historical heritage.

The following types of forest recreation are possible on the territory of the Salavatskiy forestry:

• camping forest recreation with overnight accommodation;

• daily stay without overnight accommodation;

• short-period staying without overnight accommodation for competitions and training;

• forest tourism along a certain route with overnight accommodation, and a forest hike, for example a short visit of the sights.

All this is aimed at recreation, physical development, entertainment and learning.

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Biotechnologie im Dienst des Menschen (Биотехнология на службе человека)

Biotechnologie ist eine Technologie, die auf Biologie basiert, insbesondere, wenn sie in der Landwirtschaft, Ökologie, Industrie, Lebensmittel und Medizin verwendet wird.

Die Biotechnologie vereint Disziplinen wie Mikrobiologie, Biochemie, Molekularbiologie, Genetik, Bioinformatik und technologisches Engineering. Die Grundlage sind chemische Reaktionen, die durch freie Enzyme oder Enzyme katalysiert werden, die in Zellen vorhanden sind (Biokatalyse oder Biokonversion) [5, S. 52-53].

Wenn es um die landwirtschaftliche Biotechnologie geht, so befasst sich dieses Teilgebiet mit der Entwicklung gentechnisch

veränderter Pflanzen, indem es ein interessierendes Gen in die Pflanze injiziert. Dieser Prozess hilft den Pflanzen die Ernteerträge zu erhöhen.

Wenn die Rede von der Ökologische Biotechnologie ist, so gehen hier die alle Mittel zur Wiederherstellung und Sanierung unserer Umwelt. Diese Technologie nutzt die katabolen Eigenschaften von Mikroorganismen und Pflanzen, um kontaminierte Böden und Wasser zu zersetzen, zu entgiften und zu reparieren. Es hilft auch, Treibhausgase oder andere giftige Gase zu entschärfen, die von Industriebetrieben freigesetzt werden. Keime werden hier auch verwendet, um Ölverschmutzungen zu beseitigen, die den Ozean verschmutzen [2, s. 8-9].

Wenn es um die Industrielle Biotechnologie handelt, umfasst die Biotechnologie die Herstellung von Alkohol, Waschmitteln, Kosmetika und so weiter. Dieses Teilgebiet umfasst die Herstellung von biologischen Elementen und Zellstrukturen für verschiedene Zwecke [1, s. 430].

Jetzt ist die Lebensmittel-Biotechnologie an der Reihe. Dieses Teilgebiet bezieht sich auch auf die Produktion und Modifikation von Enzymen, sie werden in der Lebensmittelindustrie verwendet. Modifizierte Enzyme werden bei der Herstellung von Brot, Sirupen, Käse verwendet, um verschiedene Eigenschaften diesen Produkten zu verleihen. Die Biotechnologie befasst sich mit den Zusatzmitteln für die Nährstoffe, damit die Lebensmittel bessere Qualität bekommen. Ein gutes um Beispiel ist der goldene Reis, die Forscher haben die neue Art von Reis entwickelt, die Beta-Carotin enthält [3, S. 208].

Zuletzt schenken wir die Medizinische Biotechnologie die Aufmerksamkeit. Die medizinische Biotechnologie beinhaltet die Verwendung lebender Zellen, um Technologien zur Verbesserung der menschlichen Gesundheit zu entwickeln. Diese Art verwendet solche Werkzeuge, die zur Erhaltung der menschlichen Gesundheit dienen. Die Technologie hilft auch bei der Untersuchung von DNA, bei der Identifizierung von den Ursachen der genetischen Störungen und bei der Entdeckung neuer Behandlungsmethoden.

Impfstoffe und Antibiotika, die für die menschliche Gesundheit unerlässlich sind, befinden sich im Gesichtspunkt der medizinischen Biotechnologie. Mehrere Pflanzen werden Gentechnik unterzogen, um Antikörper mithilfe der Biotechnologie herzustellen [1, s. 78].

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Priority directions for the development of forest genetics and breeding
(Приоритетные направления развития лесной генетики и селекции)

The article describes the directions of development of forest genetics and breeding. In order to increase the effectiveness of forest breeding in Russia, a number of problems should be solved: 1) conceptual problems; 2) economic problems; 3) organizational problems; 4) scientific problems.

A significant modernization of outdated scientific programs and methods of forest breeding with the consideration to the accumulated experience and the latest achievements of forest genetics, breeding, seed production and introduction of arboreal plants is necessary.

In this regard, the priority directions for the development of forest genetics and breeding are:

1) development of national and regional programs for the conservation and rational use of forest genetic resources;
2) development and implementation of new methods for the choice and genetic evaluation of specimen trees which are aimed at the main task – breeding of fast-growing assortments destined for creation of industrial plantations with accelerated rotation against a high agricultural background;
3) the switchover of breeders from the uninformative stage of studying of half-sib offspring obtained from free pollination of specimen trees in natural stands to the stage of analyzing their offspring obtained from controlled clone crosses on plantations;
4) radical processing of forest-seed zoning based on a critical analysis of the entire set of available data on the population-genetic structure of stand-forming species and the results of geographical experiments;
5) stimulating of research on the development of methods for clonal micropropagation and maintaining the stability of genomes of valuable genotypes of coniferous forest-forming species in order to accelerate the breeding and reproduction of clone assortments for their use on industrial plantations;
6) development of indigenous models and production of breeding phytotrons for the reaction rate evaluation and acceleration of choice at early stages of ontogenesis of valuable genotypes that show the required properties with a specific combination of limiting environmental factors of industrial plantations;
7) further development and implementation of selection methods of the level of "nature-like technologies" into the forestry practice provided in the Strategy of Scientific and Technological Development of the Russian Federation which maintain a high level of genetic heterogeneity of plantings being characteristic for natural populations and are promising for the following situations: under medium-productive forest-growing conditions (below I-II bonitet classes), during the regeneration of genetic potential of plantings, as well as during the reforestation, counting extreme ecological conditions.

The solution of forest genetics and breeding problems should be reflected in the state forest policy of the Russian Federation, in special forestry regional and federal programs. It is very important to attract public interest to the tasks of conservation and sustainable use of forest genetic resources.

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Die Wirkung verschiedener Terrariumunterlage auf die Schnecke *Lissachatina fulica* (Влияние различной подстилки террариума на улиток *Ахатина гигантская*)

Achatina fulicula (lat. *Lissachatina fulica*) ist eine Landart von Lungenschnecken der Klasse der Bauchfüßer. Das natürliche Areal von *Achatina Fulika* ist Tropen, aber sie können auch in kälteren Klimazonen gefunden werden, allerdings nur als Haustiere.

Zu Hause leben *Achatine* in verschiedenen Behältern. Meistens sind dies Plastikbehälter, etwas seltener Aquarien und Terrarien. Meiner Meinung nach ist es subjektiv am sichersten, Plastikbehälter mit Deckel zu verwenden, am besten transparent, mit einem Volumen von 30 Litern, die derzeit ohne Problem gekauft werden können. In einer Plastikbox ist es auch einfacher, die richtige Belüftung zu gewährleisten, da im Behälter eine belüftete Öffnung unbedingt sein soll.

Um Schnecken zu Hause zu halten, muss man viel über diese Tiere viel wissen. Eine der wichtigsten Komponenten in der Haltung von Schnecken ist der Terrarienhumus oder Kokoshumus. Darin verstecken sich Muscheln, legen Eier, gehen in den Winterschlaf und essen auch, da es eine große Vielfalt an nützlichen Elementen enthält. Es gibt viele verschiedene Optionen für das Terrarium-Substrat: Kokossubstrat, Torf, Moos, Schaumstoffmatte usw. Betrachten wir einige von ihnen genauer.

Kokosnusssubstrat ist die häufigste und kostengünstigste Art von Boden für bauchfüßige Schalentiere. Dieses Substrat ist absolut sicher, es ist ziemlich einfach zu pflegen und sauber zu halten. Die Anwendung ist genug einfach: das gepresste Brikett mit kochendem Wasser zu übergießen und zu warten, bis es das gesamte Wasser absorbiert, dann das überschüssige Wasser durch den Müllstoff abzudrücken und für einen leicht feuchten Zustand trocknen zu lassen. Nach der Verwendung des Substrats kann es gewaschen und wiederverwendet werden. Neben all den Vorteilen der Verwendung

dieses Bodens gibt es auch Nachteilen darin. Aufgrund der Tatsache, dass es der Erde mehr ähnelt, ist die Schnecke ständig unattraktiv schmutzig. Obwohl der Säuregehalt im Substrat die Norm meist nicht übersteigt, lohnt es sich, darauf zu achten, sonst kann das Substrat schädlich sein.

Sphagnum-Moos ist auch bei Schneckenforschern sehr beliebt, da es sich um eine sehr schöne und bequeme Unterlage in Terrarien handelt. Es eignet sich gut für bereits erwachsene Schnecken, da Jungtiere Moosblätter zerstören können. Die Kosten für Moos sind im Vergleich zu anderen Füllstoffen etwas höher und es kommt ziemlich schnell zur Unbrauchbarkeit. Wenn man Moos aus dem Wald verwendet, lohnt es sich, es für Schnecken zu neutralisieren. Die Vorteile dieser Unterlage sind vielfältig: gute Feuchtigkeitsaufnahme und -aufbewahrung, die Möglichkeit, wiederholt verwendet zu werden, es gibt keine Gewöhnungsphase, ein umweltfreundliches und natürliches Material.

Eine Schaumstoff- oder weiche Matte wurde vor relativ kurzer Zeit verwendet, und dies kam von europäischen Schneckenzüchtern. Vorteile dieser Stoff ist die preisgünstigste Option. Die Lebensdauer beträgt etwa 2-3 Jahre. Es erfüllt seine Funktionen, die Feuchtigkeit im Terrarium zu erhalten, ziemlich gut und ist außergewöhnlich einfach. Aber es hat auch Nachteile beim Eierlegen und der Verdauung.

Es gibt auch eine Reihe gefährlicher Unterlage für die Haltung von Schnecken: Holz- und Silikonfüller, Sand, Stöcke, Steine und Sägemehl. Jeder Schneckenforscher wählt selbst den besten Füllstoff für den Inhalt seiner hausgemachten Muscheln aus, aber es lohnt sich, den allgemeinen Zustand und den Zustand der Schale zu beobachten.

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Aktuelle wissenschaftliche Errungenschaften auf dem Gebiet neuronaler Schnittstellen (Актуальные научные достижения в области нейроинтерфейсов)

Neuroschnittstellen (auch Neurocomputerschnittstellen, Gehirn-Computer-Schnittstellen) sind eine Reihe invasiver und nichtinvasiver Geräte, die elektrische Impulse von Neuronen lesen, verarbeiten und in Befehle umwandeln können. Somit ermöglichen neuronale Schnittstellen einem Menschen die Steuerung elektrischer Geräte ohne herkömmliche Eingabegeräte. Die Arbeit mit solchen Geräten erfolgt in drei Hauptphasen: Auslesen neuronaler Signale aus dem Gehirn, Übersetzen dieser Signale in Befehle und Weitergeben der Befehle in den Geräten [1]. Als nächstes werden moderne Errungenschaften in jeder Phase betrachtet.

Die grundlegende Technologie zum Lesen von Gehirnsignalen ist seit 1929 unter dem Namen Elektroenzephalographie bekannt und hat in der modernen Welt eine große Vielfalt. Es ist bekannt, dass eine Verbesserung der Genauigkeit und Qualität des Signals vom Gehirn die Genauigkeit der reproduzierbaren Daten verbessert. Zu diesem Zweck entwickeln Wissenschaftler aktiv die invasive Installation von Elektroden direkt im Gehirn, wodurch die Effizienz des Signals erheblich gesteigert wird [1]. Solche Geräte und Studien zeigen erhebliche Vorteile bei der Signalqualität im Vergleich zu etablierten EEG-Optionen. Moderne invasive Elektroden dieser Art ermöglichen die Überwachung der neuronalen Steuerung selbst so subtiler Aktionen wie der Steuerung eines Computercursors und des Drückens von Tasten [3], was mit herkömmlichen EEG-Geräten zweifellos nicht möglich wäre. Aber auch das nicht-invasive Ablesen von Gehirnsignalen mittels EEG entwickelt sich weiter und ermöglicht jedes Jahr eine genauere und detailliertere Ermittlung von Informationen.

Nach dem Lesen der Gehirnsignale ist es notwendig, sie in die richtige Form zu interpretieren. Und hier offenbart sich die größte Vielfalt an Methoden und Entwicklungen. Grundsätzlich werden alle

Signale durch neuronale Netze übersetzt, die auf EEG-Daten trainiert werden [2]. In der modernen Welt gibt es Hunderte lokaler und spezialisierter neuronaler Netze, die in der Lage sind, zunächst homogene Elektroenzephalogramm-Informationen in völlig unterschiedliche Befehle umzuwandeln, vom Einschalten von Geräten bis zur Steuerung einer Computermaus oder einer mechanischen Hand. Das Training solcher neuronalen Netze ist derzeit recht individuell und für jede Person oder jedes Tier muss eine eigene Version des neuronalen Netzes erstellt werden. Der Zeitpunkt ihrer Ausbildung schränkt die Wissenschaftler jedoch nicht bei der Entwicklung immer komplexerer und mehrparameteriger Interpretationen der Elektroenzephalographie ein.

