



# SCIENTIFIC RESEARCH OF THE SCO COUNTRIES: SYNERGY AND INTEGRATION

上合组织国家的科学研究：协同和一体化

Materials of the  
International Conference

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Part 1: Participants' reports in English

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这些会议文结合了会议的材料 – 研究论文和科学工作者的论文报告。它考察了职业化人格的技术和社会学问题。一些文章涉及人格职业化研究问题的理论和方法论方法和原则。

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## Foreword

*We thank all participants of our conference "Scientific research of the SCO countries: synergy and integration" for the interest shown, for your speeches and reports. Such a wide range of participants, representing all the countries that are members of the Shanghai Cooperation Organization, speaks about the necessity and importance of this event. The reports of the participants cover a wide range of topical scientific problems and our joint interaction will contribute to the further development of both theoretical and applied modern scientific research by scientists from different countries. The result of the conference was the participation of 56 authors from 7 countries (China, Russia, Uzbekistan, Kazakhstan, Azerbaijan, Tajikistan, Kyrgyzstan).*

*This conference was a result of the serious interest of the world academic community, the state authorities of China and the Chinese Communist Party to preserve and strengthen international cooperation in the field of science. We also thank our Russian partner Infinity Publishing House for assistance in organizing the conference, preparing and publishing the conference proceedings in Chinese Part and English Part.*

*I hope that the collection of this conference will be useful to a wide range of readers. It will help to consider issues, that would interest the public, under a new point of view. It will also allow to find contacts among scientists of common interests.*

**Fan Fukuan,**

*Chairman of the organizing committee of the conference*

*"Scientific research of the SCO countries: synergy and integration"*

*Full Professor, Doctor of Economic Sciences*

## 前言

我们感谢所有参加本次会议的“上海合作组织国家的科学研究：协同作用和整合”，感谢您的演讲和报告。代表所有上海合作组织成员国的广泛参与者都谈到此次活动的必要性和重要性。参与者的报告涵盖了广泛的主题性科学问题，我们的联合互动将有助于不同国家的科学家进一步发展理论和应用的现代科学研究。会议结果是来自7个国家（中国，俄罗斯，乌兹别克斯坦，哈萨克斯坦，阿塞拜疆，塔吉克斯坦，吉尔吉斯斯坦）的83位作者的参与。

这次会议的召开，是学术界，中国国家权力机关和中国共产党对维护和加强科学领域国际合作的高度重视的结果。我们还要感谢我们的俄罗斯合作伙伴无限出版社协助组织会议，准备和发布中英文会议文集。

我希望会议的收集对广大读者有用，将有助于在新的观点下为读者提供有趣的问题，并且还将允许在共同利益的科学家中寻找联系。

范福宽，  
教授，经济科学博士，中国科学院院士，会议组委会主席“上合组织国家科学研究：协同与融合”



国际评级背景下的21世纪俄罗斯和中国的企业家精神  
**ENTREPRENEURSHIP IN RUSSIA AND CHINA IN THE 21ST  
CENTURY IN THE CONTEXT OF INTERNATIONAL RATINGS<sup>1</sup>**

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抽象。 本文基于两个国际评级对《俄罗斯和中国》的创业状况进行分析：《营商环境报告》和《全球创业监测》(GEM)。 根据《营商环境》项目的规定，俄罗斯对企业家身份的法定监管使经商更加容易，但是，中国各项指标的动态性确保了其更快，更可持续的增长。 对创业板主要指标的分析-早期创业活动总指数(TEA)表明，尽管观察到的俄罗斯TEM有所增加，而中国的这一指标略有下降，但中国人口的创业活动水平较高。

关键字：创业精神，俄罗斯，中国，经商，全球创业精神监测(GEM)。

**Abstract.** *The article deals with the analysis of the state of entrepreneurship in Russia and China based on two international ratings: Doing Business and Global Entrepreneurship Monitor (GEM). According to the Doing Business project, statutory regulation of entrepreneurship in Russia makes doing business a little bit easier; however, the dynamics of indicators in China ensures their faster and more sustainable growth. An analysis of the GEM main indicator - Total early-stage entrepreneurial activity index (TEA) indicates a higher level of entrepreneurial activity of Chinese population, despite the observed increase in TEM in Russia and a slight decrease of this indicator in China.*

**Keywords:** *Entrepreneurship, Russia, China, Doing Business, Global Entrepreneurship Monitor (GEM).*

Promoting the growth of the Russian economy is a priority for the government of the Russian Federation. The most difficult period of transition to market economy in the 1990s led to the collapse of industrial production [1]. Within the stabilization period of the 2000s Russia's economy has not fully recovered, and

<sup>1</sup>The reported research was funded by the Russian Foundation for Basic Research, grant No. 19-013-00430 A "Ethno-psychological Characteristics of Economic Self-determination of Russian and Chinese Entrepreneurs in the Sphere of Small Business".

then was negatively affected by the global economic crisis of 2008-2009 and subsequent recession. Further economic development in 2014-2017 was influenced by the international sanctions against Russia. Consequently, the last 30 years in the history of Russia can be described as a period of socio-economic instability.

The rapid growth of China's economy makes the experience of this country extremely important for countries striving to accelerate economic growth. In the past 30 years, the average annual growth rate of the Gross Domestic Product (GDP) in China has reached 10% per year, the standard of living of the population has increased, and economic efficiency has increased as well [2]. It is the national entrepreneurship that is considered to be the driving force of the economy of modern China [3], which sets the task of innovative development and further improving the living standards of the population. Therefore, the task of comparing the conditions of entrepreneurial activity in Russia and China and identifying opportunities for using the Chinese experience in the Russian economy seems to be urgent.

The international rankings provide extensive research opportunities for the comparisons on the international level. In this article, we used materials from two ratings: Doing Business and Global Entrepreneurship Monitor (GEM).

The Doing Business ranking made by the World Bank Group since 2002 is based on the study of the Ease of Doing Business score. The main goal of this project is to give an objective assessment of regulatory systems of entrepreneurial activity worldwide. Nowadays, the rating is calculated for 190 countries of the world [5]. To calculate the indicator, regulatory analysis is carried out in 12 areas of the business organization's activities, such as Starting a Business, Dealing with Construction Permits, Getting Electricity, Registering Property, Getting Credit, Protecting Minority Investors, Paying Taxes, Trading across Borders, Enforcing Contracts, Resolving Insolvency, Employing Workers and Contracting with the Government. Data for Russia and China are available for analysis since 2014.

A high level of ease of doing business ranking means that the regulatory environment in the country is more favorable. The rankings of all countries are evaluated for May of the previous year.

In terms of ease of doing business, Russia is slightly ahead of China: in 2019-2020 Russia's rating is 28, China takes 31<sup>st</sup> position. At the same time, China's special economic zones are taken into account separately. There are more favorable business regulatory conditions in Taiwan, China - 15, Hong Kong SAR, China - 3.

The dynamics of the Ease of Doing Business score in Russia and China from 2014 to 2020 are presented in Table. 1. This indicator is measured on a scale from 0 to 100, where 0 is the worst result and 100 is the best.

**Table 1***Dynamics of Ease of Doing Business score*

<b>Ease of Doing Business score *</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020**</b>
China	60,0	61,6	63,1	64,6	65,2	74,0	77,9
Russia	67,5	69,2	74,1	75,3	76,5	77,4	78,2

Source: <https://www.doingbusiness.org/en/data/>

\* Since 2016 – according to the methodology of DB17-19, 2014-2015 according to the methodology of DB15.

\*\* Data for 2020 is up-to-date for the 1<sup>st</sup> of May 2019

The Ease of Doing Business indicator for the period under review is growing in both countries: in China it has increased by 1.3 times while in Russia the indicator has risen by 1.15 times. Despite the fact that in 2014 the Ease of Doing Business indicator in China was 7.5 points lower than in Russia, by 2020 the indicators were almost equal (China - 77.9, Russia - 78.2), it means that statutory regulations for entrepreneurship in China are being reformed to increase the ease of doing business faster than in Russia.

Identifying the features of statutory regulation in various fields of entrepreneurship in two countries is of interest to researchers. The Doing Business project analyzes regulatory affairs in 12 areas of business organization activity. The Doing Business 2020 report contains information on 10 areas of activity. Let's consider the certain indicators of the Ease of Doing Business score in Russia and China in 2019-2020 (table 2).

**Table 2***Key indicators of Ease of Doing Business score in Russia and China (2019-2020)*

<b>Indicators</b>	<b>Russia</b>		<b>China</b>	
	<b>2019</b>	<b>2020</b>	<b>2019</b>	<b>2020</b>
Starting a Business	93,0	93,1	93,4	94,1
Dealing with Construction Permits	78,4	78,9	65,2	77,3
Getting Electricity	94,0	97,5	92,0	95,4
Registering Property	88,6	88,6	80,8	81,0
Getting Credit	80,0	80,0	60,0	60,0
Protecting Minority Investors	58,0	60,0	62,0	72,0
Paying Taxes	79,6	80,5	67,9	70,1
Trading across Borders	71,8	71,8	83,4	86,5
Enforcing Contracts	72,2	72,2	79,0	80,9
Resolving Insolvency	58,4	59,1	55,8	62,1

Source: <https://www.doingbusiness.org/en/data/>

The highest indicators in Russia and in China are Starting a Business and Getting Electricity indicators, and the dynamics of improving indicators in China are higher. In Russia, the value of the Registering Property indicator is higher and significantly higher than the indicator of Getting Credit. Getting loans is traditionally the most important source of financing a business, especially a new one. The value of the indicator of ease of obtaining a loan in Russia is 80.0, in China it's only 60.0. A traditionally important source of financing for a new business in China is family assistance [4]. Paying Taxes is much higher in Russia, but in China this indicator is improving faster.

The Dealing with Construction Permits indicator in China shows a rapid increase, while in Russia it remains at the same rather high level. Over the period under review, the Protecting Minority Investors indicator in China increased significantly (from 62 to 72), and in Russia the value of this indicator is much lower (58 and 60), and the positive dynamics is insignificant. Protecting investors is one of the most serious problems in Russia during the period of socio-economic instability. Another indicator by which Russia is significantly behind China is Trading across Borders, there is lack of dynamics of this indicator in Russia meanwhile the Chinese indicator increased from 83.4 to 86.5. In terms of Enforcing Contracts, China is also ahead of Russia. Resolving Insolvency is at a low level in both countries, and in Russia the positive dynamics is small (from 58.1 to 59.1), and in China it is more obvious (from 55.8 to 62.1). This indicator, as well as the Protecting Minority Investors indicator characterizes the degree of business security and in the conditions of economic instability in Russia it is quite difficult to ensure its real growth.

Thus, an analysis of the data from the Doing Business project indicates that the regulatory framework for entrepreneurship in Russia and China has approximately the same degree of rigidity. At the same time, according to a number of key characteristics, the Russian business environment lags behind the Chinese one, and positive changes in China are more obvious.

The second analyzed rating is Global Entrepreneurship Monitor (GEM) [6]. GEM was established in 1999 as a joint project of Babson College in the USA and the London Business School in the UK. The GEM project annually evaluates the national level of entrepreneurial activity. The main sources of GEM data in each country are the Adult Population Surveys (APS) and National Expert Surveys (NES). GEM indicators are subjective in nature and characterize the level of entrepreneurial activity as a reaction of the population to the state of the entrepreneurial climate in the country. One of the main GEM indicators is the Total early-stage entrepreneurial activity index (TEA). TEA characterizes the level of entrepreneurial activity in the early stages and represents the proportion of the population aged 18 to 64 who are nascent entrepreneurs and owners of a newly created business (in %).

In 2018 54 countries took part in the study. The first data on Russia was obtained in 2002, however Russia has been systematically participating in the project since 2006 (there is no data for 2015 and 2017). China has been participating in the project since 2002 (there is no data for 2004 and 2008). The dynamics of comparable data characterizing TEM in Russia and China from 2002 to 2018 (Table 3) indicates a much higher level of early entrepreneurial activity of the Chinese population.

So, in 2002 TEM in Russia was 5 times lower than in China (in Russia it was 2.47%, in China it was 12.11%). In Russia TEM is systematically growing (although there was a decrease in 2007, 2012, 2014 and 2018) and in 2018 it reached the level of 5.55%.

In China, the positive dynamics of TEM is observed until 2009, in 2010 TEM reduced, and in 2011 reached the maximum (24.01%).

**Table 3**  
*Dynamics of Total early-stage entrepreneurial activity index (TEA) in Russia and China in 2002-2018*

TEA, %	2002	2006	2007	2009	2010	2011	2012	2013	2014	2016	2018
Russia	2,47	4,84	2,67	3,88	3,94	4,57	4,34	5,75	4,69	6,27	5,55
China	12,11	15,97	16,43	18,84	14,37	24,01	12,83	14,02	15,53	10,29	10,39

Source: <https://www.gemconsortium.org/data/>

In 2012 the TEM indicator in China decreases sharply, in 2013-2014 it increases slightly, and in 2016-2018 it decreases and remains stable (10.29% and 10.39%). At the same time, the TEM in China in 2018 is almost two times higher than in Russia.

In addition to TEM, a large number of indicators are calculated in the framework of the GEM project. Table 4 shows the indicators of Russia and China in 2016 and 2018, characterizing the entrepreneurial intentions of the population, as well as the characteristics of consciousness that determine the attractiveness of entrepreneurial activity for the population (Fear of failure, High status to entrepreneurs, Entrepreneurship a good career choice).

**Table 4**  
*GEM indicators in Russia and China (2016, 2018) %*

Indicators	Russia		China	
	2016	2018	2016	2018
Entrepreneurial intentions	2,12	2,20	21,30	15,28
Fear of failure	44,80	46,42	49,08	41,70
High status to entrepreneurs	65,60	68,04	77,80	68,72
Entrepreneurship a good career choice	63,40	68,02	70,30	60,82

Source: <https://www.gemconsortium.org/data/>

Characterising the Fear of failure indicator, we note that the differences between the countries are not great, in Russia the value of the indicator is growing, while in China it is decreasing. Such a characteristic of public consciousness as High status to entrepreneurs has improved slightly in Russia, while in China it has noticeably worsened; now the value of this indicator in the two countries is approximately equal. The idea of entrepreneurship as a good career choice in Russian society in 2018 is shared by a larger number of respondents than in 2016, and in China the number of such respondents sharply decreased over the period under review. Thus, there are positive dynamics of indicators that determine the attractiveness of entrepreneurial activity for the population in Russia, and the negative dynamics in China. Despite this, the indicator characterizing the entrepreneurial intentions is much lower in Russia than in China, that can be explained by the protracted period of socio-economic instability. Despite a decrease of 6 points in Entrepreneurial intentions in China in 2018, the difference in this indicator between Russia and China remains significant.

It can be concluded that the subjective perception of the opening up business opportunities by the Russian population is much lower than in China, despite the absence of significant differences between countries in the rigidity of regulation. Entrepreneurial activity is influenced not only by the laws adopted, but also by the general state of the economy, the dynamics of the standard of living, confidence in the future. Therefore, in order to maintain the positive dynamics of the entrepreneurial activity of Russians, the measures to support entrepreneurship implemented in Russia should be systematic and consistent.

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在俄罗斯联邦法官中打击腐败  
**COMBATING CORRUPTION AMONG JUDGES  
IN THE RUSSIAN FEDERATION**

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*Ural State Law University*

抽象。 该文章涉及打击法官腐败的问题，提请注意解决法官工作中的利益冲突  
关键字：防止法官腐败，利益冲突

**Abstract.** *The article deals with the problems of combating corruption of judges, draws attention to the settlement of conflicts of interest in the work of judges*

**Keywords:** *prevention of corruption among judges, conflict of interest*

Corruption is a complex, multidimensional social phenomenon that negatively affects all spheres of life of the state and society and not only reduces the effectiveness of state institutions, but undermines the authority of the government and the prestige of the country<sup>1</sup>. The greatest danger is political and administrative corruption, as well as corruption in the judiciary and law enforcement agencies. Recently, the effectiveness of this work has increased. By the Decree of the President of the Russian Federation of June 29, 2018 № 378, the National Anti-Corruption Plan for 2018-2020 was approved, which contained the measures established to combat corruption<sup>2</sup>. Such measures are aimed at improving the procedure for controlling expenditures and the mechanism for circulating property to the state's income, in relation to which no information has been provided confirming its acquisition of legitimate income; ensuring the completeness and transparency of the information provided on income, expenses, property and property obligations; improving the effectiveness of enlightenment, educational and other activities aimed at the formation of anti-corruption behavior of state and municipal employees, popularization of anti-corruption standards in society and the development of public justice. It is recommended that the Supreme Court of the Russian Federation prepare proposals on improving the procedure for preventing and resolving conflicts of interest arising from the work of judges, including when considering cases involving citizens and legal entities with which a judge, his close relatives, or relatives have financial or other obligations.

<sup>1</sup>Combating corruption: new challenges: monograph / S.B.Ivanov, T.Ya. Khabrieva, Yu.A. Chikhanchin; ex. ed. T.Ya. Khabrieva. – M.: Institute of Legislation and Comparative Law under the Government of the Russian Federation; INFRA – M, 2018. P. 35.

<sup>2</sup>Collection of the legislation of the RF, 02.07.2018, N 27, Art. 4038

Decisions of the Constitutional Court of the Russian Federation are designed to bridge the gaps and conflicts of the current legislation, which are one of the most common corruption-causing factors. The Constitutional Court of the Russian Federation considers requests related to the problem of combating corruption, including in the judicial system. By the Decree of the Constitutional Court of the Russian Federation of November 29, 2016 № 26-P<sup>3</sup>, the provisions of the law that allow circulation in civil proceedings to the income of the Russian Federation belonging to a person filling the position of state (municipal) service, his spouse and minor children of land were recognized as not contradicting the Constitution of the Russian Federation plots, other real estate, vehicles, securities, shares (stakes, shares in the authorized (joint-stock) capital of organizations). We are talking about cases where such a person did not provide information confirming his acquisition of legitimate income, as well as cash received from the sale of such property. Anti-corruption assumes that property subject to seizure in respect of which state (municipal) employees have not provided information confirming their acquisition of legitimate income may belong to both the state (municipal) employee and his family members - spouse and minors children, who thereby undergo the adverse effects of the alleged violation of anti-corruption legislation. In order to maintain a balance between public and private interests, the federal legislator has limited the circle of people whose expenses are controlled by those members of the family of a state (municipal) employee who usually share a common household with him, namely, the spouse and their minor children (Clause 2, Part 1, Article 2 of the Federal Law “On Control over the Conformity of Expenses of Persons Filling Government Positions and Other Persons with Their Incomes”)<sup>4</sup>. The European Court of Human Rights holds a similar position, which recognizes the seizure of property of illegal origin as lawful interference by the state in the exercise of rights that pursues a legitimate aim - the fight against corruption in the public service system. According to the European Court of Human Rights, legislative measures that serve as a means of combating serious offenses that entail unjust enrichment are justified even in the absence of a conviction, as well as evidence beyond “any reasonable doubt” regarding the illegal origin of the property and may be applied not only against the accused, but also against their close relatives, who allegedly own and manage the property

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<sup>3</sup>Decision of the Constitutional Court of the Russian Federation of November 29, 2016 “In the case of the verification of the constitutionality of subparagraph 8 of article 235 of the Civil Code of the Russian Federation and article 17 of the Federal Law “On control over the conformity of expenses of people holding public office and other persons with their income” subpar. 8 par. 2 Art. 235 of the Civil Code of the Russian Federation and Art. 17 of the Federal Law “On Monitoring the Compliance of Expenses of Persons Filling Government Positions and Other Persons with Their Incomes” <https://www.law.ru/npd/doc/docid/420384218/modid/96>

<sup>4</sup>Bulletin of the Constitutional Court of the RF, N 1, 2017.

acquired by dishonest means th informally or otherwise, without the necessary good faith (judgment of 12 May 2015 on the case "Gogitidze and others against Georgia")<sup>5</sup>.

The Federal Law “On Combating Corruption” of December 25, 2008 contains a definition of the concepts of corruption and anti-corruption<sup>6</sup>. Corruption - abuse of official position, giving a bribe, receiving a bribe, abuse of authority, commercial bribery or other illegal use by an individual of his official position contrary to the legitimate interests of society and the state in order to obtain benefits in the form of money, valuables, other property or property services, other property rights for themselves or for third parties or the illegal provision of such benefits to a specified person by other individuals; as well as the commission of these acts on behalf of or in the interests of a legal entity. Depending on the functions performed by the authorities, there are corruption in the executive branch, corruption in the legislative branch, corruption in the judiciary and corruption in the municipal authorities<sup>7</sup>. You can also talk about the prevention of corruption in relation to prosecutors. All member states of the Council of Europe have adopted criminal legislation, and sometimes related regulatory documents on general corruption, especially against officials. For example, receiving a bribe by an official is strictly punished in all member states of the Council of Europe. In addition to understanding that giving and receiving a bribe are specific manifestations of corrupt behavior and are punishable under criminal law, there is no general approach to the legislation of the participating states. Regarding corruption of judges specifically, in a minority of member states of the Council of Europe, separate laws have been formally enacted which provide for harsher penalties for judges receiving bribes than for officials. In the vast majority of member states, corruption of judges falls under the same definition of crime as corruption of other officials. In the opinion of the Consultative Council of European Judges (hereinafter - CCJE), corruption of judges should be understood in a broader sense because of the important role that a judge plays as an independent and objective arbiter in the cases considered by him (her). The CCJE, in its Opinion of November 9, 2018, “On the Prevention of Corruption among Judges”, understands the corruption of judges in a broader sense as “dishonest, fraudulent or unethical acts of a judge committed in order to obtain personal gain and benefit for third parties”<sup>8</sup>. With this understanding of corruption, the main areas of anti-corruption activity are: determining the circle of judges capable of committing any corruption offenses in order to obtain personal gain and benefit for third parties; establishing the field of administration of justice, where

<sup>5</sup>The judgment of the European Court of Human Rights of 05/12/2015, complaint № 36862/05 <https://base.garant.ru/71240572/>

<sup>6</sup>Collection of the legislation of the RF, 29.12.2008, N 52 (Part 1), Art. 6228

<sup>7</sup>Mishin G.K. Corruption: concept, essence, measures of restriction. M., 1991.P. 19

<sup>8</sup>Bulletin of the European Court of Human Rights.2019. № 1. P. 126-138.

these actions may be performed in connection with the performance by a judge of his official duties; determining the purpose of this activity: enrichment, obtaining material benefits, obtaining personal benefits and benefits for third parties.

Crime, and in particular corruption, is a social disease, the effective recipes for the treatment of which mankind has not been able to develop over the entire period of its existence. Corruption is a multipolar phenomenon. It is this view of crime that allows us to consider it not only as an asocial phenomenon, but also as a social reality that has a significant impact on the conditions of existence and development of society. According to scientists, the state of corruption in Russia is associated with an undeveloped legislative system, a low legal culture, and imperfection of the control and supervision system<sup>9</sup>. It is no exaggeration to say that the prevention of corruption in the judiciary depends to a large extent on the country's political will aimed at actually creating institutional, infrastructural and organizational guarantees for an independent, transparent and impartial judiciary. The necessary legislative and by-laws should be adopted to prevent corruption in the judicial system. The state should take all necessary measures to guarantee and promote a culture of judicial integrity. Corruption is not only a peculiar reflection of the social culture of society, it itself forms a certain culture (subculture), reflecting its identifying specificity. Being a social phenomenon, corruption is rooted in the economic sphere of the life of people and any of their community. Corruption is essentially an economic phenomenon. It should be agreed with Professor I. Kozachenko that "crime is a phenomenon that combines social and economic principles equally, then in any society of crime two models must counteract: social and economic. The thesis is axiomatic: if the social sphere of society and the state is at a high moral level, then the economic potential of society and the state is extremely rich. If the economic base of society and the state is weak, then their morals, as the sailors say, are "lower than the waterline"<sup>10</sup>.

In connection with the adoption of the Federal Law of July 2, 2013 № 166-FL "On Amending Certain Legislative Acts of the Russian Federation"<sup>11</sup> the Judicial Department at the Supreme Court of the Russian Federation issued Order No. 241 of December 11, 2013 "On Approving the Procedure for Posting on the Internet Telecommunication and Internet Network of information on extra-procedural appeals"<sup>12</sup>. Such regulation has a positive effect on strengthening the climate of judicial integrity. The procedure governs the creation, preparation and posting of information on extra-procedural appeals in the information and telecommunications network Internet,

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<sup>9</sup>Fialkovskaya I.D. Corruption: concept, signs, types // Bulletin of the N.I. Lobachevsky Nizhny Novgorod University., 2018, № 1, P. 137–142

<sup>10</sup>Kozachenko I.Ya. Models of combating crime: criminal - legal and criminological aspects. // Publishing House of Ural State Law University. 2018.

<sup>11</sup>Collection of the legislation of the Russian Federation, 08.07.2013, N 27, Art. 3458

<sup>12</sup>Judicial System Bulletin, N 5, May 2018.

providing access to this information on the Internet on the official websites of federal courts of general jurisdiction, as well as the actions of employees of federal courts of general jurisdiction authorized to post such information on the official websites of federal courts of general jurisdiction. This procedure has been developed in order to: achieve the necessary level of public control over the activities of federal courts of general jurisdiction; the maximum avoidance by judges of federal courts of general jurisdiction of contacts that could belittle the authority of the judiciary, damage the reputation of a judge and question, his objectivity and independence in the administration of justice; ensuring access to justice and preventing corruption in the judiciary.

The extra-procedural communication of the judge with the defendant in the criminal case under consideration by him may serve as the basis for the early termination of the powers of the judge. The Board of Appeal of the Supreme Court of the Russian Federation upheld the decision of the Disciplinary Board of the Supreme Court of the Russian Federation on the early termination of powers of a judge of the district court K. for committing a disciplinary offense. The judge of the district court of the Primorsky Krai K. committed actions expressed in repeated out-of-procedure appeals to the judges of the district court T., I. and V. on issues relating to criminal cases in their proceedings, as well as on the application of the type of punishment to the defendants on these cases, which is justifiably regarded as a violation by Judge K. of the requirements of the Law on the Status of Judges on the inadmissibility of interference in the activities of judges in the administration of justice and their commission of a disciplinary offense, entailing the onset of disciplinary liability<sup>13</sup>.

Information and electronic technologies are one of the areas of anti-corruption. The introduction of modern information and electronic technologies in the courts, their widespread use is an important component in the system of anti-corruption standards of judicial activity. Federal Law of June 23, 2016 № 220-FL “On Amending Certain Legislative Acts of the Russian Federation Regarding the Use of Electronic Documents in the Activities of the Judiciary” is a significant step in introducing electronic justice<sup>14</sup>. But as the CCJE notes in the conclusion “On the Prevention of Corruption among Judges” of November 9, 2018, a judge should not be an outside observer in society. The judge should explain the decision that the public can understand and make<sup>15</sup>. Corruption among judges is understood in a broader sense because of the important role that a judge plays as an independent and objective arbiter in the cases he considers. Judicial corruption includes dishonest, fraudulent or even unethical acts of a judge committed in order to obtain personal gain and benefit for third parties.

<sup>13</sup>Appeal determination of the Supreme Court of the Russian Federation of February 17, 2015 № APL15-1D.

<sup>14</sup>Collection of the legislation of the RF.2015, N 29, Art. 4392.

<sup>15</sup>Bulletin of the European Court of Human Rights. 2019. № 1. P. 128-138.

The use of modern technologies allows us to create new guarantees of the principle of legality in the administration of justice, above all, to exclude the participation of the human factor in some technical procedures, thereby eliminating the possibility of errors and inaccuracies. For example, from September 1, 2019, compulsory audio recording of court hearings is introduced in all categories of cases, which should become the main form of recording the course of the trial. In 2017, legislative amendments came into force, providing for the broadcasting of open court hearings on the Internet. Extra-procedural appeals received by the courts, as well as information on income, expenses and property obligations of judges, court leaders and staff, as well as their family members, are also posted on the Internet.