Hauptziel bei der Entwicklung von Gehirn-Computer-Schnittstellen war von Anfang an die direkte Steuerung von Prothesen über Gehirnsignale. Zur Steuerung solcher Prothesen bei Menschen mit Behinderungen werden bereits invasive neuronale Schnittstellen eingesetzt. Auch die Möglichkeit, einen Computercursor zu steuern, wurde bereits erwähnt. Moderne Technologien ermöglichen es jedoch sogar, ganze Wörter und Sätze aus dem Gehirn zu reproduzieren, die wir gewissermaßen „vor uns selbst“ aussprechen. Darüber hinaus arbeiten einige Zentren zur Erforschung des Gehirns und neuronaler Schnittstellen daran, visuelle Bilder vom Gehirn auf einen Computerbildschirm zu übertragen [2]. Die Verwendung schon übersetzter Befehle ist größtenteils eine technische Frage. Beispielsweise haben Erfinder die Fähigkeit demonstriert, durch spezielle nicht-invasive EEG-Geräte Spielzeugautos, Hubschrauber, Farblampen (Farbwechsel), Körperteile zu steuern, die ursprünglich nicht vorhanden waren (Manipulatoren, eine dritte Hand und sogar so etwas wie ein Schwanz) und virtuelle Modelle am Computer [4]. All dies konnte nur durch die Kraft des Denkprozesses gesteuert werden, ohne ein Bedienfeld oder das Drücken von Tasten auf der Tastatur. Natürlich erfordert eine qualitativ hochwertige Steuerung viel Einarbeitungszeit sowohl für den Benutzer als auch für die Software, aber die Ergebnisse eröffnen bereits jetzt große Perspektiven für die Weiterentwicklung des Bereichs der neuronalen Schnittstellen.

Basierend auf Vorstudien von Informationsressourcen und wissenschaftlichen Artikeln werden moderne Forschungsergebnisse auf dem Gebiet neuronaler Schnittstellen ausgearbeitet, verbessert und mit den neuen Daten ausgerüstet.

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Moralisch-ethische Aspekte der Organtransplantation von Leichen (Моральные проблемы пересадки органов от трупов)

Transplantologie, ein Gebiet der Medizin, untersucht die Probleme der Organ- und Gewebetransplantation. Dieser komplexe Prozess birgt eine Reihe von ethischen Fragen, die bei der Entscheidungsfindung berücksichtigt werden müssen [3].

Gerechtigkeitsprobleme: Bei Organtransplantationen entsteht die Frage nach einer fairen Verteilung knapper Ressourcen zwischen potenziellen Empfängern. Zwei Hauptkriterien zur Gewährleistung der Gleichheit:

1) Eine Lotterie, die auf der Kompatibilität zwischen Spender und Empfänger basiert.

2) Die Reihenfolge, die das Alter und den Gesundheitszustand

des Empfängers berücksichtigt [2].

Es gibt jedoch Schwierigkeiten, die mit Altersbeschränkungen, einem Gesundheitszustand aufgrund schlechter Gewohnheiten und einem Notfall verbunden sind. Daher kann die Auswahl eines Patienten selbst für erfahrene Ärzte schwierig sein.

Die moralischen Probleme des Organentnahmeverfahrens: es handelt sich um das Prinzip der informierten Einwilligung , um das Recht einer Person, ihren Körper selbst zu entsorgen. Das Fehlen einer ausdrücklichen Zustimmung bedeutet Ablehnung. Es besteht jedoch auch ein Interesse daran, Gewebe und Organe zu erhalten. Eine informierte Einwilligung zu erhalten, kann für Ärzte ein psychologisches Dilemma sein [5].

Transplantationsabnahme: Die geschätzte Organentnahme bei jedem Verstorbenen ohne ihre ausdrückliche Ablehnung. Dieser Ansatz vereinfacht den Prozess, kann aber dem Prinzip der individuellen Autonomie widersprechen [4].

Widerspruchslösung ist eine Zustimmung zur Entnahme von Organen, wenn keine ausdrückliche Ablehnung vorliegt. Dieser Ansatz reduziert die Anzahl der ungenutzten Organe, wirft jedoch Bedenken hinsichtlich Zwang auf [1, s. 59].

In dieser Hinsicht existieren auch ethnische Probleme: rassische oder ethnische Ungleichheiten bei der Organspende und -verteilung können auch ethische Fragen aufwerfen. Zum Beispiel sind bestimmte ethnische Gruppen möglicherweise anfälliger für bestimmte Krankheiten, die eine Transplantation erfordern, aber der Zugang zu Organen kann für sie eingeschränkt sein.

Entscheidungen bezüglich der Organtransplantation von Leichen sollten unter Berücksichtigung all dieser moralischen und ethischen Faktoren getroffen werden. Gerechtigkeit, Respekt für die individuelle Autonomie und die Vermeidung von Diskriminierung müssen gewährleistet werden. Der ständige Dialog und die öffentliche Diskussion dieser Fragen sind entscheidend für die Ausarbeitung ethisch fundierter Lösungen.

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Die Rolle von Probiotika in der menschlichen Ernährung (Роль пробиотиков в питании человека)

Derzeit wird das Problem des Studiums der mikrobiellen Ökologie des Menschen in die Kategorie der aktuellsten und vielversprechendsten eingeführt. Die Entwicklung und massive Verwendung von Probiotika und probiotischen Produkten, die die Mikrobiozönose des Verdauungstraktes, von Kindern und Erwachsenen optimieren, ist eine mikroökologische Basis für die Aufrechterhaltung der körperlichen und geistigen Gesundheit und die Erhöhung der Lebenserwartung und -aktivität der Bevölkerung [3].

Mikrobiota ist eine Gemeinschaft verschiedener Arten von Mikroorganismen, die einen bestimmten Lebensraum bewohnen. Der Zustand des Gleichgewichts zwischen den Mikrobiota-Populationen ist charakteristisch für die vollständige Gesundheit und die Aufrechterhaltung der Konstanz der inneren Umgebung des Makroorganismus. Aufgrund neuroemotionaler Überlastung und einer negativen Umweltsituation standen viele Krankheiten im Vordergrund, eine wichtige Rolle spielte dabei die Veränderung der Ernährung — der begrenzte Verzehr natürlicher, nicht raffinierter Lebensmittel und der Übergang zu raffinierten, die jedoch reich an Kohlenhydraten und Fetten sind. Unsere fernen Vorfahren versorgten

sich mit Nahrungsmitteln besser als die moderne zivilisierte Menschheit.

Ein chronischer Mangel an Vitaminen und Ballaststoffen schafft einen günstigen Boden für das Auftreten von Krankheiten bei vollkommen gesunden Menschen. Die Forschung der letzten Jahre mit neuen Genomanalyse-Technologien zeigt den Zusammenhang von Störungen der Darmmikrobiota und der Pathogenese von Fettleibigkeit, Nahrungsmittelallergien und Reizdarmsyndrom [1]. Die Nahrung, die wir essen, spielt eine wesentliche Rolle für das ausgewogene Funktionieren der Darmmikrobiota. Die Nahrungsmittel, die unsere Ernährung ausmachen, dienen zum Leben von Hunderten von Billionen Bakterien, die in unserem Verdauungssystem leben. Probiotika, Präbiotika, Synbiotika werden verwendet, um die gestörte Struktur der Mikrobiozönose wiederherzustellen.

Es ist bekannt, dass die positive Rolle von Propionsäurebakterien als Probiotika auf die Bildung von Propionsäure, organischen Minorsäuren, Bakteriocinen, Enzymen und Vitaminen zurückzuführen ist. Propionsäure-Bakterien synthetisieren große Mengen an Vitamin B_{12}, das die wichtigsten Stoffwechselprozesse im Körper reguliert, den Immunstatus des Körpers erhöht [2]. Die Synthese von Vitamin B_{12} durch die menschliche Darmflora ist jedoch unbedeutend. Die Herstellung von Medikamenten auf der Grundlage lebender Mikroorganismen ist eine der schwierigsten Bereiche in der Biotechnologie und der Erfolg ihrer Herstellung wird weitgehend durch physiologischen und biochemischen Faktoren bestimmt. Das biotechnologische Verfahren zur Aktivierung von Bifidobakterien in Milch hat die Grundlage für die Entwicklung von Sauerteig mit verschiedenen Stämmen von Bifidobakterien gelegt. Die Verringerung der Anzahl von Bifidobakterien oder sogar deren völlige Abwesenheit ist einer der pathogenetischen Mechanismen für verlängerte Darmfunktionsstörungen bei Kindern und Erwachsenen. Es gibt Hinweise, dass Bifidobakterien der "Lieferant" einer Reihe von essentiellen Aminosäuren sind, darunter Tryptophan, Vitamine, ihre antikanzerogene und antimutagene Aktivität, die Fähigkeit, den Cholesterinspiegel im Blut zu senken, und andere.

All diese positiven Effekte haben es einst ermöglicht, Bifidobakterien als wirksamen Biokorrektor und die Grundlage für die

Herstellung von Medikamenten mit einer multifaktoriellen regulierenden und stimulierenden Wirkung auf den Körper und später als eine der Hauptkategorien der funktionellen Ernährung zu betrachten. Stämme von Propionsäurebakterien haben wertvolle biotechnologische Eigenschaften und können für die Herstellung von probiotischen Produkten empfohlen werden.

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Biotechnology in the field of cosmetology (Биология в сфере косметологии)

Between consumer demand and the extreme climate situation, cosmetics manufacturers are striving to adhere to a sustainable development approach. One of their tools to achieve this goal is the use of biotechnology. Consumption patterns are changing more than ever, consumers are looking for ethical, environmentally friendly products. This is especially true for cosmetic products. Traditional extraction is widespread, but biotechnologies are actively developing in the cosmetic market.

The emergence of biotechnologies is partly due to the fact that these technologies open up new prospects for the development of new cosmetic ingredients or active substances. Biotechnologies allow us to explore a wider range of biomass. It also helps to ensure the supply of raw materials: if a country is under stress or can no longer supply the

required biomass, biotechnologies allow the processing of molecules of interest into bioreactors. Thanks to biotechnology, we get access to molecules that we didn't have access to before, and to much more interesting concentrations. Biotechnologies allow us to diversify and bring something different from traditional extraction: we have a different access to plant diversity. We can work with hard-to-reach plants or ingredients while avoiding plant seasonality. However, the real driving force behind the development of these production technologies remains consumer demand for naturalness.

For some, biotechnology has been a way to get rid of some controversial raw materials, such as ingredients derived from petrochemical or animal raw materials. In addition, biotechnologies make it possible to get rid of some solvents used in traditional extraction methods, which can be toxic, especially to the environment. Biotechnology is a pure technology. It does not use chemical and toxic solvents, which avoids environmental degradation. This allows you to replace synthetic products with natural ones. For example, silicones have been replaced by new compounds developed in the field of biotechnology.

Many cosmetic brands take the environmental friendliness of their products seriously. And their desire to protect nature is found in everyone. Because using plants for an ever-growing market carries the risk of overexploitation of biodiversity. To avoid any problems related to the destruction of biodiversity, industry experts resort either to a closed-loop economy or to the creation of sustainable supply chains. These partnerships enable the introduction of agroecology that allows the restoration of plants that are endangered or difficult to grow, with an emphasis on respect for biodiversity.

In conclusion, biotechnology has profoundly changed the cosmetics industry. This made it possible to create ingredients and products with higher performance characteristics, while offering customization options and increasing environmental friendliness. This revolution is just beginning, and the future of beauty looks promising thanks to constant innovations in the field of biotechnology.

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Immun-Biotechnologie von heute (Иммунобиотехнология сегодня)

Als Ergebnis der rasanten Entwicklung der medizinischen Biotechnologie im letzten Vierteljahrhundert entstand ein Begriff wie die Immun-Biotechnologie (aus dem Griechischen bedeutet das Wort bios «Leben», teken ist «Kunst», Logos ist «Lehre» und vom Lateinischen immunus ist «immune»).

Immun-Biotechnologie ist ein Teil der modernen Biotechnologie, der die wissenschaftliche Entwicklung und technologische Produktion von präventiven, diagnostischen und Arzneimitteln umfasst, bei denen verschiedene Wirkstoffe und Prozesse des Immunsystems als aktive Komponenten verwendet werden. Die Immun-Biotechnologie für Zielprodukte ist nicht nur aus der medizinischen Verwendung hinausgegangen. Die meisten Mittel werden nicht für Gesundheitszwecke hergestellt. Das exponentielle Wachstum des Interesses an Impffragen in der Bevölkerung auf der ganzen Welt begann im Jahr 2020.

Impfstoffprophylaxe wird als eine der wichtigsten Möglichkeiten angesehen, die Gesundheit eines jeden Menschen in allen Ländern zu gewährleisten. Insgesamt werden weltweit gegen mehr als dreißig verschiedene Krankheiten geimpft, was die Zerstörung oder Annäherung an die vollständige Beseitigung epidemischer Bedrohungen durch viele Krankheiten ermöglicht hat. Die modernen Impfstoffe sind sehr erfolgreich bei der Bewältigung von Krankheiten, die früher als Bedrohung für die staatliche epidemische Sicherheit angesehen wurden.

Wissenschaftler lehnen die Verwendung von Tieren und Embryonen ab und nutzen zunehmend die Kultivierung von Viren. Die Forschung geht auch auf die Verwendung eines gentechnisch veränderten Materials vor, das nicht pathogene Antigen-Fragmente enthält, die Möglichkeit haben, Antikörper zu induzieren. Zunehmend werden Mehrkomponenten-Impfstoffe verwendet, die es ermöglichen, mehrere Krankheitserreger gleichzeitig in einem einzigen Verfahren zu impfen.