The Group of States Against Corruption (GRECO) in its October 18, 2017 assessment report, "Preventing Corruption Against Members of Parliament, Judges, and Prosecutors,"<sup>16</sup> drew attention to the fact that an effective guarantee of preventing corruption is a thorough check of the integrity of candidates for the position of judge, which involves checking the personal, family and public life of the applicant. Analyzing the grounds for refusals in the appointment (reappointment) of judges and candidates for judges, it should be concluded that such refusals are mainly due to a conflict of interests among applicants and (or) inaccurate declaration of income, expenses, property and property obligations. The applicant for the position of judge is refused the appointment if incomplete or inaccurate information is provided regarding: income from the sale of movable and immovable property (apartments, houses, land, vehicles); own and spouses incomes in connection with labor activity (salary, compensation payments); owned property; money received from relatives for the purchase of property (apartments, vehicles); excess of expenses over income in case of failure to submit supporting documents; failure to submit documents confirming financial opportunities for the acquisition of property during the period of work by the applicant; non-reflection of information on the disposal of property under a gratuitous transaction; reflection of information for another reporting period; failure to submit income and property declarations; untimely submission of information on income and property<sup>17</sup>. In the practice of the work of the Commission under the President of the Russian Federation on the preliminary consideration of candidates for the position of judges of federal courts, a conflict of interest is the consideration by judges of cases involving organizations in which relatives of the judge and his wife (spouse) work, regardless of the form of education and ownership of the institution, organization, enterprise, commercial structure, if the judges do not take legal measures to re-

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<sup>16</sup><https://pravo.ru/news/201245/>

<sup>17</sup><http://lip.vkks.ru/publication/34071> // Information on the reasons for the refusal to appoint judges to vacant judicial positions, by data presented by the Office of the President of the Russian Federation for Public Service and Human Resources Sosedov E.A. On the reasons for the refusal to appoint (reappoint) the heads of courts, judges and employees of the courts of the Russian Federation in 2018 // Judge.2019. № 9. P. 10-19.

solve it. At the same time, the posts and functional duties of relatives do not matter; their non-participation in the preparation of documents and in court hearings; lack of complaints about this circumstance; verification and approval of decisions by higher authorities; entry into force of court decisions.

During the visit, the attention of the Group of States against Corruption was drawn to the fact that in 2016 the IX All-Russian Congress of Judges decided to exclude three provisions related to the impartiality of judges from the Code of Judicial Ethics. These provisions required the judges to: avoid situations where close relatives are interested in the proceedings; refrain from actions that may lead to a conflict of interest; and avoid situations where personal relationships with parties to the proceedings may raise suspicions or create the impression of a lack of impartiality. These provisions were considered as duplicating the procedural rules on the recusal of judges, and this caused damage to the candidates for the posts of judges, since it made it impossible to appoint a person whose relative is a lawyer or prosecutor. In our opinion, these provisions represent important guarantees of impartiality of judges, both real and alleged, which are common in the codes of conduct of judges in accordance with the principle that justice should not only be carried out, but also be visible in action. In fact, in this case, there is no contradiction in the fact that these principles are enshrined in both the law and the Code of Judicial Ethics, the purpose of which is to confirm the basic principles that judges must follow in the performance of their duties. The Code of Judicial Ethics does not have the status of law and has no priority over the codified rules for the challenge of judges. We believe that it is necessary to return to the Code of Judicial Ethics the provisions excluded from it related to the impartiality and honesty of judges (clauses 3-5 of Article 9).

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掌握咏春拳的基础知识

**MASTERING THE BASICS OF WING CHUN TECHNIQUE**

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抽象。 文章揭示了咏春拳的起源, 技术基础以及对运动员进行技术训练的方法学建议。

关键字: 武术, 咏春拳, 技术基础, 技术培训。

**Abstract.** *The article reveals the origin of Wing Chun martial art, its technical foundations, methodological recommendations for the technical training of athletes.*

**Keywords:** *martial art, Wing Chun, technical fundamentals, technical training.*

The ancient Chinese martial art of Wing Chun or Wing Chun Kuen originated more than 300 years ago. The origin of the Wing Chun style is associated with the Southern Shaolin Monastery in Fujian. The name of the style of Wing Chun in Chinese means “Praise of Spring” or “Eternal Spring”.

Many legends are associated with the advent of Wing Chun. According to one version, the style was taught by the South Shaolin rector Zhishan as recreational gymnastics for residents of nearby villages. Another legend claims that the style was created by five masters of Southern Shaolin. The third legend says that a new style of martial art was developed by the woman Yan Yunchun, the daughter of the South Shaolin novice Yan Era (or Yan Sy).

Currently, Wing Chun is widely distributed around the world and is the simplest and most effective martial arts, suitable for self-defense.

Despite the fact that the Wing Chun style emerged from the Shaolin Kung

Fu, its technical arsenal and basic tactical concepts are not only not similar to the Shaolins quan, but rather directed against it. The most important concept is not the opposition of force versus force, which allows a fighter to defeat physically stronger opponents. In Wing Chun, a martial arts practitioner will find ways to use his opponent's strength against himself.

The style of Wing Chun is characterized by close contact combat, which uses quick strikes and tight protection in combination with a fairly mobile stance. Wing Chun involves the use of the classic type of weapon: butterfly knives and a long pole.

Appropriate equipment is used to protect against opponent's moves and strikes: gloves with open fingers, helmet, elbow pads, shin guards, mouth guards and inguinal shells. Protective equipment of opponents can be red or blue.

Wing Chun is based on technical actions leading to a victory. This type of martial arts includes only its own types of techniques in its arsenal: punch and palm, elbow and knee, movement, kicks and sweeps, fighting techniques.

For a successful and confident fight, a perfect technique of performing moves is necessary, since the athlete's technical skill is his "weapon", which he uses, guided by considerations of tactics. In general, the greater the number and more advanced methods of techniques of movements an athlete owns, the wider the arsenal of using techniques in combat, the higher the skill.

The most important problem in the technical training of a wingchunist is an effective teaching and improvement methodology, which should represent a scientifically sound and logical built didactic system, a sequence of pedagogical actions in close conjunction with a trainer-athlete, adequate to the athlete's personality and learning objectives. In the problem of motor learning, both in theoretical, methodological, and purely practical aspects, it is fundamental to single out in each type of technical action key, basic points and nodes that determine the effectiveness of technical method in general and serve as reference links in learning and improving the individually optimal technique of movements.

The effectiveness of the technical method is determined by the "correct" positions and movements at individual base, "key" points, which can be used as supporting links in training and improving the athlete's optimal technique. Such reference points, highlighted in all the techniques of hand-to-hand combat, allow the trainer to build a training algorithm, drawing the athlete's attention to them, controlling and adjusting the training process with special, short, expressive keywords and phrases ("keys") that are characteristic only for this key points of specific technique.

The description of the Wing Chun technique is quite widely disclosed in the works of various authors: Liu Weihan (2002) [1], Sifu Samuel Kwok (2006), S.N. Neskorojev (2011), Duduchan I.M. (2011) [2].

However, the issues of special technical training at various stages of training athletes remain poorly studied.

Currently, Wing Chun classes are of particular interest not only to adults, but also to children and adolescents. The training process for children and adolescents has significant differences from adult training and requires a deeper study of the organization of the training process and a higher qualification of the trainer. Currently, various tools from various sports (gymnastics, wrestling, boxing, etc.) that have not received a scientific justification for their use are widely used in the technical arsenal of children involved in Wing Chun. The lack of scientific developments in this direction requires the search for new ways to form the basic technical arsenal of young wingchunists.

The most important component of this martial art style is the basic technique. The basic equipment of the first year of Wing Chun training includes: stances, positions and methods of movement. Key techniques include captures, quick kicks to the lower level, close combat, and sharp, very accurate hand punches.

Learning techniques begins with stances. The concept of “Stance” refers to the position of the legs as a whole, from the feet to the hips. The training (frontal) stance is used in pair exercises and during working out of formal equipment. A characteristic feature of the front stance the location of the feet, resembling the shape of a triangle - socks inward, heels apart. The development of the stances allows you to develop the correct position of the fighter, strengthen the muscles and ligamentous-articular apparatus of the lower limbs.

Simultaneously with stances, turns are worked out to the sides in place, which develops the ability to evade enemy attacks using a minimum of time and effort. Also, rotation creates an additional effort to increase the force of impact with the hand. Next, the transitions to mastering the turn without mastering the intermediate position in the main frontal stance are consecutively mastered. In this case, the body is rotated 90° with the simultaneous rotation of the feet, remaining in the final position parallel to each other. To increase the efficiency of mastering the cornering technique, additional weights in the form of a belt with lead inserts are used.

Position place means a state of equilibrium between the attack and defense phases to ensure readiness to change the situation. In any of the positions, the fighter should be able to include the whole body in the strike and quickly move to another position while maintaining balance. Loss of balance of a fighter inevitably leads to a fall and defeat in a duel.

In the Wing Chun style, particular importance is attached to movements, which is accompanied by the movement of the fighter's body in space through various types of steps. The reliability of the defense and the effectiveness of the

counterattack depend on a timely step (avoiding the attack, reducing the distance). A quick transition (movement) from one technical action to another should be made while maintaining balance and at the same time controlling the situation.

The movements of the fighter are given exceptional importance, as they are one of the most important means of attack. All actions and combinations are based on various movements. The attached step as one of the main movements in the style of Wing Chun is used to approach the enemy during an attack and to break the distance to prepare a counterattack. "Sliding steps" form the basis of the attached step, which allows you to constantly maintain balance and a comfortable position of the body during the fight and it is easy to make starting positions for strikes.

To increase the effect of training sessions, it is necessary to use weights (1-2 kg) attached to the ankles of the legs after mastering the attached step.

In addition to the attached step, other methods of movement are also being studied.

In theoretical terms, the description of the basic technique looks quite simple and understandable. However, in practice, you must learn to confidently and accurately apply it.

Success in studying the art of a duel directly depends on the quality of the construction of the training process. The process of mastering and improving the technique reflects the level of technical readiness of the wingchunist. The level of technical preparedness can be characterized by: a) the degree of mastering by the athlete of the movement system of this sport; b) the volume of techniques and actions that he knows; c) the effectiveness of technique.

For a successful and confident fight, the athlete needs a perfect technique for performing moves, since the athlete's technical skill is his "weapon", which he uses, guided by considerations of tactics. In general, the greater the number and more advanced methods of techniques of moves an athlete knows, the wider the arsenal of using techniques in combat, the higher the skill.

Mastering the techniques of Wing Chun is a process of developing skills that ensure effective combat in this type of martial art. This process is characterized by the search and development of the optimal variant of the movement and the possibilities of the person engaged in a series of attempts to perform this movement in standard and variable conditions, in different functional states, etc. This is a long and painstaking work, the result of which should be to achieve a high degree of automation and reliability of movements, compliance with a given standard.

Wing Chun is quite extensive and at the same time structurally ordered style of martial arts. The process of studying and mastering the art of battle is strictly regulated and consists of several stages.

The initial level of sportsmanship of an athlete is laid at the stage of initial training, the main tasks of which are teaching technical methods, raising leading physical abilities and identifying children gifted with respect to Wing Chun classes.

One of the authors (A. Evdokimov) of the publication of the training secrets, Wing Chun recommends that beginners start classes only after passing a series of test tasks:

1. Simultaneously perform rotational movements with the palm of the right hand, and straight lines with the left.
2. Throw and catch tennis balls with both hands up.
3. Throw and catch tennis balls at the wall with both hands..

Only after successful passing of the testing can you start training sessions. The author of the publication believes that repeated repetition and quick mastery of the above exercises will make it easy to learn the basic techniques of Wing Chun.

Particular attention in the technical training of young athletes involved in Wing Chun is given to the study of the basic technique of movements. This training section is important and provides for the execution of movements in a strictly defined form and according to a clearly defined action program that defines the sequence of movements, the composition of combinations and the order of repetitions. However, questions of the methodology for improving the technical training of young athletes involved in Wing Chun remain underdeveloped.

In the initial stages of training, special attention is paid to the main stance, which is the main one for all Wing Chun combat stances. Correct positioning in the stance develops the ability to subconsciously keep the knees in the best position to protect the center line and maintain stability, and also creates the structure necessary for a sense of integrity - the unity of body movement. The stance must be kept in the correct position for a long period of time.

Before contacting with the opponent, a neutral stance is used - the fighter is not tilted forward, backward, left or right, it is similar to the stance of a tennis player while waiting for a serve. In the most dangerous situations, mobility is ensured in the position of the athlete's body, which is one of the most essential requirements in Wing Chun's classes. If the defender is in a position when his body is moved forward or backward, tilted to the right or left, then his ability to defend is impaired. Mastering the neutral stance of Wing Chun allows the athlete to successfully carry out the correct lateral movements. To master the stances, you need to spend a lot of time, since it is the basis of technology.

Young athletes are also introduced to the concept of a center line, which is an imaginary vertical line running in the middle of the body and dividing it into two parts. It is believed that it is along this line that the most impor-

tant organs of the human body are located. In the training of fighters, special attention is paid to protecting the central line, which is a key point in Wing Chun technique.

In conclusion of the above, it should be noted that an in-depth study of the basic foundations of the Wing Chun technique will help to increase the level of sportsmanship.

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按照Janusz Korczak的人文传统将残疾儿童纳入教育过程  
**INTEGRATION OF CHILDREN WITH DISABILITIES  
INTO THE EDUCATIONAL PROCESS IN THE HUMANISTIC  
TRADITIONS OF JANUSZ KORCZAK**

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注解。本文的作者考虑了波兰著名老师，作家，医生和著名公众人物Janusz Korczak的教育体系在适应残疾儿童方面的主要思想和原则，并根据人本主义教育学原理进行了调整。

作者表明，每项教育活动，成人和残疾儿童的每次教育会议都是在几代人之间分享经验的行动。应对每个行动，对残疾儿童的老师的一切想法以及对教育变革的渴望，都应通过对个人的尊重，智慧和爱来区分，这表明我对科尔恰克的教学态度具有最高的智慧。因此，存在健康问题的儿童在教育过程中融入社会的问题的存在，一方面是由于他们身心发展的偏差，另一方面是由于社会的完善程度不足。关系系统本身，由于其主题的某些严格性，残疾儿童无法使用

关键字：教学系统，Janusz Korczak，利用机会的儿童，教育，适应。

**Annotation.** *The author in the article considers the main ideas and principles of the pedagogical system of the famous Polish teacher, writer, doctor and prominent public figure Janusz Korczak in the adaptation of children with disabilities according to the principles of humanistic pedagogy.*

*The author shows that every educational action, every educational meeting of an adult and a child with disabilities is an action of sharing experiences between generations. Every action, every thought of a teacher about a child with disabilities and the desire for educational change should be distinguished by respect, wisdom and love towards an individual, which indicates the highest intelligence of I. Korczak's pedagogical attitudes. So, the presence of the problem of integration of children with health problems in the educational process and into society is due, on the one hand, to their deviations in physical and mental development and, on the other, to the insufficient perfection of the social relations system itself, which, due to certain stringency of its subjects is inaccessible to children with disabilities*

**Keywords:** *pedagogical system, Janusz Korczak, children using opportunities, education, adaptation.*

**The relevance** of this article lies in the fact that currently in the world today there are a huge number of different educational systems. All of them are focused on bringing up a harmonious and developed personality. Janusz Korczak is one of the most prominent examples of a successful educational system. He believed that only true love would help raise a child - love without systems and special techniques. The purpose of the study is to consider and apply the scientific ideas, methods, techniques that developed and tested in his own thirty-year practice, an outstanding Polish teacher Janusz Korczak, to adapt children with disabilities to the conditions of schooling.