Viren vermehren sich momentan sehr schnell und ihre Anzahl wird immer größer, so dass im Laufe der Zeit eine Impfung nur in Form von Mehrkomponenten-Impfstoffen möglich sein wird. Die Synthese des viralen Genoms ermöglicht es, seine Zusammensetzung und genetische Homogenität zu garantieren. Die Wissenschaftler verwenden auch Methoden, um Viren zu schwächen, und dadurch die Modifikationen von Genom zu resultieren.

Das moderne Entwicklungsniveau der Immunbiotechnologie ermöglichte es, eine neue Generation von Medikamenten zur Lieferung die gezielt gentechnisch verändertes Material an Zellen. Die Zelle beginnt, was früher für sie nicht typisch war, bestimmte Proteine zu produzieren. Es wurden genügend klinische Daten gesammelt, die die negativen Auswirkungen von Medikamenten auf den Körper mit mRNA- und DNA-Technologien bestätigen.

Es gibt jedoch keine wissenschaftlichen Daten über die Auswirkungen auf den Körper nach der Verabreichung von Arzneimitteln, die Nanopartikel verschiedener chemischer Elemente und gentechnisch verändertes Material enthalten. Und vor der Immun-Biotechnologie steht ein breites Spektrum von ungelösten Aufgaben auch in der Onkologie. Diese Richtung entwickelt sich aktiv, denn gegenwärtig wird die Anfälligkeit einer Reihe von Krebszellen für Viren ausnutzt.

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Development of a floating platform for an oil spill response system (Разработка плавучей платформы для системы ликвидации разлива нефти)

Accidents at fuel and energy facilities have catastrophic consequences for the environment. In the world, "freelance" hydrocarbon leaks occur with unenviable regularity. If we sum up all the damage from oil spills for at least 2020, we will get huge figures. Self–purification of reservoirs from oil pollution is a long process. Therefore, it is necessary to respond to an emergency as quickly as possible, strictly following the plan for the elimination of oil and petroleum product spills.

Localization and liquidation of emergency oil and petroleum product spills involves the implementation of a multifunctional set of tasks, the implementation of various methods and the use of technical means. Regardless of the nature of the emergency oil spill, the first measures to eliminate it should be aimed at localizing the spots in order to avoid the spread of further contamination of new sites and reduce the area of contamination. Mechanical collection of hydrocarbons is the most popular and effective method of emergency response. Its essence is as follows: special equipment – skimmers – is launched into the booms-fenced area. There are many types of oil collectors, their choice depends on where and under what conditions it will be used: in the open sea, protected from waves, on land, etc.

Nowadays a new way to eliminate an emergency oil spill is proposed. The principle of operation of the entire system is as follows:

1) the selection of the number of floating platforms with separators and pumping equipment takes place depending on the information received on the volume of the spilled oil slick;

2) preparation of floating platforms for transportation to the location of the oil slick (diagnostics of electrical appliances, calibration of instrumentation and sensors, installation of platforms to booms, etc.);

3) transportation of floating platforms by cargo ship to the destination;

4) encirclement and tightening of the oil slick with booms with integrated floating platforms placed between booms sections;

5) remote activation of pumping equipment on each floating platform;

6) pumping oil into separators located on floating platforms, where oil will settle and water will be separated from it;

7) draining the water from the lower fitting and refilling the separator with a new volume of oil;

8) transportation of filled separators on floating platforms to land;

9) moving each separator from sea to land with a gantry crane and draining the oil into a special pit.

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Visualization of sound (Визуализация звука)

The emission of a complex acoustic signal (a set of sound waves) is characterized by a complex of physical data, namely, frequencies, phases, amplitudes and changes in these characteristics over time. The results of frequency, amplitude and time analysis of the sound series (i.e., sonographic analysis of the signal) are presented in the form of planar sonogram images (spectrograms and oscillograms).Thus, the ability to see sound is realized, i.e. to perform sound visualization.

The opportunity not only to hear the voice of a bird, but also to compare it with its image, is used in the training of ornithologists, like studying phonetics in a foreign language course. Memorizing sounds is not easy. On the contrary, the ability to remember a visual image in humans is well developed. Based on this, sound visualization technology is used in order to facilitate recognition and memorization, and even more.

Sonar locators (underwater vision) are means of sound detection of underwater objects using acoustic radiation. The basis is a transceiver that sends sound pulses in the desired direction, and also receives reflected pulses if the "parcel", meeting an object on its way, is reflected from it.

A glass harmonica is a rare musical instrument consisting of glass hemispheres of various sizes strung on a horizontal rotating metal axis. The package of hemispheres is partially immersed in a resonator box with diluted vinegar, so that the edges of the hemispheres are constantly moisturized.

A glass harp is a musical instrument made of vertical wine glasses. You can play it by running wet or chalked fingers along the edge of the glasses. Each glass is adjusted to a different pitch, either by grinding each cup to a specified pitch, in this case the setting remains unchanged, or by filling the glass with water until the desired pitch is reached.

"Laser Harp" by Jean-Michel Jarre, a famous visual artist. This is an electronic musical instrument consisting of several laser beams that need to be blocked, similar to plucking the strings of an ordinary harp.

Chladni figures are figures formed by an accumulation of small particles (for example, sand) near nodal lines on the surface of an elastic oscillating plate.

Iterations on Drums is a set of four percussion tables designed to transmit sound through solid materials such as metal and wood, rather than through air. Thus, the sound they produce is felt in the performer's hands even before it reaches his/her ears. 0.9 is a network group of nine Meyer subwoofers enclosed in 3 platforms on which performers stand. It has a sign language-inspired interface and is similar to a theremin.

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Designing a maintenance site of cars in the village of Karabulak Kizilsky district of the Chelyabinsk region. (Проектирование участка технического обслуживания легковых автомобилей в поселке Карабулак Кизильского района Челябинской области)

Over the past decades, growth of the Russian automobile market is observed. Nowadays, there has been an increase in the Russian car market. Today, in terms of the number of cars per capita, our country is in no way inferior to the world powers. The domestic car market is saturated with automotive products not only from Russian manufacturing plants, but also offers a huge range of car choices from other countries of the world. According to statistics, every four out of five cars in the total world fleet are cars.

In the context of global motorization, car-users increasingly need a relatively new industry - automobile maintenance. This is facilitated by an increase in the number of cars per capita. During the operation of the car, its working properties gradually deteriorate due to wear of parts, as well as corrosion and fatigue of the material from which they are made and the lack of professionalism of workers performing repairs. Failures and malfunctions appear in cars, which are eliminated during maintenance and repair. It is also necessary to note climatic, operating conditions, road surfaces. This negatively affects the condition of the vehicle, especially the chassis.

However, in the Kizilsky district, there are not enough pit stops, oriented to the repairing the running gear of cars. The development of specific proposals aimed at improving the quality of maintenance of cars causes the relevance of the topic under consideration.

The object of our research is the technological process of maintenance of cars. The subject of the study is the design of the cars service stations in the Karabulak Kizilsky district. The purpose of this work is to design a maintenance site in Karabulak Kizilsky district. To achieve the goal, a number of measures and tasks were developed.

We focused on the creation of a specialized station for the maintenance and repair of foreign and domestic cars using modern

diagnostic and repair equipment. Analysis of the condition and number of vehicles shows a high demand for this service. In the existing conditions, it is necessary to take into account all the above factors, repair the road surface and conduct advanced training courses among car mecanics. Having studied the existing conditions in the district, we developed a number of recommendations on modernization of the maintenance sites of Karabulak Kizilsky district.

МАТЕМАТИЧЕСКИЕ И КОМПЬЮТЕРНЫЕ НАУКИ

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Sound cards. Spatial Sound Technologies. Sensaura Solutions (Звуковые карты. Пространственный звук. Технологии Сенсаура)

Sound cards are an essential component for any computer that needs to process audio. They are responsible for converting digital audio signals into analog signals that can be played back via speakers or headphones, and for converting analog audio signals into digital signals that can be recorded or processed by a computer.

Sound cards come in a variety of different formats, including internal cards that are installed inside the computer, and external cards that are connected to the computer via a USB or FireWire port. Internal sound cards are typically more affordable, while external sound cards offer better sound quality and more features.

Composition of sound cards:

- an analog filter before the analog-to-digital converter (ADC) - to suppress noise arising during the conversion of analog signal into digital;

- an analog-to-digital converter - converts sound from a microphone, a guitar, a synthesizer into a digital form;

- a digital processing unit - changes sampling frequencies, superimposes effects, etc.;

- a computer interface unit - transmits the digital signal to the computer via PCI, PCIe, USB, FireWire buses;

- a digital-to-analog converter (DAC) - converts the sound from the computer for listening in the speakers;

- an analog filter after the DAC - to suppress interference arising during the conversion of digital signal into analog.

How conventional sound cards work.

A sound processing device is referred to as a sound card or a sound board, sometimes as a sound adapter, and sometimes as a soundblaster. Although it should be noted that it would be more correct to call sound cards soundblasters (or even more accurately a Sound Blaster). A sound card is installed on the motherboard of a computer.

Computers are digital; they prefer to work with discrete quantities (binary codes). To work with discrete quantities, i.e., to input an analog audio signal into the computer and output an analog audio signal from the computer to the speakers, the sound card converts the analog signal into a binary code signal (a digital signal) and vice versa. This is the main function of the sound card.

Spatial Sound is a modern immersive technology that creates a surround sound effect in virtual three-dimensional space, around you and above you. Spatial Sound creates a more realistic atmosphere, surpassing older surround sound formats like surround sound.

All movies and games sound more powerful with spatial sound. The highest level of immersion and fidelity comes from games, movies, and TV shows with built-in support for this new technology. But even if they don't, any content that is suitable for traditional surround sound systems automatically sounds much more immersive.

For decades, the efforts of developers have been directed at finding means of recording and transmitting the maximum possible number of channels; at selecting the optimal configuration of loudspeakers and microphones; at creating an infrastructure that ensures the preparation of the content of sound information (music and speech); at transmitting it by means of wired and wireless broadcasting, sound recording, multimedia, etc.; at working out compatible recording and transmission formats for different systems of cinema, radio, television, etc.

In order to understand certain regularities in the development of spatial sound technologies, let's consider Sensaura solutions. Sensaura company has been creating sound technologies for more than 10 years. All Sensaura developments are oriented to work through the standard interface DirectSound3D (DirectSound - program interface (API) in Windows system for sound playback and recording. DirectSound3D - an extension of the basic subsystem DirectSound, designed to create a three-dimensional sound picture from individual sound sources) and its extensions. Some of Sensaura's technologies are already in practice and we will soon see other developments in action. In fact, Sensaura offers to use special algorithms for manufacturers of sound chips and cards, which in combination with the standard DS3D API and extensions for it, should provide modeling and reproduction of high-quality 3D sound.

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Set theory and their paradoxes
(Теория множеств и их парадоксы)

Set theory is a fundamental field of mathematics that studies sets, their properties, and interactions. However, in the course of the development of set theory, various paradoxes have been identified that are surprising and raise questions about the fundamental foundations of mathematics. In this report, we will look at some of these paradoxes and their impact on mathematical thinking.

1. Russell's Paradox

One of the most famous paradoxes is Russell's paradox, which arises from attempts to construct a set of all sets that do not contain themselves. If we assume that such a set exists, then a contradiction arises: if it is contained in itself, then by definition it should not contain itself, and vice versa. This paradox has raised the question of the ability of set theory to formalize its own concepts and has given rise to various attempts to resolve it.

2. The Hilbert-Bernays Paradox

Another well-known paradox in set theory is the Hilbert-Bernays paradox, associated with the attempt to construct a set of all sets. It would seem that it is possible to define the set of all sets, but this leads to paradoxical consequences: for example, the question arises whether this set contains itself or not. This leads to contradictions and raises doubts about the fundamental principles of set theory.

3. The Skolem Paradox

The Skolem paradox is associated with the consideration of infinite sets and leads to contradictions in the understanding of their properties. For example, he shows that there is an infinite set that is simultaneously equivalent to its own subset. This paradox raises the question of the nature of infinity and causes the search for more thorough and rigorous definitions and axiomatic bases of set theory.

4. The Cantor Paradox

Cantor's paradox is related to the study of various types of infinities and leads to the conclusion that the set of all sets cannot be aligned with the set of all sequences of zeros and ones. This contradicts the intuitive idea of the dimension of sets and indicates the difficulty of understanding them.

The paradoxes of set theory emphasize the importance of strict formalization and the axiomatic basis of mathematics. They raise doubts about intuitive ideas about sets and infinity and encourage the search for more precise and rigorous definitions. Studying these paradoxes helps to better understand the nature of mathematical objects and develop fundamental concepts of set theory.

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Issues of modern professions
(Проблемы современных профессий)

Nowadays more and more people consider programmers to be the happiest and richest people in the world but is it really the case? Many children today are dreaming about becoming bloggers and streamers – those who make funny and uncomplicated video-content for people (mostly for children themselves). However, none of them think about the problems and obstacles these people usually have to face with.

Speaking about programmers, we have to mention their lifestyle: as their work is known to be inactive, IT-specialists for the most part just rarely leave their housing. Of course, it might cause some problems with health coupled with non-healthy food most programmers are used to. However, the main problem of being a programmer is the constant fear to be replaced by artificial intelligence. Some neural networks have already replaced many professions which required human's presence in the recent past. Thus, there is no doubt that programmers are next to be forgotten.

Bloggers' routine is not that easy as it seems to be. Despite the fact that many adult people do not consider making funny videos to be a profession, bloggers and streamers earn enough money to buy some fancy clothes, gorgeous cars and mansions at their young age. So what "problems" these youngsters may have? Apart from psychological burnout, they often face mercantile people on their way, what makes making new friends way more difficult than it is for an ordinary person. If you have ever thought that bloggers' life does not have any issues, then ask yourself again right now.