### **Materials and methods**

In the article, the author reveals the integration of children with disabilities into the educational process in the humanistic traditions of Janusz Korczak and presents an analysis of scientific literature and publications on the heritage of Korczak. The author also cites data obtained through questioning and processing respondents' answers; the results will help to form a correct understanding of the adaptation of disabled children in the educational process and in society.

### **Introduction**

Currently, the integration of children with disabilities, both in the domestic and in the world scientific literature, is presented in the form of a set of theoretical approaches to its individual problems, which makes it difficult for the scientific classification of its areas. Thus, the term “integration” implies either relatively local problems (for example, the integration of hearing impaired people in modern society; an integrated approach in teaching children with disorders of the musculoskeletal system; their integration into the educational process and in society, as well as integration of school-age children with intellectual disabilities, etc.), or interpreted in a generalized form: (integration is the inclusion in the general flow or one of the important means of preparing for independent living in society) and in social tion in the educational process in a new environment for children with disabilities [Korczak J. Jak 1919-1929] [3. C.1.].

For a child with disabilities, who is brought up in a different format than healthy children, the most significant objects of socialization are the team, peers, teachers and teachers, etc. Considering that educational institutions are a place of mass accumulation of schoolchildren or students with different health features, an educational institution has a more pronounced effect on the psycho-emotional development of children with disabilities than healthy children. In this regard, the level of adaptation in the educational process in children with disabilities with comorbidities will be lower than in children with disabilities with preserved intelligence and in healthy children [Korczak J. Jak 1919-1929 1930] [4. S. 434]. And for this category of children with disabilities with comorbidities, a certain approach and requirements for education are needed. Janusz Korczak believed that the main installation of the pedagogical system assumed the education of an active and independent personality

with developed humanistic qualities. “I want to teach you to understand and love this wondrous, creative“ I don't know ”modern child science, full of life and the brightest surprises. I want them to understand: no book, no doctor can replace my own sharp-sighted thought and careful observation ”[Korczak J. Jak 1919-1929] [1. P. 81].

The great humanism and the highest level of ethical thinking and behavior allows you to directly address parents, carers and educators in relation to children with disabilities. Daily knowledge about the child is insufficient. Scientific research and pedagogical works also far from exhaust this important perspective. Therefore, each student is a separate and full-fledged personality, possessing a unique set of qualities, a personality full of mysteries and endless questions. The main task of the teacher is to reveal and understand each of the students. Therefore, Korczak encourages adults to learn how to love each child correctly; shows how to love intelligently, unconditionally and forever nurturing tolerance to any child.

A disabled child in a team acts in accordance with its value system and spiritual and psychological state. Getting into the atmosphere of benevolence, taking his picture of the world, into the field of dialogue, he moves from a wary, tense state to a calm one, and the adaptive process takes place less traumatic. So, having studied the scientific foreign literature, one can offer the experience of different countries, with the methodological basis for integrating children with disabilities into the system of general education, which is the principle of equal rights and opportunities in obtaining education. In this regard, integration appears in two forms: social and pedagogical. So social integration involves the adaptation of a child with disabilities into the educational process and the general system of social relations and interactions, primarily within the educational environment in which he integrates, and the notion pedagogical integration means the development of children with disabilities mastering the educational material determined by the general education program, that is, the general curriculum (co-education in the same class or classroom).

### **The results of the study**

In order to integrate children with disabilities into the educational process in the humanistic traditions of Janusz Korczak, an analysis of foreign and domestic scientific literature was conducted, research devoted to the humanistic traditions of the doctor, teacher J. Korczak, who teaches modern educators to cultivate kindness, openness and love for their neighbor, despite the fact that they do not look like healthy children.

At the second stage, the respondents were selected (15 - 7 teachers from the university, 8 - teachers from the secondary school). 15 parents of general education schoolchildren, 35 students and a sociological survey were conducted using specially designed questionnaires. Based on the data obtained, an analysis of the responses was made, which showed the following results:

University teachers - 100% answered that they are ready to teach in inclusive education, but remotely. This is due to the lack of an accessible environment in the school (narrow door and elevator openings, the lack of braille signs, etc.).

Teachers of secondary schools were divided in the opinion of 3 people - 37.5% answered that they were not against teaching children with disabilities in cases of preserved intelligence, but 5 people - 62.5% answered that children with disabilities with concomitant diseases (lack of vision, hearing, intelligence, behavior, etc.) should be trained in specialized educational institutions, in specially equipped, according to special developed programs. However, 100% of teachers answered that they should socialize this category of disabled children together with healthy children, for example, in places such as summer camps, joint activities, etc.

When processing the answers of schoolchildren and university students, also the opinion was divided 8 schoolchildren, 53.3% of 15 people. answered that they are ready to accept a child with limited health abilities into their team and study together, 2 people- 13.4% answered that they didn't care and 5 people- 33.3% did not want to study with children with limited health care, and when processed responses of children with disabilities 2 people - 40% of pupils of students with disabilities and 3 people - 60% of students at the university noted that the school is not suitable for a long stay. The classrooms are poorly equipped and there are no special tables, and writing on the knees is not convenient, it is inconvenient to call in elevators and there is no elevator at school, which impedes their movement, etc., however, the analysis of the answers of university students is 100% - 15 people. showed that they are not against education with people with disabilities in health, they are also worried about not equipped educational institutions with specialized devices (narrow doors, lack of sign language interpreters, etc.). Next, we analyzed the answers of parents of secondary school students 8 people - 80% replied that they would not want their children to study with children with disabilities in health, because teachers with disabilities will pay more attention to children with disabilities than their children will suffer from and will learn poorly educational material, and parents of children with disabilities 5 people. 100% answered that they want children to study with ordinary children, but they are afraid of condemnation, lack of understanding of parents of healthy children and the lack of special equipment to facilitate learning conditions for children with disabilities.

### **Conclusion**

Modern education today is the most mass democratic and accessible institution for education. Therefore, it is necessary to understand and take into account the development of social consequences, expressed in the limitation of vital activity and social insufficiency in the integration of children with disabilities in the educational process and society.

Despite the undeniable problems of social adaptation of children with disabilities and differences of opinion, in most educational organizations and universities, the administration and children are not quite ready to accept a new non-ordinary contingent of children with disabilities. So modern society is experiencing a shortage in the application of technologies of social adaptation of children with disabilities. In this case, it is advisable to talk about bilateral changes. On the one hand, it is “addictive”, “adaptation”, “adjustment” to the given conditions in which a disabled child falls. On the other hand, it is an attentive assistance of the educational organization as a public institution with the variability of creating favorable for the social adaptation of the child in the learning environment.

Currently, the main task of education is to ensure social stability, emotional and personal well-being, as well as the creation of conditions for the integration of the child in the educational process. Also, the integration into the educational process will further contribute to the pedagogical integration of the child with developmental problems during training.

Thus, one of the main conditions for the socio-pedagogical integration of children with disabilities in development is the correction of the relations of the participants in the integration process (both children and their teachers) to each other. It consists of three components - mutual understanding, mutual respect and interaction, which lead to the success of integration in universities, general education and special schools when teaching and educating students with disabilities.

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非语言大学教科书中外语教学的认知方面  
**COGNITIVE ASPECT OF TEACHING FOREIGN LANGUAGES  
IN A TEXTBOOK FOR NON-LINGUISTIC UNIVERSITIES**

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抽象。 本文专门针对非语言大学的外语教科书考虑教学的认知方面。 基于学生认知能力的形成是外语学习过程中的优先任务之一这一事实，本文分析了其实现方式，并在教科书中给出了具体示例，这是实现学习目标所必需的主要工具。

关键词：外语教科书，非语言大学，认知能力，思维，记忆，创造力。

**Abstract.** *The article is devoted to the consideration of the cognitive aspect of teaching in a foreign language textbook for non-linguistic universities. Based on the fact that the formation of cognitive competence of students is one of the priority tasks in the process of learning a foreign language, the article analyzes its implementation and gives specific examples in a textbook - as the main tool necessary to implement the learning objectives.*

**Keywords:** *foreign language textbook, non-linguistic university, cognitive competence, thinking, memorization, creativity.*

According to teaching standards, the main purpose of a foreign language course in non-linguistic universities is to provide students with the necessary and sufficient level of communicative competence to solve social and communicative problems in various fields of everyday, cultural, professional and scientific activities when communicating with foreign partners, as well as for further self-education.

Foreign language teaching is aimed at the comprehensive development of the communicative, cognitive, informational, sociocultural, professional and general cultural competencies of students. This presupposes the development of such qualities as creativity, consciousness, aspiration for self-development, self-education, improvement of their intellectual abilities among students.

In addition, the study of a foreign language at a university is based on an interdisciplinary integrative basis, which implies an inextricable link with future professional activities. A textbook, being the main means of learning, plays an important role in achieving learning goals, for the success of the educational process as a whole. Therefore, a textbook on a foreign language should reflect all the basic principles of teaching a foreign language at a university.

One of the most important principles today is the development of students' cognitive ability, that is, "the ability to participate in new activities and integrate new information into an existing knowledge system, modifying the latter if necessary" [3, p. 103].

In this regard, researchers identify cognitive competence, which can be defined as the ability of students to the mental perception and processing of external information.

A.V. Shchepilova considers cognitive competence "the foundation for the development of all elements of communicative competence (linguistic, discursive, sociocultural, strategic)" [7, p. 56, 63].

In the process of mastering a foreign language, students build a "picture of the world" thanks to the information they receive through certain actions. This is not only about information perceived with the help of the senses, but about complex cognitive processes that are formed in the learning process.

As rightly observes I.Yu. Mangus, "a person is born not with knowledge, but with the ability to mine and master it" [1, p. 50-58]. Therefore, the formation of cognitive competence, and as a result, the ability to think analytically, compare one or another phenomenon, plan your activity, analyze it, independently find the necessary information, solve non-standard problems, creatively approach tasks, etc., is a complex process that must be reflected in the textbook of a foreign language.

Let's consider the stages of implementing the formation of cognitive competence in a foreign language textbook for non-linguistic universities in more detail.

As you know, at the first stage it is necessary not only to introduce new material, but also to increase the motivation of students, to interest them in new material. To stimulate interest in the content of the lesson in the textbook, along with the use of various printing tools (highlighting, fonts, various colors), at the beginning of the chapter (lesson, paragraph), it is necessary to reveal the practical significance of the material studied, to familiarize students with the purpose of the lesson, to make their imagination work by asking questions about what they already know about the topic. For example:

- Today you will learn how to write a resume and talk about your professional experience, using the past tense
- Do you often use the Internet? At the end of the lesson you will be able to work with Internet sites in French

In a foreign language textbook, in our opinion, the balance between texts and illustrative material is important. Illustrations carry not only a positive emotional attitude, and, therefore, a more effective memorization of material, but also familiarity with a foreign language culture, a different way of thinking, perceiving information, a different picture of the world.

The use of creolized texts (texts in which information is represented by means belonging to various sign systems), according to O.M. Ovchinnikova, allows “the most effective way to present the information that is in demand in professional communication of specialists” [4, p.3].

Such texts include advertising texts, posters, comics, presentations, etc. In the process of working with such texts, students develop the ability to transcode, deploy visual information, which also contributes to the development of cognitive competence. Examples of tasks can be:

- comment on a chart
- make an advertising slogan for a given object
- in what institutions can such ads be found?

In such texts, the material, as a rule, is presented figuratively, vividly, emotionally, which from the very beginning creates an attitude to perception, and drawing attention to objects of perception helps to preserve information in memory.

At the next stage, it is necessary to organize effective memorization of the studied material, using mnemotechnical and other techniques that contribute to the work of memory. It is known that memory plays an important role in cognitive processes, all thinking skills are associated with the ability to remember. To optimize the memory, tasks must be emotionally saturated, contribute to the correct semantic organization of the material. Tasks in the textbook should be diverse: including different types of speech activity, various forms of work (individually, in pairs, in a group). Priority should be given not to tasks that are performed mechanically, but to those that stimulate the students' thinking processes (analysis, synthesis, systematization, analogy, generalization). For example:

- identify correspondences between lines and illustrations
- compare two resumes and select the best candidate for a position
- rephrase a line to match a given situation
- categorize words from a list

The assimilation of information should follow an associative path. Information is easier to remember and reproduce if correlated with other impressions, already known information. It is necessary to teach students to independently create associations that are peculiar to them. To do this, examples of associations (for example, words and illustrations) and tasks stimulating this process should be placed in the textbook. For example: "What kind of associations does this word have for you?"

Strong associations are usually caused by a vivid emotional image, which in the textbook can be created using a frame. A frame is a generalized model of the organization of cultural knowledge around a certain concept, the structure of knowledge about the world, associated with a specific linguistic unit [2, p. 48].

A.N. Shamov compares a frame with a shot, for which everything that is typical for a given set of circumstances falls within [6, p. 72]. A vivid memorable illustration in the textbook that accompanies, for example, a particular lexical topic, contributes to the creation and preservation of the totality of associations in memory, which means the lasting memorization of linguistic units.

The training stage in the application of speech skills should stimulate the students' creative activity, stimulate their interest in learning a foreign language, and develop their personal potential. For this, the textbook should use personality-oriented, problem-search, game, scenario-contextual, design technologies.