Managers in modern IT-companies also have impressive salaries, what makes other people feel jealous. Actually they can hardly be envied, as top-managers in IT-companies spend in average 8 to 10 (or even more) hours in the office. These people literally live at work, what usually causes problems in their families.

The conclusion is obvious: big money costs big issues. If you

want to earn a good salary, to make your life more convenient, you should work hard and overcome any obstacle on your way.

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Besonderheiten der wissenschaftlich-ausbildenden Fallmethoden in digitaler Elektro-Chemometrie mit der Ausnutzung der virtuellen Modellbildung (Особенности научно-образовательных кейсов по цифровой электрохемометрии с виртуальной лабораторией моделирования)

Im Laufe der Zeit ist dies eine wichtige Angelegenheit für die Gesellschaft, die sich auf eine stabile Organisation im Unternehmen berufen hat. Im Mai 2020 haben wir die offizielle Information erhalten, dass sich eine neue Epidemie unter Bezeichnung Coronavirus weltweit verbreitete. Damals war es sehr wichtig, ungeachtet vieler Schwierigkeiten neue Wege und technische Erfindungen zu beherrschen, um bei solchen Bedingungen zu kommunizieren. In dieser Zeit ist es üblich, ein neues, reales Leben zu führen. Der Grund dafür ist, dass wir ständig in der Arbeit oder bei der Arbeit entfernter Technologien verbrauchen können. Dies ist für Kinder, Arbeiter, Männer und Frauen wichtig.

Die Mitarbeiter unserer aktuellen Gruppen sind auf die Entfernung von Technologieunternehmen spezialisiert, nutzen die neuen Mitarbeiter und bieten virtuelle Konferenzen an. Dies ist jedoch nicht der Fall, da es in echten Unternehmen geschieht, da dies aufgrund der „Offenlegung“ nicht möglich ist. Im bestimmtem Zeitraum haben wir unsere Ergebnisse anhand aktueller Tests, anhand realer Online-Testergebnisse ermittelt.

Dafür arbeitete eine große Anzahl von Mitarbeitern mit virtuellen Labormodellen.Dank der modernen Kommunikationstechnologie haben wir eine Art der Interaktionstechnologie, die jedoch nicht auf praktische Weise mit der praktischen Umsetzung und Verbesserung verbunden ist. Im Rahmen unserer neuen Kompetenzanalyse und -behebung werden reale Problemsituationen in den Bereichen Chemometrie, technischer Informationen/Mathematik, Fotografie, Ökologie, und des Druckverfahrens untersucht. Von unserer Gruppe wurden komplexe elektrochemische Prozesse durchgeführt, die Zeit des Prozesses wurde verkürzt und die Objekte wurden mit begrenzten Ressourcen für bestimmte Zwecke verlagert.

Besonderheit unserer Fallmethoden – Elektro-Chemometrie-Fallmethoden – steckt in 3 Grundeigenschaften: 1) Registrierung und Analyse vieler Kunden läuft im Online-/At-Line-Modus mit der Nutzung moderner elektrischer Dienstleistungen, und zwar solche technologische Karte wird vom Avatare - Injektor-Laboranten verwendet. 2) Vorbereitende Arbeiten innerhalb eines bestimmten Zeitraums werden mit einem neuen Computer mit ausgewählten Datenbanken, Objekten und vorläufigen Änderungen organisiert. Als Vorteile unserer Arbeit sind die folgenden Merkmale: + keine Tests im Institut + Erstellung unserer grafischen Arbeiten + sofortige Anmeldung eines Heimcomputers. + Alle Mitarbeiter werden auf dem neuesten Stand der Technik mit einem spezialisierten Unternehmen beauftragt. 3) Einzigartige experimentelle Ergebnisse und Ergebnisse des Autors sind für die Veröffentlichung in vielen Ländern der Welt verfügbar und werden in der nächsten Zeit veröffentlicht werden.

Bewertungsergebnisse, die in der heutigen Welt erstellt wurden, Modernisierungsmethodik, die im Rahmen eines einzelnen Projekts, eines Kursmitarbeiters, eines Kandidaten erfolgt. Wenn der Mensch sich für eine Arbeit entscheiden oder sich auf ein Produkt spezialisiert hat, kann er seine Modelle und technischen Geräte testen. Für die Bereitstellung interaktiver und praktischer Videotechnologien waren theoretische und praktische Blöcke wichtig. Die Durchführung von Elektro-Chemometrie- und Chemometrietests erfolgt im Rahmen moderner Verfahren.

In der nächsten Zukunft startet das Projekt „Elektronisches Fernsehen“ und die interaktive Geschichte, die durch Fernsehen verwirklicht wird, unter INTERNET-ADRESSE

https://t.me/+l1foNdDN8vswM2I6. Da wird sehr spannende und sehr informative Beschäftigung.

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Schutz von Angriffen auf maschinelles Lernen und künstliche Intelligenz (Защита от атак на машинное обучение и искусственный интеллект)

Moderne Systeme des maschinellen Lernens und der künstlichen Intelligenz haben das Potenzial, unser Leben zu revolutionieren. Gleichzeitig geraten sie ins Visier von Angreifern, die versuchen, Schaden den Benutzern zuzufügen oder unbefugten Zugriff auf Daten und Ressourcen zu erlangen. Die Implementierung eines Schutzmechanismus gegen Angriffe wird zu einem integralen Bestandteil der Entwicklung und Anwendung solcher Systeme.

In diesem Teil stellen wir die Schwachstellen von maschinellem Lernen und künstlicher Intelligenz fest. Das Verstehen der Schwachstellen von Systemen des maschinellen Lernens und der künstlichen Intelligenz ist der erste Schritt zur Entwicklung effektiver Schutzmethoden. Wir betrachten verschiedene Schwachstellen wie das Aufdecken von Modellschwächen, Manipulation von Eingabedaten und Angriffe auf das KI-Modell selbst [3].

Welche Arten von Angriffen auf Systeme des maschinellen Lernens und der künstlichen Intelligenz existieren momentan? Angriffe auf Systeme des maschinellen Lernens und der künstlichen Intelligenz können verschiedenartig erfolgen [2]. Zu den häufigsten Angriffen gehören die Verwendung von Modell-Daten, adversarialen Beispielen und Angriffen auf den Schulungs- und Bereitstellungsprozessen bestimmter Modelle.

Was versteht man unter den Proaktiver Schutz vor Angriffen? Proaktive Schutzmethoden zielen darauf ab, Angriffe auf Systeme des

maschinellen Lernens und der künstlichen Intelligenz zu verhindern. Dabei werden Modelle gestärkt, Ergebnisse analysiert, Ensemble-Modelle verwendet und Daten authentifiziert.

Wozu dient der Reaktiver Schutz vor Angriffen? Reaktive Schutzmethoden umfassen die Überwachung und die Erkennung von Angriffen, die Entwicklung von Mechanismen zur schnellen Reaktion und Abschaltung des Systems sowie Wiederherstellung nach Angriffen und Gewährleistung der Sicherheit.

Was benutzen die Fachleute für die Bewertung der Effektivität von Schutzmaßnahmen? Die Bewertung der Effektivität von Schutzmaßnahmen ist von großer Bedeutung für die Entwicklung und die Verbesserung von Schutzmethoden. Maßbestimmungen und Bewertungsmechanismen ermöglichen die Beurteilung, wie erfolgreich ein System Angriffe abwehrt, sowie Tests auf Sicherheit und auf Schwachstellen[1].

Der Schutz von Systemen des maschinellen Lernens und der künstlichen Intelligenz vor Angriffen ist eine aktuelle und komplexe Herausforderung. Nur durch ständige Weiterentwicklung und Verbesserung der Schutzmethoden können Angriffe effektiv verhindert werden, um die Sicherheit solcher Systeme zu gewährleisten [1].

Es ist wichtig, ein Gleichgewicht zwischen proaktiven und reaktiven Schutzmethoden zu finden und die Evaluationsmechanismen zur Effektivitätsbewertung kontinuierlich zu verbessern, um die Sicherheit und Zuverlässigkeit von Systemen des maschinellen Lernens und der künstlichen Intelligenz zu erhöhen.

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What does Google know about you? (Что Гугл знает о Вас?)

Google is an American search engine company founded in 1998. What does it monitor? Every search you do, every video you watch, every route you drive or walk, everything you buy, your income, your gender, your age, your voice, your face and much, much more.

Google collects a lot of information about you - perhaps even more than you think. Google remembers every search you do and every YouTube video you watch. Regardless of whether you have an iPhone or an Android smartphone, Google Maps registers wherever you go, which path you choose, when you arrive and what time you leave - even if you never open the app. When you really look at everything Google knows about you, the results are maybe stunning, even a little scary.

As a spate of data leaks and privacy violations continue to weaken public confidence in major technology companies, Google has responded by creating a privacy center that allows you to access, delete and restrict the data that Google collects about you. To make matters worse, whenever you make changes the limit of how much or how long Google tracks you, Google warns that its services will also not work without unhindered access to your data. How true this may be is not clear.

Despite Google's best efforts to increase transparency, recent revelations that the search giant is secretly sharing users' personal data with third-party advertisers have called into question public confidence in the company whose smart speakers - Google Home and Google Nest - install microphones and cameras in your home. Consider now what personal information Google considers to be "publicly available". Most likely, Google has your name, a photo of your face, your birthday, gender, other email addresses that you use, and your password and phone number. Some of this is listed as publicly available information (certainly not your password). Here's how you can see what Google is sharing with the world about you.

1. Open a browser window and go to your Google account page
2. Enter your Google username
3. In the menu bar, select Personal Data and view the information. You can change or delete your photo, name, birthday, gender, password, other emails and phone number.
4. If you want to find out what information you have publicly available, scroll down and select “About Yourself”.
5. Then you can go back and make changes. There is currently no way to make your account private.

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The role of the English language in the development of software and technical documentation in the field of robotics (Роль английского языка в освоении программного обеспечения и технической документации в области робототехники)

Robotics is a rapidly evolving field that encompasses computer science, mathematics, electronics, mechanics, and other technical disciplines in the design of robots. A robot is an automated device designed to carry out various tasks. Their applications are diverse: industry, medicine, space exploration, and more.

The modern world is driven by the desire for increased productivity and efficiency in many processes. Using robots helps to reduce human workload, improve accuracy, and minimize risks to human health in hazardous tasks. Robotics plays a significant role in scientific progress and research. These machines are used to explore difficult and dangerous places, such as the ocean depths, outer space, and disaster zones. They can perform tasks that would be too difficult or dangerous for humans to complete.

The scope of robotic applications is expanding every year. According to a report by Markets and Markets, the global market for

robotics was valued at $76.6 billion in 2020 and is projected to reach $176.8 billion by 2025. This growth is driven by the increasing demand for automation, the development of machine learning, and computer vision technologies.

Investment in scientific research related to robotics is also growing. The largest markets for robotics are in North America, Europe, and the Asia-Pacific region. There is a lack of literature, technical documentation, and software for robotics in Russian. Or, if it is translated, it is not done in a timely manner after the release. Therefore, there is a need to have knowledge of the English language. A specialist who does not speak English may face serious obstacles in their work: misunderstanding specialized terminology and complex technical phrases, disruption of the production process, barrier to access relevant information in the field etc.

All these factors can limit a specialist's professional growth and competitiveness in the job market. Therefore, it is essential for specialists to continuously improve their language skills as part of their professional training and development. This will help them stay up-to-date with the latest developments in their field and enhance their competitiveness in the job market.

English language proficiency is essential for success in the rapidly growing field of robotics. It is becoming a crucial factor in competitiveness and professional growth. Today's contributions to language learning provide ample opportunities for participation in groundbreaking international projects and access to the latest innovations in this exciting field.

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Intelligent systems in construction (Интеллектуальные системы в строительстве)

The report is devoted to a new specialty at USPTU, which is called «Intelligent systems in construction». In the 21st century

technological progress is developing at an incredible speed, and people cannot imagine their lives without any hardware. For this reason, the future of modern construction belongs to the specialists of this faculty. The objects of professional activity are automated information processing, management systems, software of computer equipment, experimental research, computer-aided design systems of information life cycle support for industrial products. There is also mathematical, informational, technical, linguistic, software, ergonomic, organizational and legal support of the listed systems.

The subjects studied at the university are also indicated, these are some of them: Metrology, standardization and certification; Programming and algorithmization; Artificial intelligence systems; Information technology; Operational calculus and Systems theory.

Areas of knowledge and professional competencies include engineering cybernetics; building management systems, for example, “smart”, “passive” and “active” buildings, “green” construction; systems with elements of artificial intelligence; regulatory and technical support of the construction complex, metrology and certification and regulatory and technical support of the construction complex.

As for the future career, the bachelors with a diploma in this field can work as software engineers, designers and developers of automation systems and tools, dispatching, etc. Moreover, this article provides information about the salary which depends on the region, industry, work experience, and qualification category and ranges from 30,000 to 100,000 rubles at the beginning. Bachelors can work in various organizations that use complex devices: monitoring and diagnostic devices in the energy sector; medical or vehicle devices and diagnostic equipment at car service stations; non-destructive testing and diagnostics devices in oil and gas pipelines. In addition, they can work at enterprises producing products containing control and measuring devices, automation equipment, dispatching; at gas and petrochemical plants.

To conclude, it should be noted that this direction is still at an early stage, so this article will allow readers to better understand this profession and, perhaps, attract new students who will pave the way for further research in this field.