The textbook should help create an atmosphere of creativity in the classroom due to visual aids, stimulate students' imagination, and flexibility of thinking. Tasks should be creative, for example:

- prove the need for investment in this industry
- imagine that we live in the XXII century, what problems do we have to face?
- express your consent/disagreement with the use of atomic energy
- look at the pictures and conclude what emotions these people experience
- explain your behavior in a given situation

As you know, the content of a textbook should reflect the interests of students, their needs. In a textbook for non-linguistic universities, there must be assignments that ensure joint collective work of the students' professional orientation, simulation of real situations of professional activity, communication with native speakers.

For this, a textbook contains tasks in which it is supposed to solve real, not educational problems (for example, conducting research, organizing an experiment, role-playing, business games, etc.) Such tasks motivate students, realize their need for communication, self-expression, and require conscious mastery of the language, develop intellectual potential, contribute to the formation of highly qualified specialists. For example:

- conduct a survey of your colleagues and formulate a conclusion based on the data
- write a petition
- make a program for the delegation's visit

Based on the fact that the textbook is the main means of instruction, it should fully comply with modern requirements and standards in the field of language education in a non-linguistic university. Therefore, in addition to the main functions, the textbook must also implement a cognitive function - to teach students to learn, to consciously perform one or another work with language material, to ensure mastery of the language through the use of students' intellectual, creative potential.

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应用远程教师专业发展: 基础阶段

## APPLYING DISTANCE PROFESSIONAL DEVELOPMENT OF TEACHERS: THE BASICS STAGES

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抽象。在本文中,将讨论与组织教学阶段,远程专业发展的建模,远程学习在消除专业发展系统中存在的问题以及将远程教育整合到传统专业中的过程中的作用和可接纳性有关的问题 信息社会时代的发展。除此以外,还包括有关组织教学阶段的实际学习过程的简要信息。

关键词: 社会, 信息社会, 远程教育, 远程学习, 远程教师专业发展, 建模, 组织教学阶段, 在线活动, 面对面的会议。

**Abstract.** *In this article to be discussed the issues regarding to the organizational-pedagogical stages, modeling of Distance Professional Development, the role and admissibility of Distance Learning in the process of eliminating existed problems in the system of Professional Development and integration of Distance Education into Traditional Professional Development in the age of Information Society. Together with this included brief information about the practical learning process concerning to the organizational-pedagogical stages.*

**Key words:** *society, Information Society, Distance Education, Distance Learning, Distance Professional Development of Teachers, modeling, organizational-pedagogical stages, on-line activities, face-to-face sessions.*

The systematic changes occurred in the contemporary society, the process of global information; constant development of information-communication technology realized its effect in all spheres of human activities.

As the society formed due to the natural needs of people for living in community, the specific features of the development of modern society specified with the process of Information, which has a global character.

In the process of Information society traditional activities used by people in the life transform the new forms. Such kind of transformation realistically appears in the development of Distance Education and its integration into the traditional teaching system.

By reviewing the articles and research works conducted by local and foreign scholars, we can say that there are different kinds of definitions to the terms used in the Distance Education field. For example, the scholars verified the System of Distance Education as a Pedagogic System in the new stage. [4,61].

In the resources, Distance Education stated as:

- “the form of education organized with the help of the methods, techniques and means of Distance Teaching” [3, 269];
- “the form of education gained with the help of Distance teaching methods and means” [2, 121];

As to Distance Learning:

- "It is the kind of education organized on the basis of Information and communication technology (computers, telecommunications, multimedia tools) accordingly to the relevant regulatory documents" [3, 269];
- "All or part of the training carried out on the basis of modern telecommunications and information technologies, in distance learning" [5, 73];
- "it is a communication between students and teachers in a certain distance from each other using the Internet or any other interactive technology and all the components of the educational process – purpose, content, organizational forms and teaching methods" [6, 254] and defined with other comments.

In the scope of tasks, the National Program of Personnel Training constantly improving professional skills of teachers, new approaches to this direction, and implementation effective forms of Professional Development indicated as a significant and important mission. [1].

To improve Professional skills of teachers considered constantly updating their skills accordingly conducting educational courses with the help of information technology, teaching or training interactive methods, education and training tools to ensure high scientific and methodological level – to the types of Education and basing on the requirements of the State Educational Standards (State Requirements) provide continuous growth of their professional and pedagogical skills.

In the public education system exists two conflict situations which are opposite to each other: the first - to improve the skills of teachers is very important in the context of globalization as one of the important type of educational activity, the second - the current professional development education system and society, create the following range of problematic situations between the family, the school and a person:

- to achieve the periodical and continuous professional development;
- problems of personnel competence of the Professional Development Educational Institution;
- problems on developing the content of Professional Development based on the needs of the teachers;

- the issue of the negative impact of the Professional Development to the pedagogical process of school;
- the problems of occurrence the negative social relations;
- the problem of the high expenditures in the system of Professional Development.

To resolve this conflict in the public education system, it is very available introducing the new form of teaching – the use of the training opportunities of distance education. This is an education paradigm aimed at increasing knowledge and skills of teachers through independent and creative activities.

The introduction Distance form of Professional Development in the Public Education system, caused to change "face to face" traditions which is implemented keeping the essence and requirements of "direct form of Professional development". This change could be related to the following three directions regarding to their characteristics:

1) The direct impact to the participants (teachers) personal and professional activities:

a) direct impact to the teachers personal character.

- *ease of use and efficiency*: teachers have an opportunity of using learning materials in any convenient places for themselves, any time and quick search and find the necessary information and exchange them with others.

- *cost-effective*: to reduce personal and family expenditures regarding to the process of Professional Development of teachers;

- *social equality*: to provide equal condition to the teachers despite the distance of their place and work from the Professional development Institutions as well as their social conditions and relations, their duties before the family and public. Such kind of equality to improving professional skills to minimize the negative effect of professional development to the life style and family relations of teachers.

b) the directly impact to the teachers' professional activities.

- *based on the needs*: there is a possibility of individual choice in gaining education basing on the needs of teachers;

- *technological support*: use of information and telecommunications technologies in gaining education, self-assessment and evaluation, to strengthen their knowledge, communication, operational processes;

- *uninterrupted activities in their work*: to prevent the negative impact and disruptions of the activities directed to getting and giving qualified knowledge and skills and connecting them with the use in practical life;

- *application development*. or information technology and interactive teaching methods in the educational process on the updated and in-depth knowledge, skills and abilities, which are directly linked with the strengthening of the application, creates a learning environment.

2) The impact of Professional Development to the activities of the educational institution.

- *variableness*: appearance the opportunity of the basic needs of the customer and the variation depending on the requirements of curricula and syllabi and the development and introduction of the content;

- *coverage*: created the conditions for the learners to improve the professional skills continuously in a timely manner on the basis of quantitative and qualitative unit;

- *savings*: to be expected the reduction of the expenditures for updating the material-technical base and infrastructure, and staff salaries to additional personnel power, the resources in the organization of educational process, including multiplying and delivering;

- *monitoring*: appeared the new opportunities of collaboration with the regional authorities in the field of education through analysis of the quality of the educational process, the results of the participants activities, the gaps in the data, as well as the management of the educational process basing on the participants' interests, likes, needs and suggestions;

- *continuity and periodicity*: achieved periodicity of Professional development of teachers on a regular basis, even after the course with the help of delivered new educational materials in accordance with the applicable regulation;

- *development*: through using up to date modern equipment and technology achieved and realized the status "modern institution" and introduced a new form of acting as a teacher "tutor" action to be established;

3) The impact of the implementation of the priority aims of the state and society.

- *socialization*: formed suitable learning environment served to improve the social relations of the audience, their needs and conditions;

- *savings*: achieved to state-specific cost efficiency and it is expected to use the savings in the way to further development of the education sector;

- *targeting*: create conditions for fully implementation of the state and society education reforms, to realize the aim of establishing information society and all stated tasks.

The conditions created in the country as well as the attention of the public education system in the form of distance training of teachers to develop highly efficient manner based on scientific development and introduction of the contents, which is required to be given time.

The observations proved that it is not highly effective directly implementation of any kind of distance learning model existed in the world and use the ready template. Instead, it is necessary to develop and introduce the new, relevant model of Distance learning apt to the existing law and regulations of Uzbekistan, based on the effective and useful international practices in this area and socially support of teachers, improve their conditions on education and upbringing of the children.

The factors that influence the effectiveness of the Distance Professional Development system of teachers, defining its organizational and pedagogical stages will simplify the modeling of the whole process, that is according to the methodological principles and approaches modeling the whole process of the Distance Professional Development can be done separating it by the following organizational and pedagogical process:

$$M_{\text{DPD}} = \sum \left\{ \left\{ M_{\text{os}} \sum \{M_{\text{os}_1} \dots M_{\text{os}_i}\} \right\}, \left\{ M_{\text{ps}} \sum \{M_{\text{ps}_1} \dots M_{\text{ps}_j}\} \right\}, \{x\}, F, O \right\}$$

Here,  $M_{\text{DPD}}$  – model of distance training (DT),

$\{M_{\text{os}}\}$  – a package of the organizational stage,

$M_{\text{os}_i}$  – a package of the elements of  $i$  – early step of the organizational stage,

$\{M_{\text{ps}}\}$  – set of pedagogic stages,

$M_{\text{ps}_i}$  – a set of  $j$ -step elements of the pedagogical stages,

$\{x\}$  – correlations and interaction of factors and packages,

$F$  – the function of the system depicted its targeting and integrative features (a new feature)

$O$  – additional factors.

Basing on the above-mentioned model of distance professional development can be outlined the introduction of the organizational-pedagogical stages of Distance Professional Development of teachers in the public education system.

Introduction of Distance Professional Development related to the following organizational directions and they considered its organizational stages: identification and selection; development, preparation; organization of the process; monitoring and analysis.

The pedagogical stages of introduction of distance professional development included the following steps: pedagogical supervision; the competency of the learner and adaptation; educational process; continuous methodological assistance.

The content of the parts of introduction stages of distance professional development, organizational lines, providing the link between the periodicals and the regulation principles, the content of its pedagogical stages, distance learning conditions consist of the essence of the educational process, which envisages the set of implementation guidelines, you can look at.

Today, each pedagogical-organizational step of the Distance Professional Development of teachers in the public education system organize taking into consideration its establishment on the scientific proofs.

For example, the stages related to organizational process of learning organized in the Central In-Service and Retraining Institute of Public Education staff named after A.Avloni as following:

Distance learning process of teachers to be delivered by the Distance Education Development Center and Regional Distance Education Coordination Centers.

Distance professional development learning process organized according to the 3 + 1 scheme (75%, respectively - regardless of the place of residence, for 25% of conducted in the face-to-face mode in the Educational Institutions) total amount of 144 hours of Professional development allocated as 108 + 36 hours.

108 hours (2-4 hours per day) self-study activities give the learners an opportunity of studying handouts, training materials independently, doing the mid-term controls and participate on-line activities. Allocation of this activity as following:

- Studying learning materials (SLM) - 80% -85%;
- Complete mid-term controls (CMTC) - 5% -10%;
- To participate in on-line sessions (POS) - 5% -10%.

36-hour contact(face-to-face) session consists of one hour training session which lasts 80 minutes, one face-to-face session is composed of not more than 3 training sessions. The period such kind of face-to-face sessions indicated between each 10-15 days.

During the course, the performance of learners assessed, basing on their activities prepared a Feedback by the Course organizers and tutors on the appropriate directions, according to this their participation defined in the final test to be defined. The learners of the Distance Professional development courses prepared their Qualification paper basing on the course category included the modules concerning to their specialization and at the end of the course they make a presentation as a final attestation. The learners who successfully completed the appropriate syllabi according to the requirements will get the State recognized certificate.

In conclusion we can say that the current system of distance learning technologies widely introduced to the teachers' professional development system and increasing the number of modern approaches to the modeling. Above stated Distance Professional Development models ensure the effectiveness of professional development, providing its connection with practice and maximum individualization of training, education and teaching as well as pedagogical collaboration.

Teacher training is a prominent area where distance education has made a major contribution. This includes initial training for formal qualifications, in-service supplementary training for formal upgrading, and continuing in-service training in particular subjects.

Many examples show that teacher training at a distance may reach large groups of teachers and have profound impact on the efficiency of national education systems. Distance learning for teacher education has been proved as a crucial strategy when expansion, quality improvement or cost-effectiveness is needed in the public education system.

Thus, also in Uzbekistan, distance education might be introduced into the teacher training system in order to achieve the above mentioned purposes.

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技术方法作为改善未来化学老师教学活动的一种手段

## TECHNOLOGICAL APPROACH AS A MEANS OF IMPROVING THE PEDAGOGICAL ACTIVITY OF FUTURE CHEMISTRY TEACHERS

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抽象。 本文对有关在教育领域(例如化学教育)中应用技术方法的问题进行了研究分析。 作者着重于培训学生,未来的化学老师,在化学和化学方法的教学整合运用教学技术的方法论问题。

关键字: 技术方法, 学生, 化学方法论, 专业能力, 学校, 老师, 学生。

**Abstract.** *The article presents an analysis of studies on the problem of applying the technological approach in the field of education (for example, chemical education). The authors focus on the problems of training students, future chemistry teachers, on the methodological problems of the integrated use of pedagogical technologies in the teaching of chemistry and chemistry methods.*

**Keywords:** *technological approach, student, chemistry methodology, professional competencies, school, teacher, student.*

Today, significant changes are occurring in the education system, a significant share of which is the implementation of the Federal State Educational Standard. This is reflected, first of all, in changing the goals of education and introducing varied pedagogical technologies into the educational program, individually or in a complex application. Changing the educational paradigm requires the development of a technological paradigm, on the basis of which the development of pedagogical technologies takes place. The question raises before a subject teacher “How to learn effectively?”, Which requires an immediate response. Currently, a simple set of developed elementary knowledge and skills of graduates of educational institutions at various levels is no longer enough. We are talking about the competencies of graduates, given the practical component of vocational training of students [1; 2; 3]. This applies not only to former schoolchildren (future applicants), but also to young specialists, former students of higher education. One of the components of such training is the introduction of a technological approach to training, thanks to which you can achieve a guaranteed learning outcome.