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Tissue damage or periodontal disease
(Поражение тканей или заболевание пародонта)

Periodontal disease is also called periodontitis or advanced gum disease. It is an inflammatory disease affecting the gums, bones, and surrounding tissues. Periodontal disease begins in a gingival sulcus, a coat of soft tissue around the neck of the teeth which is emerged through the gums.

Healthy gingivae are pink in colour. The sulcus depth ranges from 0 to 3 mm in diameter measured from the tip of gingival margin to the base of the sulcus. The attachment fibres connecting the gums to the teeth and the teeth to the bone are intact. The gums are resilient and neither bleed nor hurt when being probed.

During meals food debris accumulates in the sulcus when mixed with mouth bacteria and proteins from saliva. Plaque and less obvious biofilm are formed. Both are harmful to teeth and to periodontal structures. Bacteria and biofilm begin to mineralize forming hardened deposits called calculus which can only be removed with dental instrument. In response to the increased bacteria adjacent to the soft gingivae the body sends immune cells and healing cells to the area by way of the circulation.

Continuous exposure to acids and enzymes from plaque bacteria and the body immune response to them eventually causes the periodontal attachment to be lost. An irreversible condition is known as periodontitis.

Periodontitis is the advanced stage of the periodontal disease characterized by inflammation and infection of the supporting structures of the teeth, such as the gums, bones, and ligaments. It is usually caused by poor oral hygiene habits that allow plaque to build up in the mouth. Periodontitis has three stages; mild, moderate, and severe.

The sulcus depth increases to the point when patients can no longer effectively remove plaque which leadsto the destruction of tooth supporting bone. When back teeth are lost the front teeth will be unable to support the jaw muscles, and they begin to ache and move and the cheeks begin to collapse inwards. Periodontitis affects all of the teeth.They may loosen and appear unnaturally long and inattractive and may ultimately be lost

Periodontal bacteria can enter the body circulatory system through leaky blood vessels. Once inside the bacteria can lead to blood clots and inflamed vessels which constrict in diameter leading to strokes, heart diseases and heart attacks and poor circulation in the extremities.

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Diet for type 2 diabetes mellitus
(Диета при сахарном диабете 2 типа)

In 2023 alone, 3.16 million adults with type II diabetes were registered in Russia. Proper nutrition is very important in the case of diabetes mellitus. For a long time, the so-called insulin-dependent sugar disease, i.e. type 2 diabetes, has been treated exclusively with diet and dosed physical activity. Unfortunately, diabetes mellitus is still considered untreatable, but it is possible to control it and live a full life. A person who follows the recommendations on a diet has normalization of diabetes mellitus, an improvement in the general condition of the body and an increase in immunity. Hunger, strict restrictions on food are not allowed.

For people with diabetes, it is necessary to consume foods with carbohydrates, fats and proteins not only in a certain amount, but also in a certain ratio.

Fiber is digested more slowly, which provides a long-lasting feeling of satiety. According to the healthy eating method, at each meal you need to mentally divide the plate into three blocks. Half of

them must be filled with low–fat vegetables - fresh or ready-made. These can be salads made from cauliflower, string beans, tomatoes or cucumbers. And half of the plate should be occupied by low-fat protein sources: baked fish, boiled meat. A portion of protein on a plate should be placed in the palm of your hand. There are a quarter of complex carbohydrates left, such as whole grain bread, cereals. Their number should be in the size of a fist. Additionally, you can add several useful ingredients, for example, a few pieces of avocado, or season salad with a spoonful of olive oil.

Basic principles should he followed. Meals should be fractional 5 times a day – 3 main meals, 2 snacks, breakfast should contain exclusively complex carbohydrates with a low glycemic index. A light dinner, including low–fat proteins, vegetables and fruits, it is recommended to eat more than 420 grams of various greens and vegetables during the day, also follow the drinking regime - at least 7-8 glasses per day.

What you can't eat: foods with a high glycemic index such as flour, fast food, chocolates, carbonated drinks, coffee, heat-treated beets, carrots, etc. Carbohydrates are quickly absorbed in them and there are sharp fluctuations in blood glucose.

Products with lactose. It is recommended to limit the consumption of milk, liquid fermented milk product to 115 ml / day. Fructose reduces the sensitivity of the cell to insulin, which is already reduced in type 2 diabetes. Therefore, the diet of fruits, dried fruits and honey should be limited to 16 g. of glucose per day. For example, sweet bananas and pears, it is better to replace them with berries. And use this group in the form of desserts, and not use it as an independent dish.

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The influence of physical activity on the human cardiovascular system
(Влияние физической активности на сердечно-сосудистую систему человека)

Physical activity is the most important aspect in every person's life. Physical education significantly affects the heart, the circulatory system and overall human health. Regular training brings many positive changes: reduces the risk of developing diseases of the circulatory system, improves sleep and overall well-being.

Stimulation of cardiac muscle makes it more effective pumping blood through the body. Improving blood circulation and reducing the load on the heart at rest reduce the risk of developing hypertension and coronary heart disease.

Weight control plays a crucial role in maintaining the health of the cardiovascular system. Being overweight increases the risk of developing cardiovascular diseases, including stroke, heart attack and heart failure. Maintaining a normal weight reduces this risk and makes a significant contribution to overall well-being. Regular moderate physical activities help burn extra calories and maintain normal weight. In addition, physical activity also has a beneficial effect on the regulation of glucose levels, which is important for preventing cardiovascular complications in people with diabetes and hyperglycemia.

Regular physical activity combined with a healthy diet and good-quality sleep is the basis for successful weight management. Maintaining a healthy weight reduces the risk of cardiovascular diseases, improves glucose levels in people with diabetes and promotes overall health and longevity.

The heart is a muscle that due to intense physical activity thickens the walls of the left ventricle and pumps much more blood. The blood, in turn, carries oxygen, minerals and other nutrients with the blood throughout the body. Under the influence of physical load, the heart rate increases, the heart muscle contracts more actively, and blood pressure increases. This leads to a functional improvement of

the circulatory system. Often, due to an improper lifestyle, low physical activity, stress, the work of the heart muscle and blood vessels becomes less intense which leads to various diseases of the cardiovascular system. It is necessary to think about our lifestyle doing everything necessary to preserve and maintain our heart healthy.

Cardiovascular diseases are one of the most common causes of deaths worldwide, so it is important to maintain physical activity to prevent these diseases.

In order to improve your health you need regular workouts. People who exercise have great advantages over sedentary people: they look better. They are healthier mentally and are less prone to stress and tension, sleep better, and have fewer health problems.

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The phenomenon of laughter therapy as a way to deal with stress (Феномен смехотерапии как способ борьбы со стрессом)

In our modern fast-paced world more and more people face the phenomenon of stress due to such factors as increased workload at school, college and work, fierce competition for jobs, and digital overload.

Stress is the body's response to any external factor (stressor or irritant) that impairs its homeostasis and the corresponding state of the nervous system. This response puts the body into a state of increased readiness, causing changes in biological parameters such as body temperature, heart rate, blood pressure, and respiratory rate, blood oxygen saturation, glucose levels, and so on. As a result, stress negatively affects concentration, increases irritability and even weakens our health. So, what are the ways to solve this urgent problem?

There are many ways to deal with stress starting with deep breathing and ending with physical activity. However, there is another

original way to solve the problem – this is laughter therapy.

Laughter therapy is a type of therapy using special humorous techniques aimed at improving physical and psychological health.

Firstly, laughter reduces the levels of stress hormones such as adrenaline (C9H12NO3), cortisol (C21H30O5), growth hormone (somatotropin) and 3,4-dihydrophenylacetic acid (a major dopamine catabolite) in the blood serum, which indicates a reversal in the stress response. Moreover, it helps to change the activity of dopamine, serotonin and endorphins that have a beneficial impact on mood.

Secondly, when we laugh, the inhalation becomes deeper followed by a series of short and strong exhalations which makes our lungs work more actively. As a result, oxygen levels in the blood increase, improving oxygen supply to the brain and other vital organs and tissues.

Thirdly, laughter causes blood vessels to dilate by lowering blood pressure.

Some studies have also found beneficial effects of laughter therapy, including a decrease in blood sugar levels in diabetic patients. Laughter also activates facial and abdominal muscles. It even increases the activity of lymphocytes which are cells that help fight off harmful substances in the body for up to 12 hours after laughter. Laughter itself also plays an important role in our social relationships. It can bring people together and help them feel more connected. Summing up the results, this is why laughter therapy is a type of non-drug alternative that does not need special preparations or equipment. It has a positive impact on a person's physical and emotional well-being, and it can be especially helpful in dealing with stress on a daily basis.

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Influence of low-intense pulse ultrasound for tumor cells (Влияние низкоинтенсивного импульсного ультразвука на опухолевые клетки)

Ultrasound is now widely used in disease diagnosis and is also e mployed in tumour therapy. Normally, high-power ultrasound is used f or this, however it can damage not only tumour cells but normal cells t oo. Presumably, the reduction of side-effects after such exposure can b e achieved by using low-intensity pulsed ultrasound. As a consequenc e, a number of authors noted that the degree of inhibition in tumor gro wth after exposure to pulsed ultrasound depends sharply on the numbe r of pulses, their period and intensity of radiation. The higher the inten sity of ultrasound ranging from A-type to S-type frequencies, the stron ger the heating effect in tissues. Pulsed ultrasound, however, transmits less energy per unit time and does not heat up tissues. Most of the current studies on the antitumor effect of pulsed ultrasound utilize high radiation intensities or pulse repetition rates exceeding 100 Hz. However, there is a lack of research that has comparatively evaluated pulsed ultrasound below 100 Hz at low intensities.

The objective of the study is to investigate the antitumor properties of pulsed-periodic ultrasound (IP-US) and explore the mechanism of action of PI-US. A KUS-2S ultrasonic device (Ito Chotanpa Co., Tokyo, Japan) with a resonant frequency of 1.2 was employed as the source of pulsed-periodic ultrasound. The duty cycle was set at 50%, with a pulse repetition frequency ranging from 0.5 to 100 Hz. Output intensities stood at 0.3 W/cm. Human histocytic lymphoma U937 tumor cells, cultivated in RPMI-1640 nutrient medium at 37°C with 5% CO_2, were utilized.

Pulsed ultrasound irradiation resulted in diminished cell numbers, with the extent of impact linked to pulse repetition rates. A reduction of 50-60% in total cell count, with 15-20% displaying necrotic damage, was observed in the 0.5-3 Hz frequency range. Conversely, higher pulse repetition frequencies exhibited less significant tumor cell death than the control group. Notably, stationary ultrasound exposure yielded a mere 10% cell count, with cells perishing during the process due to increased temperature and mechanical disruption, rather than necrotic means. Even at 0.3 W/cm, stationary exposure proved more aggressive compared to pulsed, potentially harming surrounding tissues.

Pulse-periodic ultrasound at 0.3 W/cm inhibits the growth of human histocytic lymphoma U937 tumor cells via non-thermal mechanisms. These findings hint at the promise of employing pulsed ultrasound in tumor therapy, warranting further investigation.

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Useful properties of chocolate for humans (Полезные свойства шоколада для человека)

Chocolate, a delectable confection crafted from cocoa butter extracted during the processing of cocoa beans, the seeds of the cocoa tree rich in theobromine and caffeine, is a widely beloved food often utilized in culinary creations. Its composition boasts a range of components, including carbohydrates (6-56%), fats (31-38%), protein (5-9%), and trace amounts of theobromine and caffeine (0.5%). With an energy value of 670 calories per 100g, chocolate is a popular choice with an annual consumption of six billion pounds. Various alternatives to traditional chocolate are available, flavored with erythritol, monk fruit, or stevia, offering a diverse array of tastes.

The health benefits of cocoa and dark chocolate are remarkable, particularly for heart health. These treats can aid in reducing blood pressure by promoting nitric oxide production, which aids in relaxing

artery muscles. Rich in essential minerals like magnesium, iron, potassium, copper, phosphorus, and zinc, chocolate can boost good cholesterol levels (HDL) by lowering bad cholesterol (LDL). It may also decrease the risk of heart disease by improving endothelial function and preventing plaque formation. Antioxidants in chocolate combat the formation of plaques and blood clots, while also reducing stress hormones and potentially lowering cancer risk, enhancing insulin levels, reducing stroke risk, uplifting mood and enhancing physical performance.

Moreover, chocolate's impact on the body is attributed to serotonin and theobromine levels. The microelements present in chocolate offer skin-healing and toning benefits, smoothing wrinkles and stimulating skin cell growth. Methylxanthine and caffeine found in chocolate further contribute to skin toning effects. Cocoa-based masks applied to the face and neck can leave the skin velvety after treatment. While chocolate consumption offers numerous advantages, its high calorie content remains a concern. Products with lower cocoa content often contain more sugar, milk, or nuts, increasing caloric intake and diminishing health benefits. Opting for chocolates with over 50% cocoa content is recommended, with those containing 70% or more ideal for weight loss diets. Enjoying chocolate in moderation can provide positive effects such as antioxidant protection against free radicals and mood enhancement through endorphin release. However, limited consumption is advised due to its sugar and fat content; selecting higher cocoa content options and savoring chocolate as an occasional indulgence while maintaining a balanced diet is key approach.

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Une septicémie qui tue des millions de personnes (Сепсис, убивающий миллионы людей*)*

La septicémie a longtemps dépassé le problème chirurgical spécialisé consistant à identifier et à désinfecter rapidement les foyers Purulents ou les plaies infectées. À l'heure actuelle, la septicémie continue de préoccuper un nombre croissant de cliniciens, car elle a subi une pathomorphose importante et, sans être reconnue à temps, a coûté la vie à des patients dans des cliniques non infectieuses de divers profils. Il est important de se rendre compte que la septicémie, se développant parfois rapidement, peut compliquer l'évolution de diverses maladies – somatiques, oncologiques, endocrinologiques, etc. l'Évolution de l'humanité perd la guerre contre les bactéries, qui ont développé et mis en œuvre de nombreux mécanismes de résistance aux médicaments, en conséquence, l'Arsenal de nos “armes principales” – antibiotiques s'épuise, et fondamentalement Une preuve frappante de l'échec de la politique moderne de pressage antibactérien est l'urgence croissante du problème de la septicémie. La septicémie est une maladie connue de l'humanité depuis l'antiquité. Déjà dans les temps anciens, la septicémie est décrite dans les écrits d'Hippocrate, Galen, Ibn SIN comme une maladie potentiellement mortelle caractérisée par la fièvre et les symptômes de “putréfaction”, qui, selon la gravité de la manifestation, était recommandée pour se différencier de la rage et de la léthargie. Avant la découverte de micro-organismes au XVIe et XVIIe siècle, la septicémie était considérée comme une intoxication grave du corps par des produits chimiques inconnus, plus tard au XIXe siècle – comme une maladie contagieuse. Naturellement, avec l'avènement de la science de la Microbiologie, le concept bactériologique de la septicémie a dominé le monde pendant de nombreuses années.

D'autres infections, la septicémie est fondamentalement différente en ce sens qu'il s'agit d'une maladie polyéthologique qui se développe de manière acyclique avec la participation de micro-organismes opportunistes – représentants du microbiote humain. La deuxième différence importante est que pour guérir de la septicémie, il

n'est pas nécessaire d'éliminer complètement ces micro-organismes du corps de l'hôte. L'importance fondamentale est la masse de la charge bactérienne – c'est elle qui est nécessaire pour déclencher une réaction inflammatoire systémique et la “paralysie” de l'immunoréactivité primaire-phagocytose, c'est-à-dire pour la manifestation de la septicémie.

Dans le même temps, il faut reconnaître que pour la validation de la charge microbienne, différents chercheurs utilisent des critères différents, car il n'y a pas d'unités claires de mesure de la charge microbienne. Par exemple, la charge microbienne signifie et mesure en conséquence le nombre de bactéries formant des colonies dans un certain volume de matériel biologique; la concentration de lipopolysaccharide, de peptidoglycane ou d'autres composants structurels de la paroi cellulaire bactérienne, ainsi que le contenu quantitatif des copies d'ADN d'un agent pathogène potentiel et de nombreux autres marqueurs de la septicémie.

Dans le monde moderne, les changements globaux de l'écologie en général et de la microécologie en particulier s'accompagnent d'une augmentation de la prévalence des infections bactériennes, ce qui peut être observé le plus souvent parmi le contingent le plus affaibli de patients, selon la gravité de l'état hospitalisé. D'une part, l'étiologie de ces infections est associée à des bactéries dites conditionnellement pathogènes qui font partie du microbiote humain, qui n'étaient auparavant pas attribuées à des agents pathogènes, par exemple le staphylocoque épidermique. D'autre part, en tant que micro-organismes étiologiquement importants, les bactéries Gram-négatives non enzymatiques non propres au corps humain sont de plus en plus appelées, pour lesquelles la colonisation d'objets environnementaux humides est plus naturelle (par exemple, Pseudomonas spp., Acinetobacter spp., Stenotrophomonas maltophilia, Burkhalderia cepacia et al.). Il est important de souligner que tous ces “agents pathogènes modernes” ne présentent souvent pas de caractéristiques particulières de pathogénicité/virulence par rapport à celles connues précédemment. Mais tous les” agents pathogènes problématiques modernes ont une propriété commune — la capacité de résister à la thérapie antimicrobienne. Avec l'utilisation extrêmement répandue d'antibiotiques, les bactéries acquièrent des formes de protection de plus en plus sophistiquées qui leur permettent de survivre et de se multiplier sans entrave en présence d'antibiotiques des générations les

plus récentes. Ainsi, les staphylocoques “problématiques” (SARM, MRSE) sont protégés de la plupart des antibiotiques par le mécanisme de résistance à la méthicilline.

Avec le développement de la septicémie en milieu hospitalier, en particulier dans le département de réanimation, on peut affirmer qu'elle est causée par des souches polyrésistantes hospitalières. Par conséquent, lors du choix d'antibiotiques dans de tels cas, le traitement combiné le plus souvent recommandé sur le principe de désescalade, par exemple, carbapénème + linézolide. Il est appelé vital, car actuellement, les médecins n'ont pratiquement aucune alternative. La recherche scientifique intensive de nouveaux mécanismes et de nouvelles solutions au problème de la résistance aux antibiotiques se poursuit dans le monde.

Le centre européen de contrôle des maladies constate qu'en Europe, chaque année, près de 25 000 personnes peuvent mourir en raison de la résistance des bactéries aux antibiotiques. Selon le premier rapport de l'OMS, 11 millions de personnes, dont des enfants, meurent chaque année de septicémie. Des millions d'autres restent paralysés.

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Chronic pancreatitis (Хронический панкреатит)

Chronic pancreatitis is a chronic disease of the pancreas of various etiologies, characterized by progressive focal or diffuse degenerative-destructive changes in the exocrine tissue of the pancreas, atrophy of glandular elements, their replacement by connective tissue.

The following variants of chronic pancreatitis are distinguished:

toxic /metabolic, idiopathic, hereditary, autoimmune, chronic pancreatitis as a consequence of recurrent and severe acute, pancreatitis, obstructive.

The common causes of chronic pancreatitis include chronic renal failure, hyperparathyroidism, ischemic lesion in atherosclerosis of mesenteric vessels.

Abdominal pain is the main symptom of chronic pancreatitis. Usually, the pain is localized in the epigastrium with irradiation in the back, intensifying after eating and decreasing in a sitting position or leaning forward. It is observed in 80-90% of patients, in 10-20% of cases "pain-free pancreatitis" is noted. The phenomenon of "pancreatic burnout" is based on progressive fibrosis, as a result of multiple repeated attacks of pancreatitis, accompanied by a gradual decrease in pain simultaneously with the development of exocrine insufficiency has not yet been proven.

A doctor may suspect chronic pancreatitis if a patient has pain and dyspeptic syndromes, especially in cases where he abuses alcohol, has diseases of the biliary tract and duodenum**.**

The main role in solving the patient's problems – pain, dyspeptic syndromes, etc. – belongs to non-drug and drug treatment. Of great importance is care which provides:

• informing the patient about the principles of diagnosis and treatment of the disease;

• preparation of the patient for laboratory and instrumental studies;

• endoscopic examinations;

• monitoring the observance of bed rest in the acute phase of the disease, the dynamics of clinical manifestations (abdominal pain, dyspeptic manifestations, frequency and nature of stool, etc.);

• teaching the patient general hygienic and other measures that help reduce the severity or disappearance of dyspeptic syndrome: oral hygiene (careful brushing, rinsing, etc.), principles of therapeutic nutrition; prevention of flatulence (use of activated carbon, espumizan, etc.).

In conclusion, it can be noted that this disease is a serious problem of modern medicine. An important aspect in the treatment of chronic pancreatitis is an integrated approach including drug therapy, diet, physical activity and compliance with doctor's recommendations.

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Professional deformation of medical workers: how to avoid it? Профессиональная деформация медицинских работников: как этого избежать?)

A lot of doctors deal with various different stressful situations every day. Due to the lack of special training, doctors have to independently look for ways to relieve emotional strain. Faced with overloads at the beginning of a medical career young professionals do not always successfully adapt to different aspects of their work. Many doctors develop persistent and difficult-to-correct signs of professional personality deformation.

What is professional deformation of medical workers? This term is understood as the process and result of the influence of a person's subjective qualities, formed in accordance with the specifics of a certain professional activity, on his personal characteristics. Such a personality change occurs under the influence of periods or episodes of stress, however, it is not a stress disorder since it may not have pronounced clinical symptoms. Psychologists focus on the fact that professional deformation is an individual phenomenon that is expressed in different ways. There are three vectors of its manifestation:

- persistent exhaustion: incipient health problems, frequent headaches, body aches, disruption of the gastrointestinal tract, skin rashes and unhealthy sleep. This also includes emotional fatigue, inability to concentrate, excessive sentimentality and other atypical reactions.

- cynicism: weakened communication skills, depersonalization of patients, abandonment of plans for further professional growth.

- medical apathy: devaluation of one's achievements, dissatisfaction with one's work, impostor syndrome.

Doctors who often encounter fatal cases during practice are more prone to professional deformation. These include oncologists, surgeons and intensive care specialists. Highly specialized doctors are also more likely to face this problem than others. The lack of diversity,

typical clinical cases, treatment that is similar for all patients- it seems that there is nowhere to grow and there is no need- everything has already been studied. As a result, interest in work is lost.

So, what can doctors do to prevent the symptoms of professional burn out? Psychologists give the following recommendations: establish clear boundaries between work and personal time, define and realize the area of your competence, don't worry about what doesn't depend on you, take care of your health by including sports, walking, proper nutrition and sleep in your life, analyze all the pros and cons of the profession of a doctor and if the disadvantages outweigh, it may be worth thinking about changing your place of work or field of activity.

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Problems and issues of professional intercultural communication in the construction industry (Проблемы и вопросы профессиональной межкультурной коммуникации в сфере строительства)

Professional intercultural communication plays a crucial role in the construction industry due to its global nature and the involvement of diverse stakeholders from different cultural backgrounds. There are several problems and issues:

1. Language barrier. Communication breakdowns can occur when parties involved in construction projects do not share a common language or have limited proficiency in a shared language. This can lead to misunderstandings, errors, delays, and overall inefficiencies in project execution.

2. Cultural differences. Cultural diversity among team members, clients, contractors, and other stakeholders can lead to misunderstandings and conflicts. Variations in communication styles, decision-making processes, and work ethics can create challenges in coordinating activities and reaching consensus on project goals.

3. Lack of cultural awareness and sensitivity. Insufficient understanding of cultural norms, values, beliefs, and practices can hinder effective communication and collaboration in construction projects. Failure to recognize and respect cultural differences may result in unintentional offense, misinterpretations, and strained relationship among team members.

4. Cross-cultural conflict resolution. Disagreements, disputes, and conflicts may arise due to cultural differences in communication styles, conflict resolution approaches, and negotiation strategies. Resolving conflicts effectively requires cultural sensitivity, empathy, active listening, and a willingness to compromise to find mutually acceptable solutions.

Addressing these problems and issues of professional intercultural communication in the construction industry requires proactive measures such as:

- Providing intercultural communication training and cultural competence workshops for construction professionals to enhance their communication skills and cultural awareness.

- Encouraging diversity and inclusion initiatives within construction organizations to promote respect for cultural differences and create a supportive work environment for employees from diverse backgrounds.

- Implementing cross-cultural communication strategies, such as using interpreters, translation services, visual aids, and technology tools to facilitate effective communication across language barriers.

- Establishing clear communication protocols, guidelines, and conflict resolution mechanisms that consider cultural nuances and promote constructive dialogue among multicultural teams.

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The unusual architectural building of the Lala-Tulpan Mosque of Ufa (Необычное архитектурное строение мечети Ляля-Тюльпан г. Уфы)

I am a student of the Department of Construction of Bashkir State Agrarian University in Ufa so unusual forms of buildings always attract my attention. The article is devoted to the architectural features of the Lala-Tulpan Mosque in Ufa.

The building of the Lala-Tulpan Mosque is one of the most remarkable architectural masterpieces of Ufa. It is a very famous place of interest of the city. The architectural ensemble of the mosque is unique, recognizable and very beautiful. It harmoniously combines classical design elements with the latest fashion trends. This Moslim temple is located in the northern part of Ufa, on the bank of the Belaya River. The Lala-Tulpan Mosque was built thanks to donations from believers and was opened on 7 April 1998.

The architect of the mosque is Vakil Davletshin. He created a unique project inspired by the pattern of the undying bud of the spring flower – the tulip. This flower is one of the symbols of Islamic culture and means the approach of spring.

The name of the mosque comes from the two tall minarets in the form of tulip blossom at the entrance. The minarets are graceful snow-white columns directed to the sky, are 53 meter tall, so they can be seen from a great distance. The weight of each minaret is 34 tones. The minaret towers serve for muezzin to call believers to a prayer several times a day.

The building of the mosque consists of the above-ground part and of the underground part which is 10 meters deep. The ground work makes up 6 m. The mosque includes a mosque and a madrasah. The hall of the mosque can give place to half a thousand Muslims, and 200 women can attend a prayer on the special balcony.

The interior of the mosque reflects Islamic decoration traditions.

Marble walls are decorated with plant patterns and images of paradise flowers. The same is depicted on the stained glass windows. The floor is made of ceramic tiles. Carpets with oriental patterns cover the floor.

The building of the mosque is three-storeyed. One storey is reserved for study halls and a library. The other floor is used for various ceremonies, including weddings.

The unique temple attracts plenty of pilgrims and believers, as well as many tourists who visit this place every year. It may be of great interest also for construction specialists.

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The importance of urban landscaping (Значение озеленения городской территории)

The problem of developing favorable living conditions in cities involves the creation of healthy and comfortable conditions for the population. This has become relevant due to the fact that external landscaping, organization of open areas, landscape design and landscaping are becoming increasingly important for solving this problem. This study is aimed at identifying specific positive aspects and advantages that the presence of green spaces in an urban environment brings. In addition, it includes an assessment of the effectiveness of using green spaces to solve various problems.