1. Knowledge of the technological approach to teaching as a component of the synergetic development of a whole complex of sciences is of great importance in the pedagogical activity of a chemistry teacher. With their help, the teacher can organize the process of teaching chemistry in such a way as to interest and activate students not only during the lesson, but also in the chemical education system itself, contributing to the comprehensive development of students. Having certain knowledge on the variable application of elements of pedagogical technologies, a chemistry teacher also increases his professional competence by organizing the educational process of chemistry education more efficiently. Practice shows that among subject teachers there is a certain negative attitude [4; p.204-208] to changes in education that inhibit the full implementation of innovations in the educational process. Therefore, we decided to continue our study, which began in 2016, and conduct a study to identify the level of application of modern teaching technologies both among experienced teachers and among future teachers.

In this paper, we will not disclose the features of the formation and development of the process of technological effectiveness in training. We offer our point of view on the application of the methodological features of the technological approach in chemical education as a means of improving the pedagogical activity of students, future chemistry teachers.

The topic of the technological approach to teaching was studied in the scientific works of V.P. Bepalko, E.S. Polat, V.A. Slastenin, M.V. Klarin G.K. Selevko, A.V. Vinevskaya, V.V. Serikov [5], I. Temple, G. E. Muravyeva and others. We have defined the meaning of the term “technological approach”. Our understanding is closest to the point of view of G. E. Muravyeva regarding the technological approach to teaching. This term means: in the narrow sense - the design of the educational process, based on streamlining the goals of education; in a broad sense, the organization of training, in which the main aspects are the determination of goals and ways to achieve them [6].

The technological approach allows to reveal different areas of educational and pedagogical activity, namely:

1. Plan the results of education with greater accuracy and more effectively manage the learning process.
2. Organize favorable conditions for the personal growth of each student.
3. Apply pedagogical tools more effectively.
4. Choose effective educational technologies and methods for solving complex pedagogical situations.

At the moment, there are a large number of pedagogical technologies that guarantee the achievement of certain results during the training. The basis of each technology is the idea of creating the necessary conditions for an effective process

of cognition. A teacher working according to the Federal State Educational Standard needs to master the relevant educational technologies and be able to rationally choose the teaching technology as part of the chemistry education process. The choice of a particular pedagogical technology depends on the content of the lesson, its goals, the level of student learning and the planned learning outcomes. This contributes to the fact that students independently discover new knowledge, and the teacher tries to plan correctly each stage of the lesson, implementing universal educational actions during the lesson [7, pp. 204-208]. In this study, we used the data obtained by us during the last years of studying this problem, taking into account the results of our pedagogical activity as a chemistry teacher in the municipal autonomous comprehensive educational institution for children who have shown outstanding abilities - "Secondary general educational boarding school" Specialized Olympiad and Scientific Center "SOINTSe".

In the course of our study, teachers from LAEI SBS "SOINTSe", undergraduates of 1-2 courses of the Institute of Psychology and Education in the field of preparation 44.04.01 "Pedagogical education. Chemical education", students of the Kazan (Volga Region) Federal University of Pedagogical Directions:

- Alexander Butlerov Institute of Chemistry, training direction 44.03.01 "Pedagogical education" Section: Chemistry;
- Institute of Physics, training direction 44.03.01 "Pedagogical Education" Section: Physics.
- Lobachevskii Institute of Mathematics and Mechanics, training direction 44.03.05 "Pedagogical education" (with two training sections).

The experiment was attended by 80 respondents.

At the first stage of the study, we conducted a remote survey among teachers and undergraduates of 1 and 2 courses of the Institute of Psychology and Education of KFU on the topic "Modern pedagogical technologies." The main purpose of this questionnaire was to identify pedagogical technologies used by teachers and undergraduates in the course of pedagogical activity. The number of respondents is 30 people. It should be noted here that 83% of undergraduates in this area work in chemistry at various levels as chemistry teachers. The results of the study showed that the most commonly used technologies in school education are: information and communication technology (82%), problem-based learning technology (83%), group learning technology (70%).

Next, we decided to conduct the same survey among future teachers - 4th year students of the three KFU institutes that were mentioned above. In analyzing the results of this questionnaire, we identified the following most commonly used technologies among future teachers: information and communication technologies (80%), gaming technologies (75%), and collaboration technology (70%). The number of students who participated in this survey is 40 people.

We also revealed the level of orientation of future teachers (more than 80%) to their use of pedagogical technologies to organize an effective learning process. This confirms that the future generation of teachers seeks to use modern education technologies to organize better chemical education.

Based on the processing the results of the most used training technologies, we developed a pedagogical case on the topic: "Pedagogical technologies for pedagogical practice in K(P)FU". In this case, the methodological features of two technologies are considered: information and communication technology and game learning technology. The structure of this case includes the following components:

- definition of the described pedagogical technologies;
- theoretical basis of technologies: purpose, objectives, founders of this technology, functions and main differences of technology;
- stages of the implementation of these technologies in educational activities;
- advantages and disadvantages of technology.

The use of this developed case is aimed at conscious understanding and acceptance by students, future chemistry teachers and undergraduates of the benefits of using these pedagogical technologies in the course of pedagogical activity.

We developed and analyzed the results of a survey on pedagogical situations to identify the level of knowledge of basic pedagogical technologies among students of 1-4 courses of study at the Chemical Institute named after A. M. Butlerova pedagogical direction. The survey results showed that the average score of correct answers for pedagogical situations (5 situations) is 72%. The total number of respondents was 50 people.

Thus, the technological approach is of great importance in the development of young specialists in the field of chemical education. Here it is necessary to take into account, of course, the possibilities and distance learning of students to implement the concept of "lifelong learning" [8]. To implement the technological approach, it is necessary not only to possess knowledge on pedagogical technologies and be able to apply them in pedagogical activities, but also to be competent specialists already in the process of university preparation for future practical activities. This is determined by the fact that students from the 1st year are gradually immersed in the future teaching profession during the traditional chemistry festival. During this competition of methodological developments, students of 1-2 courses develop and conduct extracurricular activities for schoolchildren of the city of Kazan and the municipal regions of the Republic of Tatarstan. The application of the technological approach allows yesterday's schoolchildren to correctly model these events and be prepared for the varied participation of schoolchildren in the implementation of extracurricular activities. Our study showed that future chemistry teachers have good knowledge of modern teaching technologies and are ready to apply them both in future pedagogical activities and in the closest production (pedagogical) practices for 3-4 courses of study. Future teachers are developing in accordance with the requirements of a new generation standard.

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广告文字是语言能力发展的基础  
ADVERTISING TEXTS AS THE BASIS FOR THE DEVELOPMENT  
OF LINGUISTIC COMPETENCE

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抽象。 这篇文章致力于学生学习俄语作为外语的专业语言能力的形成。 该实验的目的是在编辑广告文字时比较对照组和实验组的语言技能发展结果。 对照编辑的结果证明, 实验组的效率有所提高。 这表明使用广告文字以消除学习俄语作为外语的学生违反词汇, 形态和句法规范的有效性, 并为提高专业能力做出了很大贡献。

关键字: 专业能力, 广告文字, 语言规范, 词汇, 形态, 词汇。

**Abstract.** *The article is devoted to the formation of professional linguistic competence of students studying Russian as a foreign language. The aim of the experiment was to compare the results of the development of linguistic skills in the control and experimental groups when editing advertising texts. The results of the control editing have proved that the efficiency in the experimental group has increased. This indicates the effectiveness of the use of advertising texts in order to eliminate violations of lexical, morphological and syntactic norms by students studying Russian as a foreign language and contributes much to the increase of professional competence.*

**Keywords:** *professional competence, advertising text, language norms, vocabulary, morphology, lexis.*

In the development of the linguistic competence of future advertising specialists, the teacher pays special attention not only to the study of the norms of the modern Russian language, but also to the peculiarities of the written language of copywriters. Following this goal, it is necessary to determine the advertising texts [4, p. 117], which are used in classes.

Initially, students are encouraged to find advertising texts that make lexical,

grammatical (morphological and syntactic) errors. At the second stage, the teacher selects, analyzes and classifies advertising texts according to the violations of the norms of the modern Russian language.

The essence of the experiment was to compare how the Russian language and culture of speech skills among students, studying Russian as a foreign language, in the control and experimental groups have been formed while editing advertising texts that did not meet the standards of the modern Russian language. The purpose of the experimental study was to verify the effectiveness of the use of advertising texts in the Russian language and culture of speech classes. In the control group, teaching the discipline "Russian language and culture of speech" was carried out without the involvement of advertising texts. At the end of the experiment, students of the control and experimental groups edited the advertising texts and the teacher evaluated them in terms of compliance with the norms of the modern Russian language.

The essential features of the text, allowing it to perform a communicative function, is the integrity, connectedness, processing of the writing material in accordance with the laws and norms of the literary language. According to L. I. Velichko, the integrity of the text is created by the presence of special knowledge and structural-semantic organization of the message [2, p. 96]. Moreover, the connectivity is manifested in the substantial dependence of the subsequent sentence on the previous one. The analysis of samples of advertising texts teaches students to see the usage of the general laws of specific texts, to observe how vocabulary is reflected in them.

An advertising text contributes to a change in the students' information and intellectual potential, forms their textual competence [2, p. 107]. The latter is associated with competence in the field of professional communication. Textual competence is shown in the knowledge of the specifics of the content structure of the advertising text - on the part of the author - the ability to express it adequately, and on the part of the student - the ability to form the semantic structure (meaning as understood content) of a particular text. Textual competence is necessary for the expression (and understanding) of professional knowledge [3, p. 22] in both statics and dynamics.

The advertising texts can be divided into many separate levels (groups) according to their close relationships.

Since scientific concepts are found not only in linear, but also in vertical (hierarchical) relations, dividing linguistic material into parts without taking them into account makes it difficult for students to develop full-fledged skills in creating and editing advertising texts. The development of students' skills to evaluate the lexical content of an advertising text consciously was carried out by analyzing and highlighting keywords (I. A. Sternin [5, p. 69]), taking into account the semantic relations between the components of the text.

When working with the lexical content of an advertising text, students are of-

ferred the material that contains lexical errors (the first case reflects the error, the second is the editing option proposed by students):

- violation of lexical compatibility (The **increase** of the level of customer service did not have to wait long – The **improvement** of the level of customer service did not have to wait long);

- the use of the word without taking into account the lexical meaning (The potential consumers listened to the sales manager **fixedly** – The potential consumers listened to the sales manager **carefully**);

- speech redundancy (pleonasm and tautology) (**Using** the fertilizers we offer will bring great **use** to your plants - The fertilizers we offer will bring great **benefits** to your plants);

- speech deficiency (The employees of our company sacredly **preserve their founders** - The employees of our company sacredly **preserve the memory of its creators**);

- logical errors (We see a guest of our restaurant with a cup of morning coffee, **his face flipping through a glossy magazine** - We see a guest of our restaurant who leafs through a glossy magazine with a cup of morning coffee).

In the process of working with such material, students not only find lexical errors, determine their type, but also offer various editing options, while replenishing their vocabulary and hone their skills in creating advertising.

The analysis of the experimental group students' works has shown that the vast majority of students who used advertising texts as a part of their training scheme were successful to find and eliminate the violations of the modern Russian language norms. The results are presented in table 1.

The results of the formation of knowledge and skills in the Russian language and culture of speech in the experimental group (lexical norms)

Types of errors		Start of training	End of training
Lexical (and logical) errors	- violation of lexical compatibility	52,3%	74,8%
	- the use of the word without taking into account the lexical meaning	57,0%	82,2%
	- speech redundancy (pleonasm and tautology)	54,8%	78,1%
	- speech deficiency	55,2%	77,4%
	- logical errors	45,7%	81,1%
	<b>Total:</b>	<b>53%</b>	<b>78,7%</b>

As it can be seen from the data at the end of the training course, the students improved in the implementation of the norms of the modern Russian language, they corrected the advertising text lexically and variously.

During the grammatical analysis of the advertising text, students learn to notice, correct morphological and syntactic errors and prevent them in the text. In terms of morphology, the following types of violations of grammatical norms are practiced:

- the formation of nouns (We received a new collections of **shoe and boot** - Received a new collection of **shoes and boots**);
- the forms of adjectives (The **comfortabler** hotel conditions - The **most comfortable** hotel conditions).
- the forms of numerals (The authorized capital of the company is more than **five hundred seventy millions** – The authorized capital of the company is more than five hundred and seventy million);
- the forms of pronouns (Thanks to **he**, we were able to increase capital - Thanks to **him**, we were able to increase capital);
- verbs and verb forms (I didn't **think find** myself in such a wonderful place - I didn't **think that I could find** myself in such a wonderful place).

The analysis of the works of students in the control group showed that most of the students in whose training the advertising texts were used successfully mastered the types of work they proposed in finding and eliminating violations of the morphological norms of the modern Russian language. The results of the assimilation of knowledge and skills by students are presented in table 2.

The results of the formation of knowledge and skills in the Russian language and speech culture in the experimental group (morphological norms)

	Types of errors	Start of training	End of training
Morphological errors	-the formation of nouns	58,2%	88,6%
	-the forms of adjectives	49,7%	91,6%
	-the forms of numerals	41,4%	72,1%
	-the forms of pronouns	52,2%	93,4%
	-verbs and verb forms	58,1%	94,7%
	<b>Total:</b>	<b>51,9%</b>	<b>88,08%</b>

In terms of syntax, the following grammatical errors are considered:

- management standards (In this salon we can always buy gifts for friends **with** their rather different tastes - In this salon we can always buy gifts for friends **according to** their rather different tastes)
- coordination of subject and predicate (A new collection of children's clothing "Owlet" **are presented** in our boutique - A new collection of children's clothing "Owlet" **is presented** in our boutique);

– building sentences with homogeneous members (The variety and uniqueness of the goods presented at the exhibition and sale will not only surprise you with good quality, **and** will also please you with the price - The variety and uniqueness of the goods presented at the exhibition and sale will not only surprise you with good quality, **but** they will also please you with the price);

– building of complex sentences (The feedback on the sponsors event was interesting, but, **however**, could not trigger a response - The feedback on the sponsors event was interesting, **but** could not trigger a response);

– ways of transmitting someone else's speech (The main viewer admired our volunteers and noted that **I** want to spend every day off in such a company! - The main viewer admired our volunteers and noted that **he** wants to spend every day off in such a company!)

– participle and verbal participle phrases (**Passing** by the created composition by your company, a sense of pride covers us! - **When we pass** by the composition created by your company, a sense of pride covers us!)