Greening an urban area has many advantages that are important both for the environment and for urban residents. Here are some of the main advantages of urban greening: improving air quality, creating natural barriers, regulating temperature, creating a comfortable urban environment, social benefits, and increasing biodiversity.

There are many types of landscaping that can be used to improve the urban environment: parks and squares, alleys and boulevards, vertical landscaping, urban gardens and garden plots, outdoor pots and pots on balconies, green roofs.

As an example, let us consider the Square of the 50th anniversary of the Victory in Ufa. It is a green area dedicated to the memory of victory in World War II. There are various types of plants that are used to create a beautiful and well-maintained landscape.

In recent years they have updated pedestrian paths, completely modernized the lighting system, installed benches and trash cans, a bicycle path, a children's play area, a complex of street exercise equipment, the latest playground for skateboards and roller skaters, built a hockey box. There is a flower bed in the shape of a five-pointed star in the central part of the square. They have renovated the lawn, equipped flower beds and alpine hills, and planted young trees.

Greening an urban area can also face a number of problems and challenges that can complicate the process and require careful consideration: lack of land, soil and air pollution, lack of water, care and maintenance, conflicts with infrastructure, biodiversity and ecosystems, waste management. These problems and challenges require an integrated approach to the planning and implementation of urban greening, as well as the cooperation of various stakeholders to achieve sustainable and effective results.

In conclusion, urban greening is an important step towards creating a healthy and sustainable urban environment. Despite existing problems such as lack of land and water, pollution and maintenance, landscaping has many positive effects, including improving air quality, lowering temperatures, maintaining biodiversity and improving the life quality of citizens.

СОВРЕМЕННЫЕ ТЕХНОЛОГИИ ПИЩЕВОЙ ПРОМЫШЛЕННОСТИ И БИОИНЖЕНЕРИИ

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Human nutrition: Organising proper nutrition (Питание человека: организация правильного питания)

Nutrition is very important for maintaining human health throughout his life. It is the set of biological processes that affect the survival, growth, development and the integrity of a living organism on the basis of the availability of energy and nutrients. It is therefore distinguishable from the power supply, which in physiology is regarded as the moment of the corresponding nutrition action to provide nutrients to the body.

The importance of food is known to be obvious and essential. Healthy balanced diet provides us with nutritive substances and energy to stimulate growth, to maintain physical and mental health and prevent diseases. To support the internal forces of the organism, it is especially important to receive food and biological substances that ensure the optimal realization of physiological and biochemical processes fixed in the genotype.

However, unbalanced diet which is manifested by various changes in the human body can be the beginning of the development of a large number of alimentary-dependent diseases caused by many factors including the excessive caloric intake of food, a sedentary lifestyle, genetic predisposition, taking medication and the presence of endocrine and psychiatric diseases. Restriction of energy intake, fear of gaining weight, changed self-perception and an over-evaluation of one's body weight and shape contribute to the nervous disturbance.

An important condition is the development of a person's correct eating behavior which depends not only on his internal state, but also mental and physical capabilities, life expectancy, resistance to infections and harmful environmental factors. Also, food behavior

provides such important functions as the supply of substances from which hormones, enzymes and other regulators of metabolic processes are formed; renewal and construction of cells and tissues; energy supply to cover the energy costs of the human body.

Therefore, when organising proper nutrition, it is necessary to observe the energy balance, which represents the equilibrium state between the energy supplied by food and its expenditure on various types of human physical activity, maintenance of basic metabolism, growth, development and additional costs in women during pregnancy and breastfeeding.

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Ruby chocolate: What makes it unique?
(Рубиновый шоколад: Что делает его уникальным?)

Chocolate is consumed largely worldwide, and it is known as one of the most favorite treats. Main categories of chocolate are dark, milk and white, corresponding to the content of cocoa solids, milk fat and cocoa butter. With the mentioned three types of chocolate, Barry Callebaut, Belgian-Swiss cocoa company, has recently released the fourth type of chocolate - Ruby chocolate. It is claimed that red or purple cocoa-derived materials can be produced by treating cocoa nibs, obtained from raw cocoa beans which have higher polyphenol content than fermented cocoa beans.

Unfortunately, some researchers dispute the fact that there are 4 types of chocolate. In their opinion, this chocolate is created with the use of colouring and flavouring agents. Larisa Ryseva, a head of the chocolate production laboratory at the All-Russian Research Institute of the Confectionery Industry believes that ruby chocolate is a marketing ploy with the addition of dyes and flavors. Vitaly Alenkin, a curator of the collection of tropical plants at the Moscow State University’s Botanical Garden "Aptekarsky Ogorod" suggests that cocoa beans are picked unripe and fermented for a short time or

simply dried and "alternatively they can be extracted to add a pink colour to existing chocolate". This opinion is more likely to be true, as it is explained by the patent taken by Barry Callebaut. Chocolate expert Dom Ramsey was also sceptical about Ruby's appearance, saying it was hard to judge the variety because Barry Callebaut had said little about its ingredients or production process.

Experts describe the taste of ruby chocolate as a moderately sweet white chocolate with raspberry and lemon notes. Also, people who have managed to taste this type of chocolate say that it has almost no characteristic cocoa flavour. As far as we know, the main ingredients of ruby chocolate are cocoa beans, cocoa butter and milk. However, the main flavour characteristic of ruby chocolate is its acidity. Ruby chocolate texture is smooth and creamy, its fluidity is estimated at 3 drops, which makes it suitable for the preparation of all desserts. Although the exact method of making the chocolate is a mystery, some experts speculate that ruby chocolate is made from unfermented Brazilian cocoa beans, which may have a natural reddish-pink colour.

After dark, milk and white, ruby is the most uncommon chocolate discovery. Its unique taste makes it have a range of applications in culinary art.

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Rosehip energy drink: Composition and health benefits (Энергетический напиток с добавлением шиповника: Состав и полезные свойства)

In recent years, energy drinks have gained popularity among people of all ages. Energy drinks as stimulating beverages enhance mental and physical activity, boost energy and concentration due to

the ingredients such as caffeine or taurine and glucose. Energy drinks refer to the functional beverages, which can be grouped into sports and nutraceutical drinks. Sports drinks are supported to be consumed during physical activity to prevent dehydration, supplying carbohydrates, providing electrolytes without containing caffeine. As for nutraceutical beverages, they contain bioactive compounds such as concentrated tea, fruit, beverages and herb extracts promote and enhance health.

The addition of rosehip will result in a significant enrichment of the energy drink thanks to its active biological substances, as well as a unique taste. Additional interest among the consumers is caused by the fact that rosehip can be considered a healthy food product. Scientific studies have shown that there is a wide range of preventive and therapeutic activities for rosehip. In traditional medicine, there are many ways to use these fruits, most often used to help you avoid colds and flu. Rosehip fruits are used as a source of Vitamin C. Medicines with the addition of rosehip are used to support the immune system. When ingested, 6-12 g of rosehip fruits can completely replace the daily intake of Vitamin C and P. Thus, rosehip can not only add more nutrients to energy drinks that stimulate the body, but also give a flavor zest.

Having studied the chemical composition, the ingredients of energy drinks, we came to the conclusion that they can really give our body energy, but they have a short-term effect, as well as negative consequences for the body, many of which are not completely studied, because energy drinks themselves are not produced for so long. The problem can be solved by adding rosehip, it will make the composition of the product more useful for your body. Health experts recommend not to consume energy drinks for no reason and in large quantities, drink them in moderation, otherwise no value of the product will save you from the health consequences like increased heart rate and blood pressure, insomnia and anxiety.

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Modern cookery: Molecular gastronomy (Современная кулинария: Молекулярная кухня)

Modern cookery is a dynamic blend of traditional food methods and innovative food techniques. By combining ingredients and techniques from different culinary traditions professional chefs can create both visually appealing and delicious dishes. Molecular gastronomy has become a significant trend in the culinary world and has attracted attention from both food scientists and professional chefs. Molecular gastronomy or molecular cuisine is a culinary style that involves new techniques in the preparation, transformation and artistic presentation of food.

While molecular gastronomy is still considered to be a niche within the culinary world, it has attracted a growing number of followers and has become an integral part of modern gastronomy. Its popularity can be seen through the increasing number of restaurants and culinary establishments that emphasize molecular gastronomy techniques and concepts in their menus. Molecular gastronomy allows chefs to use new techniques and ingredients transforming familiar flavours into exciting culinary experiences. Molecular cooking techniques such as specification, foams, and emulsions can create unique textures and enhance the flavor of dishes. This can provide a memorable dining experience for the customers. Molecular gastronomy techniques can be used to modify the texture and presentation of food, making it more appealing and easier to consume for certain individuals with special dietary needs. Moreover, these techniques can help preserve the nutritional value of ingredients by reducing heat exposure during cooking. Molecular gastronomy has become an exciting and innovative approach to cooking. Its unique techniques and visually appealing dishes have captured the interest and fascination of many people, contributing to its development in the culinary world. It encourages people to learn about the chemistry and physical properties of ingredients, leading to a better understanding and appreciation of food.

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New trends in the food industry: Functional foods (Новые тенденции в пищевой промышленности: Функциональные пищевые продукты)

The development of food industry technologies is influenced by many factors including the changing requirements of consumers, which determine new trends in the production, storage and quality control of food products. Consumers are becoming increasingly interested in safe and environmentally friendly methods of producing new products, given their impact on health and the environment. They are also interested in healthy eating, preferring functional foods and nutraceuticals promoting health.

Food manufacturers are actively exploring new methods of processing and storing products to meet the needs of consumers for safer and healthier products.

One of the key trends in food production is the growing demand of consumers for functional products promoting health. Such products not only cause harm, but can also be useful for the treatment or prevention of various diseases, such as heart disease, osteoporosis, diabetes and others. The Food and Nutrition Board of the Institute of Medicine has defined functional products as food or food ingredients that can have a beneficial effect on health, in addition to the traditional nutrients they contain.

The functional characteristics of food products can be improved in various ways, including the use of biotechnology. Genetic engineering plays an important role in creating products with certain properties. This approach is to change the genes contained in cells to form products with new properties or composition. An example of this approach is the genetically modified Flav T-Savr tomatoes, which not only have an improved texture, but also have other useful properties.

Genetic engineering can be used to increase the nutritional value of products such as corn with a high content of oleic acid or tomatoes with a large amount of lycopene. It is also possible to create products

with a high content of resveratrol, such as wines and yeast by gene modification. This will open up the possibility of producing food specially adapted to specific groups of consumers, such as hypoallergenic products, from which allergens have been removed.

Research in the field of genomics and genetics allows us to understand more deeply the human genome and the genetic nature of some diseases that can open up prospects for creating products that reduce the risk of cancer and other diseases.

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One more brilliant way to justify the theory: Schrodinger's cat (Ещё один блестящий способ подтвердить теорию: Кот Шродингера)

What is Schrodinger's cat? This is a thought experiment authored by one of the founders of quantum mechanics, Erwin Schrodinger. The presence of a physically understandable object in a thought experiment makes such an experiment much more popular than others precisely because of the "intelligibility" factor. The purpose of the experiment is to show that quantum mechanics is incomplete without some rules that indicate under what conditions the wave function collapses, and the cat either becomes dead or remains alive, but ceases to be a mixture of both.

A quantum state, or in another way, a superposition state, is a state in which one object can be located at different points in space, states, or any other quantities. According to the superposition, not only the position of the object can change, but also its state. So, Schrodinger's thought experiment: a cat is locked in a cell. There is a particle of a radioactive isotope in the chamber on the Geiger counter, so small that its decay may or may not occur in an hour.

In case of disintegration, a capsule with a poisonous substance will break, which will kill the cat. If the disintegration does not occur,

the cat will remain alive, because the capsule with this poison will not be broken until the end of the experiment lasting, say, for an hour. It is unknown whether the cat is alive or not, and it becomes clear only at the end of the experiment with the opening of the cell. After the cell is opened, we understand what happened to the cat, but while the cell is closed, the cat is in the state of superposition between life and death.

The thought experiment was proposed when discussing the physical meaning of the wave function, which, in fact, had nothing to do with the unfortunate cat.

Schrodinger was going to show that a superposition state is possible until the experiment is done. But there are some things that cannot be in a transitional state. And it was the absurdity of the cat experiment that confirmed his words. After all, a cat cannot actually be in an intermediate state. At the end of the experiment, it will be either alive or dead.

It was nevertheless absolutely correct, from Schrodinger's point of view, to associate the result of the experiment, namely the state of the cat, with the decay or non-decay of the atom in the allotted time.

To sum up, we can say that the mental and so popular experiment with Schrodinger's cat was nothing more than a vivid metaphor for substantiating his ideas while discussing much more important things. During the discussion of the interpretation of quantum theory.

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Fiber optics in Medicine (Оптоволокно в медицине)

Fiber optics as a term is the study of the propagation of light flux in an optical fiber. As a product, fiber optics is everything that contains a fiber optic element. An optical fiber is a thin strand made of quartz glass, inside which a light beam flows without leaving it. Today there is optical fiber with a plastic core, the characteristics of which are close to natural quartz. There is only one meaning - the light beam

is reflected from the walls of the core and retains its information content regardless of the data transmission distance. Optical fiber is the best material for transmitting a digital signal without attenuation over long distances.