The analysis of the experimental group students' works has shown that the large group of students who used advertising texts as a part of their training scheme were successful to find and eliminate the violations of the modern Russian language morphological norms. The results are presented in table 3.

The results of the formation of knowledge and skills in the Russian language and culture of speech in the experimental group (syntactic norms)

Types of errors		Start of training	End of training
syntactic errors	-management standards	55,7%	84,6%
	-coordination of subject and predicate	57,4%	89,1%
	-building sentences with homogeneous members	48,2%	78,9%
	-building of complex sentences	49,7%	92,4%
	-ways of transmitting someone else's speech	51,4%	88,2%
	-participle and verbal participle phrases	42,2%	78,9%
	<b>Total:</b>	<b>50,7%</b>	<b>85,3%</b>

From the data above it can be seen that at the end of their studies students successfully obtained the norms of the modern Russian language.

At the end of the experiment, students in the control and experimental groups were asked to edit the advertising texts in compliance with the norms of the modern Russian language (lexical, grammatical). The texts for all groups were exactly the same. The results of the verification and analysis of the works are performed and summarized in table 4.

The results of the formation of knowledge and skills in the Russian language and speech culture in the control and experimental groups.

Types of errors		control group	experimental group
Lexical (and logical) Errors	-violation of lexical compatibility	72,8%	94,4%
	-the use of the word without taking into account the lexical meaning	70,0%	92,8%
	-speech redundancy (pleonasm and tautology)	74,4%	98,1%
	-speech deficiency	75,2%	87,7%
	-logical errors	65,9%	91,1%
	<b>Total:</b>	<b>70,9%</b>	<b>92,8%</b>
Morphological errors	-the formation of nouns	68,4%	98,6%
	-the forms of adjectives	69,7%	91,6%
	-the forms of numerals	51,4%	86,4%
	-the forms of pronouns	67,1%	93,4%
	-verbs and verb forms	69,4%	94,7%
	<b>Total:</b>	<b>65,2%</b>	<b>92,9%</b>
syntactic errors	management standards	68,4%	94,6%
	-coordination of subject and predicate	57,4%	89,8%
	-building sentences with homogeneous members	58,8%	88,9%
	-building of complex sentences	69,0%	92,4%
	-ways of transmitting someone else's speech	71,9%	98,6%
	-participle and verbal participle phrases	57,4%	88,9%
<b>Total:</b>	<b>63,8%</b>	<b>92,2%</b>	

The analysis of the student tests has revealed that the use of advertising texts in the study of lexical and grammatical norms of the modern Russian language and speech culture leads to higher results (20-25% better at the proposed task). This indicates the effectiveness of the use of advertising texts in the development of the linguistic competence of future advertising specialists, studying Russian as a foreign language, to eliminate violations of lexical, morphological and syntactic norms and helps increase the level of professional competence.

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史蒂文森 (R.L. STEVENSON) 和英国新教主义  
**R.L. STEVENSON AND ENGLISH NEOROMANTICISM**

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抽象。本文分析了19世纪后期英国文学中新一波浪漫主义的起源。它感动了许多作家，特别是史蒂文森 (R.L. Stevenson)。创造性的问题性和主题性特征证实了他方法的浪漫主义统治，史蒂文森对浪漫主义美学的承诺也通过人的观念得到了证明，他的评价不是纯粹的社会现象，而是永恒的立场，完全基于纯粹的观点。个人身份。史蒂文森艺术人类学的中心位置是所谓的“复杂”角色，贯穿他的所有作品。

关键字：浪漫传统，知觉历史，创作方法，英雄问题

**Abstract.** *The article analyzes the origin of a new wave of romanticism in English Literature on the late 19<sup>th</sup> century. It touched a number of writers, and especially R.L. Stevenson. The romantic dominant of his method is confirmed by the problematic and thematic characteristic of creativity and also Stevenson's commitment to romantic aesthetics is evidenced by the concept of man, his assessment not as an estate-social phenomenon, but from timeless positions, based on a purely personal status. The central place in Stevenson's artistic anthropology is occupied by the so-called "complicated" character, passing through all his work.*

**Keywords:** *romantic tradition, history of perception, creative method, the problem of the hero*

Robert Louis Stevenson had complicated literary fate. He became famous already after his first works – the short story “A Lodging for the Night” (1877) and the book of essays “An Inland Voyage” (1878), but his novels “Treasure Island” (1883) and “Strange Case of Dr. Jekyll and Mr. Hyde” (1886) made him really famous.

The early criticism reduced the literary merits of Stevenson mainly to its style and form. None other than O.Wilde upbraided him for liking for the utilitarian vital material. He didn't like that "the delightful master of the tender and dreamy prose" wrote "the stories which looked like life" [1]. Such a point of view got support from the later critics. So, in 1912 W.Collier wrote, that "Stevenson was obliged his status in literature... purely to artistic beauty of his style" [2].

But almost at once the other, negative tradition in the perception of Stevenson was discovered. The judgements, that got resonance in later critic works, were told in the first considerable work about him: W.Archer, the author of article "Robert Louis Stevenson: his style and thinking" (1885), not only accused him in the light-weightless of style, but directly underlined, that he "loved literature for the literature itself" [3].

During the first time after the death of Stevenson his reputation remained unshakeable. In 1896 G.Saintsbury in his book "The History of 19<sup>th</sup> Century Literature" named Stevenson "the most and interesting of the English writers of the second half of the century" [4]. This high appraisal seemed insufficient to some literary critics. R. Le Gallienne had defined Stevenson as "Vergilius in prose" [5]. A.Quiller-Couch had expressed himself even more emotionally: "Put away the books, papers and pen... Stevenson died, and now there is nobody who is worthy to write" [6]. However, this declaration didn't prevent its author without false modesty to write a sequel of the unfinished novel by Stevenson "St. Ives".

But soon the discussion about "manner" and "matter" fairly had shaken the reputation of the author of "Treasure Island" and "The Master of Ballantrae". And his friend H.James, who considered "The Master of Ballantrae" as "the purest and the most perfect crystal, a creation of the inexpressible beautiful art", simultaneously was forced to part with the former popularity. When the critical heat of the supporters of the utilitarian, applied attitude to the literature had slightly fallen down, and the writers got again the opportunity to take care about the artistic form without damage for their reputation, H.James was rehabilitated. As for Stevenson, his name was stroke off the list of the serious writers for a long time and he was perceived mainly as a writer of the essays and adventure stories. Such a point of view with the special acuity and predilection was fixed in the work by F.Swinnerton [7].

Such status quo kept up to the middle of the 20<sup>th</sup> century. In the 1930s C.Caudwell, who stood on the positions of the vulgar socialism, condemned Stevenson as a writer, who along with Wilde reflected the mood of the bourgeois-aristocratic circles of the English society. "Stevenson is too insignificant to pretend to serious study", - wrote then Caudwell [8]. In 1948 nobody considered it necessary to object to F.Leavis, when he uncomplimentary wrote about Stevenson-artist in the eloquent comment to his book "The Great Tradition" [9]. But from the be-

gining of 1960s some works appeared in which Stevenson was considered as a real artist-psychologist, and his works were revalued [10]. And what is more, G.Greene himself declared him as his predecessor, and modern critics began to name Stevenson as “the English Dostoyevsky”.

The fate of Stevenson was almost analogous in our country. His works had become famous in Russia in 1880s, and from the very beginning he was presented to the Russian readers as one of the fathers of the newest sensational novel. The early Russian critics couldn't perceive in Stevenson, the author of not only the novels “Treasure Island” and “Kidnapped”, but also “Strange Case of Dr. Jekyll and Mr. Hyde”, the writer of the deep psychological penetrations, who in his own way reflected the discrepancy of the modern to him reality, superficially noted in him only an excellent stylist and a fascinating story-teller.

Though the literary criticism in our country had a number of articles and dissertations about the works of Stevenson, till recently he appeared in Russia mainly as a master of the adventure novel and was noted in connection with the adventure genre. Only the works by N.Y.Dyakonova, A.A.Belsky, M.V.Urnov let us specify the place of Stevenson in the English literature and perceive him as one of the first modern writers according to style and psychology, who could predict the main features of the 20<sup>th</sup> century literature.

At the same time the undetermined problems in the study of the aesthetics and works by the writer are still left. One of them is the role of Stevenson in the beginning of the new wave of romanticism in the English literature of the end of the 19<sup>th</sup> century, which in the critic works got the name “Neoromanticism”. On his ambivalent attitude to romanticism, a kind of “Stevenson paradox”, in particular, writes M.I. Sverdlov.

The English Neoromanticism as an ideological and artistic phenomenon is typical for the definite historical period, and exactly - for the end of the 19<sup>th</sup> century, when the feeling of crisis, uncertainty, relativity of all the existed ideals and values had appeared in the society. This crisis atmosphere, the mood of anxiety and confusion had affected the literature. The critic of the beginning of the 20<sup>th</sup> century J.Kennedy wrote, that “melancholy was the leading burden of the last period of the English literature since approximately 1880 and ending, let us assume, in 1905” [11]. In the middle of the 20<sup>th</sup> century A.Kettle also wrote about predominance in the English literature of the 19<sup>th</sup> century of “the uncertain and strained tone”, about the feeling of “the deep anxiety” as about the consequence of “process of disintegration of the Victorian society” [12].

Neoromanticism was an outcome of this turning epoch. However, in general we can hardly speak about even any long fading of the romantic tradition in the English literature after the flourishing of romanticism in the first third decade of the 19<sup>th</sup> century. Soon after 1832, when W.Scott died, the young Dickens-Boz

appeared on the literary arena of England. In his works both the English and Russian literary critics had discovered many facts of the confluence of realism and romanticism. Blaming the vices of the bourgeois aristocratic England in “*Oliver Twist*” (1838) and some of his other novels, Dickens successfully used the possibilities of both the romantic and realistic methods. Without any doubt we can feel the romantic pathos in the novel “*Jane Eyre*” (1847) by Ch. Brontë. The romantic heroes having qualities, typical for the former epoch, return to life in the novel by E.Brontë “*Wuthering Heights*” (1847), though they act under not so romantic motives [13]. The modern researchers perceive the art of Pre-Raphaelites in the course of the latter romanticism [14]. Even in the second half of the 19<sup>th</sup> century, in the period of preponderance of the positivism and utilitarianism, the romantic voices continued to be heard: “*The Poems and Ballads*” by Ch. Swinburne, in which frank hedonism and aestheticism were combined with the passionate pathos of freedom, had appeared in 1886.

The activities of Stevenson as a propagandist of the romantic ideals began in the years, when the literary appearance of time was defined by the works of G.Eliot, A.Trollope and their followers, when E.Zola had already declared naturalism as “the intellectual movement of the century”.

In 1880s the definite situation arose in the English literature, when many writers and critics began to feel dissatisfaction with the old artistic system, in which the principle of faithfulness to the reality sometimes turned the naturalistic partiality to prosaic, utilitarian sphere. E.Gosse, commenting the state of literature on the boundary of the 19<sup>th</sup> and 20<sup>th</sup> centuries, wrote: “All of us are absolutely depressed by the dominant influence of the superficial realism. Even our children gradually part with the ability to believe in the possibility of incredible things” [15].

The English neoromanticists tried to compensate the absence of real poetry in the life by the intent attention to history, by heightened interest to the national cultural heritage and folklore. In the end of the 19<sup>th</sup> century the genre of literary tale (Carroll, Kipling, Wilde) was revived, the historical works by Stevenson and Haggard appeared, the novels by W.Scott were republished. The interest for the detective genre (Conan Doyle, Chesterton) was sprung up. The science fiction (Wells) was test the true heyday.

Stevenson more than ones expressed his anxiety about the state of the modern literature. As long ago as in 1878 he wrote in his book “*An Inland Voyage*”: “In literature we all play the sentimental flute and there is no the man among us, who could stand up in front of a column and begin to beat the courageous drum” [16].

In the integral and programmed form the aesthetic principles of Stevenson were stated in his article “*A gossip on Romance*” (1882), in which the writer declared himself as a supporter of the romantic art, which was raised above the ordinary and mediocre. He was departed from the narrowly utilitarian outlook, cult

of the material calculation, which reigned in the society of his time. According to Stevenson a writer-romantic creates the new, perfect world, changing the chaos of the real life with the help of his sublime fantasy. “The life is monstrous, - wrote Stevenson, - indefinite, deprived of logic, cruel and miserable; in contrast to life, the work of art is clear, definite, finished, reasonable and deprived of the brute force” [17].

In his essay “A Note on Realism” (1883) Stevenson defended the romanticism in art and continued the polemics with naturalism. Speaking about the literary-critical views of the writer, it is necessary to mean the circumstance, that the term “realism” in his idea is identical to the notion “naturalism”. As A.A.Belsky wrote, the artist defended “dialectical view on the art”, which could be simultaneously realistic and romantic [18]. Stevenson had his doubts about the assertion that the French naturalists could depict the reality more truthful, than the traditional romantics. According to his opinion, any work, which was “planned with the strength and sincere aspiration for truth”, pretends to the fidelity of the portrayal of life, because “the question about realism has no any relation to the genuine truth, which is included in the work of art, it is connected not only with technical method” [19].

The thought of Stevenson about the genuine truth, which was a basis of the romantic art was confirmed by Conrad after the thirty years. In his letter to S.Colvin Conrad had recognized, that though he was always named as “the singer of the sea, tropics and far lands”, first of all he aspired to get to know “the real value of the things, events and people” [20]. Though in the end of the 19<sup>th</sup> century Stevenson was not alone in the propaganda of the romanticism. W.Henley made a valuable contribution to the development of the neoromantic ideas. He had not only promoted the edition of the books “Treasure Island” and “King Solomon’s Mines”, but also followed the romantic principles in his artistic practice. The other authoritative defender of the romantic art was the famous poet, critic and folklorist A.Lang. His articles about W.Scott, A.Radcliffe, A.Dumas and later about Stevenson and Haggard had the important significance for the formation of the Neoromanticism.

In general, the wave of the romanticism in the end of the 19<sup>th</sup> century was high enough. It touched upon such different writers as Wilde, Kipling, Conrad, Conan Doyle, Galsworthy. It was not accidentally, that R. Le Gallienne in his autobiographical book “The Romantics’ 90s” wrote: “I called 90s “the romantic years” not only because it was romantically to live then or because in these years so many romantic figures pulled out, but first of all because the more typical writers and artists of the time showed their resolution to run away from the dead slavery of the material calculation and obsolete conventions, and to live significantly, intensively, freely, and, if you want, bravely. The aspiration for the romanticism was the main motive in the 90s” [21].