The method under consideration has many applications in medicine, being used in the diagnosis and treatment of eye diseases, endoscopy, surgery, photodynamic therapy, and laser therapy. Light guides can be used to transmit light into the body to visualize internal organs and tissues, and to minimize invasive treatment, meaning less physical harm to the patient. In diagnosing eye diseases, light guides can be used to transmit light into the eye, allowing doctors to view the fundus of the eye and diagnose diseases such as glaucoma, cataracts, and retinal degeneration.

Fiber optics is used in endoscopy, a procedure in which a doctor inserts an endoscope into a patient's body to examine internal organs, remove tissue samples for biopsies, or perform surgery. Fiber optics plays an important role in this procedure, as it allows the image from the endoscope to be transmitted to a monitor, which allows the doctor to see the internal structure of the organ and identify the presence of pathologies.

The use of fiber optics in endoscopy of the gastrointestinal tract is especially important. The intestines have a complex structure, and fiber optics helps doctors accurately diagnose and choose the right treatment strategy. One of the most common endoscopic diagnostic methods is colonoscopy, which can detect polyps and tumors in the colon.

Fiber optics is also used in surgery. It allows surgeons to accurately guide instruments and perform manipulations, which reduces the risk of damage to surrounding tissue. For example, in laparoscopy, where a surgical instrument is inserted through small holes in the abdominal wall, fiber optics allows surgeons to see the surgical field on a monitor even if they are outside the patient's body.

Photodynamic therapy is a tumor treatment method that uses photosensitive drugs and light to destroy malignant cells. Fiber optics allows you to precisely direct the light flux to the tumor, which increases the effectiveness of treatment and reduces the negative impact on health.

Fiber optics in medicine has a spectrum of advantages.

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Advantages of natural gas (Достоинства природного газа)

The process of extracting and processing natural gas uses various methods such as well operations and gas liquefaction technologies. Once processed and purified, natural gas becomes "purified natural gas" and can be used in a variety of industries such as energy, chemicals, industrial heating and home heating. It can be used as a fuel to generate electricity, heat water, and power gas furnaces and turbines. Natural gas is also used as a raw material to produce various chemical products, including plastics, fertilizers and more. Due to its relative purity and low content of harmful emissions when burned, natural gas is considered one of the most environmentally friendly sources of energy.

Natural gas is considered more environmentally friendly than other fossil fuels because its combustion produces less carbon dioxide and other harmful substances. In addition, natural gas has a higher energy density, making it more efficient and economical.

However, the extraction and use of natural gas also has its downsides. Uncontrolled emissions of natural gas into the atmosphere can lead to air pollution and an increase in the greenhouse effect. In addition, natural gas extraction can lead to environmental problems such as earthquakes and groundwater contamination.

However, with the use of new technologies and control measures, natural gas can play an important role in reducing the use of hydrocarbon fuels and the transition to cleaner energy. Many countries are currently actively developing their infrastructure for the production, transportation and use of natural gas.

Natural gas is an important energy resource that plays an important role in human life and without which we cannot imagine life.

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Application of a derivative for problems of mechanics (Применение производной функции к задачам механики)

This article is devoted to the application of the derivative to problems of mechanics.

The derivative of function is one of the most important concepts in mathematics and is widely used in various fields of technics and science. In particular, in mechanics, the derivative of a distance function with respect to time allows us to determine the speed of a body movement, and the derivative of speed with respect to time allows us to determine acceleration.

Let's consider an example of using the derivative for mechanics problems. We expect that the derivative of a function will allow us to determine the instantaneous speed of a body, as well as to find its acceleration and trajectory.

The function S = S(t), t ∈ [t1; t2] determines the law of body motion (t – time, S – path, S(t) – function that determines the distance traveled during each piece of time between t1 and 2t). Let's fix some moment t ∈ [t1; t2] and give it an increment Δt so that there is also t + Δt ∈ [t1; t2]. It should be noted that Δt can be of any sign. Let's make the corresponding increment of the function S(t): ΔS = S(t+Δt) – S(t). The ratio ΔS/Δt is obviously the average speed of movement within the interval [t; t + Δt] and for a fixed t depends on Δt. Then the limit of the average speed at Δt → 0 (if it exists) is the instantaneous speed at the given time t, which is denoted as follows:

$$v = \lim_{\Delta t \to 0} \frac{\Delta S}{\Delta t} = S'(t) \left(\text{или } \dot{S}(t) \right).$$

At the same time, in this notation S′(t) is called the derivative of the function S(t) at the given point t ∈ [t1; t2]. But since the point t is taken completely arbitrarily, then, on assumption that the specified limit exists for any t ∈ [t1; t2], we immediately come to the definition of the derivative S′(t) as a function defined within the same interval as

the function S(t). Thus, the problem of determining the instantaneous speed – the path derivative with respect to time – is solved for each point of the segment (the derivative is a certain number) and for the segment as a whole, where the derivative is a function, since each valuation t ∈ [t1; t2] is brought into account according to the law with the corresponding value v(t) = S′(t).

Therefore, it is possible to calculate the acceleration using the derivative in the same way. It will be designated as follows:

$$a(t) = \lim_{\Delta t \to 0} \frac{v(t + \Delta t) - v(t)}{\Delta t} = v'(t)$$

In conclusion, I would like to note that the application of derivatives in mechanics in such a way plays a very important role in science, allowing us to understand and analyze the movement of bodies, to determine their speed and acceleration, and to predict their behavior in various situations. The notion of the derivative allows us to calculate physical parameters more precise and make well-founded decisions while designing and maintaining various mechanical systems. Consequently, the study and application of derivatives in mechanics is of great importance for modern science and practice.

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Application of differential equations in physics (Применение дифференциальных уравнений в физике)

This article is devoted to the differential equations.

Most problems in physics lead to the necessity for solving differential equations. This may be explained by the fact that many physical laws are differential equations regarding some functions that characterize these processes. Physical laws represent a theoretical generalization of many experiments and describe the evolution of the

sought quantities, both in space and in time.

A differential equation is an equation that also contains derivatives of unknown functions in addition to independent variables and unknown functions of these variables. The highest derivative order of an unknown function included in a differential equation is called the order of the differential equation.

A 1st-order differential equation is an equation that connects an independent variable, the sought function and its 1st-order derivative. These methods are often used to setting up of differential equations: 1) Write down the condition for the derivative of the sought quantity using certain laws of physics and the physical meaning of the derivative; 2) Determine which of their values will be an independent variable, and which will be a dependent one; 3) Then find a linear approximation for the increment of *Dy* for *h*; 4) By dividing *Dy* by *Dx* and turning to the limit *at*, a differential equation is obtained.

A 2nd–order differential equation is an equation that includes an independent variable, an unknown function, and the first and second derivatives of this function. For example, Newton's second law of motion is a second-order differential equation

$$m\frac{d^2 * r}{dt^2} = F(r, v, t)$$

Therefore, differential equations are an important tool for solving physical problems.

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The occurrence of oil and gas deposits in the subsurface and methods of extracting them (Залегание залежей нефти и газа в недрах и способы их добычи)

Oil is the black gold of our planet. Nowadays it is impossible to imagine human life without oil, as it is used to produce fuel, plastic and other materials necessary for various industrial fields.

How does the oil production work? Many people believe that drilling a well is all it takes for oil to come to the surface. However, in

reality, there are many geophysical factors that need to be taken into account in order to produce oil and gas. Complex technical devices are also used in the process.

Where to find oil? One of the main characteristics of oil is its lower density compared to water. This is what leads to the formation of oil-bearing formations. There is usually water at the bottom, oil in the middle, and natural gas at the top. Rocks that contain oil and accumulate oil and gas are known as reservoirs. They are most often sedimentary rocks. However, in order for a rock to act as a reservoir, it must be enclosed between two impermeable layers such as clay or gypsum. Oil is trapped in what are known as "traps", where hydrocarbon-rich layers are enclosed between impermeable rock layers.

Prospecting, exploring, and developing mineral deposits all involve studying the geology of an area. To do so, geophysical methods are used to examine wells and determine the sequence of rock formations, presence of minerals, and depths of different strata. It is essential to conduct well exploration before and after field development, as this data is crucial for planning and optimizing production. Analyzing geologic sections assists in understanding the potential for minerals and their distribution in an area, which is critical for making informed decisions regarding drilling locations.

Currently, there are two main methods used for well operation: fountain and mechanized (which, in turn, can be divided into two categories: gas lift and pumping). The choice of method depends on various factors, including the magnitude of reservoir pressure, depth of formation, composition of oil, degree of water content, pressure of liquid in the borehole, and other factors.

The fountain method is used at high reservoir pressure. In this case, the oil gushes, rising to the surface through pumping and compressor pipes (TUBING) due to the energy of the reservoir.

Gas lift is a mechanized method of oil production that uses the energy of compressed gas to lift oil from the bottom of a reservoir. The pumping method of mechanized oil production involves the extraction of oil using different types of pumps.

Therefore, oil production is a complex process that needs to take into account various factors.

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Aktuelle Probleme der modernen Physik (Актуальные проблемы современной физики)

Wenn wir die Entwicklung der Menschheit betrachten, kann es für uns scheinen, was die Wissenschaft alles weiß. Dass wir die Antworten auf alle Fragen kennen, dass uns alles im Universum bereits bekannt ist, ist das eigentlich nicht unser Fall. In vielen Bereichen der Wissenschaft existieren immer noch ungelöste Fragen, auf die wir keine Antworten finden können. Physik ist auch keine Ausnahme. Beschreiben wir einige dieser Fragen.

Auf dem Gebiet der theoretischen Physik besteht das Problem darin, zwei Theorien – die Quantenmechanik und die allgemeine Relativitätstheorie – in eine kohärente Theorie zu verbinden. Es wird dadurch verursacht, dass diese beiden Theorien auf verschiedenen Prinzipien basieren, was schwer zu kombinieren ist. Wenn wir jedoch eine neue Theorie aufbauen können, die die beiden vereint, werden wir der sogenannten «Theorie von allem» näherkommen, die alle grundlegenden Wechselwirkungen im Universum beschreibt.

Wenn die Rede von Kosmos ist, so bewahrt der Kosmos in sich viele Geheimnisse. Es gibt dunkle Materie im Universum, die nicht elektromagnetisch mit der Umgebung interagiert, weshalb wir sie nicht direkt sehen können. Einige beobachtete Phänomene im Weltraum können jedoch durch sie erklärt werden. Bisher ist die dunkle Energie hypothetisch. Die Wissenschaftler haben geglaubt, dass sich die Expansion des Universums verlangsamt hat – bis experimentelle Daten haben gezeigt, dass es sich mit Beschleunigung ausdehnt. Um dieses Phänomen zu beschreiben, wurde ein Modell dunkler Energie erstellt. Aber die Existenz dieser Energie ist noch nicht bewiesen.

Für Wissenschaft gibt es viele noch ungelöste Erscheinungen. Das Unbekannte sollte uns jedoch nicht erschrecken, sondern im Gegenteil unsere Neugier wecken. Im Laufe der Zeit werden alte Fragen gelöst und neue entstehen aus ihnen – nur so kann man zum Wesen der Dinge gelangen.

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Chemical industry today
(Химическая промышленность сегодня)

Metallurgy is actively used in the chemical industry in the modern world.

Valves are made from various metal alloys, and parts and devices are made from them. Then, through these cracks, some szupada pass, which must not react with alloys, some of which have deteriorated. The gate valve is a part of the body, a type of independent shut-off valve. Construction causes disruption of the internal working environment to industrial highways, utility and technical pipelines. Device management functionality is enabled by the component system. The principle of which is simple. It overrides the locking element of the handle, which prevents the movement of liquid and gas.

Serial or high-strength modular cast iron and various steels - low-alloy, low-alloy, stainless steel - are used for the production of bolt bodies.

The material of the latch cannot affect its resistance to aggressive environments. A cast iron valve is resistant to the effects of gasoline, diesel fuel, industrial and motor oils a little worse than steel. A combined option is possible - the body is made of cast iron, and the details in contact with an aggressive environment are made of stainless steel. An epoxy coating can protect the housing from corrosion.

Not only ferrous metals, but also colored (aluminum alloys) and even non-metallic materials are used for housings. The range of some manufacturers includes PVC (polyvinyl chloride) valves.

For example, gate valves and hose valves are specialized devices, while wedge valves are a universal device. And in pipelines that transport non-aggressive media (water, oil, gas) and ammonia, alkalis, etc. can be used for caustic substances such as.

My father works as a machine tool operator at the Valve factory in Blagoveshchensk, Bashkortostan. Such body parts are produced there, my father works with them, creates computer programs and processes them, and thus various devices are obtained, which are then widely used. They are bought by gas and oil companies and the state housing and utility corporations.

С О Д Е Р Ж А Н И Е

Секция 1
НАУЧНО-ТЕОРЕТИЧЕСКИЕ И ПРИКЛАДНЫЕ ПРОБЛЕМЫ ИССЛЕДОВАНИЙ

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ЕСТЕСТВЕННЫЕ НАУКИ

МАТЕМАТИЧЕСКИЕ И КОМПЬЮТЕРНЫЕ НАУКИ

ФИЗИЧЕСКИЕ НАУКИ

ХИМИЧЕСКИЕ НАУКИ

Секция 2

ПРОБЛЕМЫ ПРОФЕССИОНАЛЬНОЙ КОММУНИКАЦИИ

ГУМАНИТАРНЫЕ НАУКИ

ЕСТЕСТВЕННЫЕ НАУКИ

ИНЖЕНЕРНЫЕ НАУКИ

МАТЕМАТИЧЕСКИЕ И КОМПЬЮТЕРНЫЕ НАУКИ

МЕДИЦИНА

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