As for Stevenson, the romantic dominant of his method is confirmed by the problematical and topical characterization of his works. In particular, some of his works are based on the historical material: in “The Black Arrow” and “The Master of Ballantrae” – the motives of Scotland of old times, “A Lodging for the Night” is connected with the French history and “The Pavilion on the Links” – with the Italian one. The sea theme is represented side by side with “Treasure Island”, “The Wrecker” and the short story “The Merry Men”. The residence of Stevenson on the Samoa island and his acquaintance with the culture and way of life of the people of Polynesia promoted the origin of one thematic rubric, which put together the short stories “The Beach of Falesa”, “The Bottle Imp” and “Isle of Voices”. A number of his works, such as “Dr. Jekyll” and “Markheim”, can be refer to the ethical cycle about the origin of evil and the duality of human nature. At last, Stevenson once intended to write the series of horror stories and to include them in the book of collected stories with the conventional title “The Black Man”. Such an irrational principle, going back to the Gothic tradition, is present in the short stories “Damned Janet” and “Olalla”.

The conception of a man, his appraisal not as a class or social phenomenon, but from out of time positions, coming from the purely personal status. The central place in the artistic anthropology of Stevenson occupies so called “complicated” character, passing through all his works. The opinions of the author himself, told in his article “The books, which influenced me”, could be applied to this character: “The man’s nature is so complicated... The crying weaknesses and dazzling merits go hand and persistently preserved in one and the same man” [22].

Francois Villon and Prince Florizel from “The Suicide Club” are the first specimen of such contradictory heroes. Norstmour, who underwent the evolution from the egoist and individualist to the fighter for the oppressed ones (“The Pavilion on the Links”), and Jekyll, who had his vile double in Mr. Hyde (“Strange Case of Dr. Jekyll and Mr. Hyde”), belonged to the same category of the complicated, polysemantic figures, who were ruled by the contradictory feelings. John Silver is the Shakespearian character indeed, in whom the monstrous vices whimsically combined with the attractive impulses of generosity and courage (“Treasure Island”). At last, one more example of the hardened fight of the good malicious commencements in a man was presented in the image of James (“The Master of Ballantrae”).

Thus, the aesthetic views and artistic works of R.L.Stevenson define him as one of the clue figures of the English Neoromanticism.

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过度使用个人名称  
**DEVIANT USE OF PERSONAL NAMES**

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抽象。 本文讨论了基于去匿名化进行二次提名的情况,即将专有名称转移到新的引用对象,该引用对象在语言中具有中性名称。 它涉及源自人类称谓的referring语和俗称,指的是非传统性取向的人。 人名的过分应用会导致其性别中立。

关键词: 个人名称, 去匿名化=去匿名化, 非常规性取向, 性别中和

**Abstract.** *The article deals with cases of secondary nomination based on de-onymizing, which consists in transferring a proper name to a new referent, which has a neutral name in the language. It concerns slang and colloquial names derived from anthroponyms and referring to people of non-traditional sexual orientation. Deviant application of personal names results in their gender neutralization.*

**Key words:** *personal name, de-onymizing = de-onymization, unconventional sexual orientation, gender neutralization*

The article considers cases of secondary nomination based on de-onymization by which is meant transferring a proper name to a new denotation which has a neutral designation in the language. We have in mind slang and colloquial designations of representatives of non-traditional orientation, derived from anthroponyms. We consider it necessary to stipulate that when covering the topic discussed, we adhere to the generally accepted terms of sexology, medicine and sociology, giving preference to euphemisms, trying not to go beyond the linguist's competence.

It is customary to distinguish several lines along which de-onymization occurs and proper names develop common meanings 1) the name of a person → person: *hercules* in the meaning of "a man of outstanding strength or size"; 2) the name of the person → thing: *mac* in the meaning of "a (waterproof) raincoat"; 3) the name of the place → thing: *burgundy* in the meaning of "heavy red table wine"; 4) name of the person → action: *boycott* in the meaning of "termination of relations"; 5) the name of the area → action: *panama* in the meaning of "swindle, fraud, deception"; 6) the name of a person → unit of measure: *ampere, pendant, angstrom*; 7) the name of the area → place: *Kamchatka* in the meaning of "remote place"; 8) person → place: *penates* in the meaning of "one's home" [1].

Slang and colloquial designations of representatives of non-traditional orientation derived from anthroponyms belong to the first type of transfer “the name of a person → person” and as a rule, female personal names are applied to men: *agnes, annie, belle, betty, daisy, ethel, jessie, lily, margery, mary, maud, molly, nancy, nellie, nola* and others. An indicator of the new status and of the transition to the category of common names is their spelling mainly with a lowercase letter. Interestingly, the deviant (from the layman's point of view) use of male personal names among lesbians is almost not observed or is not so pronounced: a few examples come down to the names *jasper* and *tom*. If *tom*, according to J. Green, has been circulating since the end of the 19th century [5, p. 1212], *jasper*, in its turn, came into use in the mid-20th century and is limited in use by the prison jargon and the speech of Afro-Americans [5, p. 655]. In relation to a lesbian with traces of moustache on the upper lip or with facial hairs, the designation *van dyke* is used, based on the outward resemblance to a Flemish artist who had (bushy) mustache and (sparse) beard on his face. The same name may be given to the female driver (the meaning “van” and the name of the artist are played on) [2].

Depending on the sex of the person, the names are divided into male and female. However, there are gender neutral forms of names used both in relation to men and women, for example, *Valentine, Leslie, Sam*, etc. According to our observations, gender neutralization usually affects short homonymous forms of names: so, for example, *Chris* correlates with the male names *Christian, Christopher* and the female names *Christiana / Christina, Christine, Jo* and *Joe* - with the male name *Joseph* and the female *Josephine, Mat* with *Matthew / Matthias* (male forms) and *Mathilda, Martha* (female names), *Vic* with the male name *Victor* and female *Victoria, Val* with the names *Valentine* (male and female), *Valery, Valeria* [2]. The name *Winnie* or *Winny* of Welsh descent can refer to either a man or a woman. It is perceived as a short form, which can correlate with several female names at once: *Edwina, Winnifred, Gwendolyn, Guinevere, Gwyneth, Wynne*. The name is associated with adjectives that convey positive meanings: “fair”, “honest”, “light”, “white”, “smooth”, “soft”, “clean”. The male form is derived from *Winston*, of which Winston Churchill is the most famous carrier, or from the names such as *Edwin, Darwin*, and other names ending in *-win*.

There is reason to consider the use of personal female names in the system of forms of address adopted in a homosexual environment in relation to a partner or associate, as well as the use of male names in a lesbian environment as cases of gender neutralization.

Let us consider in the sociocultural aspect some female names that are used by non-traditional people, taking into account such characteristics as activity / passivity, age, preferences, etc. The name *angelina* (in use since the middle of the last century) serves, for example, as a designation for a boy (a passive partner of an

older homosexual) [4, p. 22], [4, p. 14]. Collectively, *angelina sorority* - (young) passive homosexuals. An aging homosexual can be called *abigail*, and a rude, brutal or temperamental homosexual is *Mother Parker* [5, p. 807]. The name *old nellie* (derived from rhyming slang (hereinafter referred to as Rhy. Sl.) *Nellie Dean = queen*) also refers to an older gay person. In Rhy. Sl. we find more than two dozen rhymes to denote people in this category, based on first or last names [3], of which the “female” rhymes are *Doris Day = gay*, *Maggie May = gay*, *nellie / Nelly Duff = puff (= poof)*, *Nellie Dean = queen*, *Torvill & Dean = queen*. Let us provide a sociocultural commentary on the first two rhymes.

The *Doris Day = gay* rhyme is based on the name of the American singer and actress Doris Day, the golden age of Hollywood star, who was one of the most popular actresses of the 1950-60s. The owner of two Oscars devoted most of her life to protecting animals. The *Maggie May = gay* rhyme is based on Rod Stuart's autobiographical song *Maggie May*, which he recorded in 1971. The song is narrated on behalf of a 16-year-old teenager who is “made a man” by an adult woman named Maggie May, who was supposedly a mother's friend.

Politically correct designations of a gay person are considered to be *dorothy's friend / friend of dorothy*. A Jew homosexual reasonably receives the designation *esther*, which plays on the biblical name of the wife of the Persian king Artaxerxes, who saved the Jewish people from extermination. As the Biblical Esther was the wife of the king (*queen*), so the meaning of the word queen “a person with homosexual inclinations” is played on. The name *gladys* is stereotypically associated with a fat, aggressive and boastful homosexual [5, p. 500]. A number of designations refer to effeminate men and gay persons who dress and act like a woman: *jessie*, *lizzie / Lizzie*, *mary-ann*, *nancy*, *nellie*. The appearance and behavior of gay people reflect the designations *hairy Mary* for a courageous and strong homosexual; *leather mary* – for a homosexual or a lesbian who love to dress in skin (sometimes as part of a sadomasochistic copulation); *muscle mary* – for a muscular, well-built homosexual.

Male names are but few: *Dorian* [4, p. 89] and *Oscar* [5, p. 881], motivated by the main character of the novel “The Picture of Dorian Gray” and the name of its author, the playwright and writer Oscar Wilde, who was sentenced to two years in prison on charges of homosexuality; *ganymede* - young catamite [5, p. 466] (from Greek mythology, after the name of a beautiful young man whose beauty captivated Zeus so that he made the youth a cupbearer and his lover. The myth gained extraordinary popularity in Ancient Greece and Rome, as it seemed to give a religious justification for attracting men to boys); *gussie* (the personal name *Augustus*, considered stereotypically feminine) [5, p. 547] and, finally, *john-and-john* [twice john] [5, p. 671]. One of the recent additions to the list of names - *Marco Polo* (in circulation since the 1980s) - exploits the name of the Venetian traveler and writer (1254 - 1324) [5, p. 770].

Thus we examined cases of secondary nomination based on de-onymization, consisting in transferring a proper name to a new denotation which has a neutral designation in the language. We focused on slang and colloquial designations of representatives of non-traditional orientation, derived from anthroponyms and the deviant use of personal names, resulting in gender neutralization of the name.

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语言是种族身份的固有特征

## LANGUAGE AS AN IMMANENT FEATURE OF ETHNIC IDENTITY

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抽象。 本文考虑了作为埃文克人族裔意识(萨哈(雅库特)共和国)组成部分的母语的作用和功能。 在与萨哈共和国语言使用有关的主要问题中,作者将北方土著少数人的语言领域中某些职能的持续减少分开。 我们认为,这种趋势的根源在于对国家语言的重要性及其在族群保护中的作用的低估。 种族自定义是一个心理过程,当捕获有关象征性文化元素(例如种族语言)的组装知识时,会被激怒为个人对民族文化的内向注入。

关键字: 族裔的语言, 种族, 族裔身份, 语言环境的规范, 遗产语言, 母语, 第二语言。

**Abstract.** *The article considers the role and functions of the native language as a constituent of the Evenk people's ethnic awareness (the Sakha (Yakutia) Republic). Among the major problems relating to the language usage in the Sakha Republic, the authors separate out the ongoing reduction of certain functions in the language domain of indigenous small-numbered peoples of the North. In our opinion, the root of the tendency in question lies at underestimation of national languages' significance and their role in ethnic group preservation. Ethnic self-definition is a mental process and is provoked as an individual's immanent introjection into his national culture when capturing knowledge about the assembly of symbolic cultural elements, such as an ethnic group's language.*

**Keywords:** *ethnic group's language, ethnicity, ethnic identity, specification of linguistic situation, heritage language, native language, second language.*

### Introduction

Ethnicity is defined as a group's awareness of its individuality, dissimilarity from other ones in a number of critical ways [2, pp. 9-49]. Ethnic identity still remains an understudied issue, therefore modern researchers fully recognize the necessity to explore it more thoroughly [12, p. 94], which is of high relevance in the age of globalization and marginalization. Native language is considered one of an

integral part of ethnic identification, as throughout its evolution it accumulates the data about the people's history, the surrounding world and their mentality. Among the main problems of language life in the Sakha Republic modern researchers mention a reduction of certain functions in the language domain of indigenous small-numbered peoples of the North, including the Evenki, a decrease of interest in the national culture and a lack of positive incentives to study native languages. Nowadays people tend to underestimate the significance of national languages and their role in preservation of ethnic groups, the multinational cultural diversity of our country, as well as its unity [12, p. 101].

The republic witnesses a negative trend, where 85,4% of the Evenk people speak Yakut and Russian, instead of Evenki [10, p. 68]. In the framework of the socio-linguistic expedition dating back to 2014 the researchers investigated and compared the linguistic situations in two Evenki villages: Hatystyr in Aldan district and Iyengra in Neryungrinsky district. The research was carried out using the methods of comparison and grouping; it included an analysis of the data obtained from interviewing and questioning 156 those surveyed aged from 14 to 60.

Thus, according to the results obtained, the process of language shifting towards the Russian and Yakut languages among the Evenki continues [5, p. 37]. The field data prove that nowadays the Evenki language role is more symbolic, rather than communicative.

Ethnic identity bears relation not simply to the actual usage of a language by an ethnic group, but even more with its symbolic role in raising the consciousness of affiliation with the ethnic group.

The given characteristics of linguistic situations in the dense dwelling environments of the Evenk people in the Sakha Republic can serve as manifestation of the language's controversial role in developing and preserving their ethnic identity.

### **Heritage language as a means of cultural involvement**

Various theories defining ethnic identity mention language as the determining factor. At the same time there exists, however, an opposite point of view, according to which it cannot always serve as a reliable criterion for defining ethnicity.

Among essential sociolinguistic factors the researchers mark out social, language and communicative ones [1, p.193]. On this basis, the main target of the current work is to determine the Evenki language role and functions in the context of their ethnic awareness, as the linguistic classification does not fully correlate with the ethnic one. For this reason, the terms "ethnos" and "language" cannot be given the same status.

Language accumulates a nation's historical experience, its ethical, moral, socio-aesthetic, artistic and educational standards. It manifests the nation's emotional-value attitude to the surrounding world, view of life and its manifestations.

Recently linguists, ethnologists and psychologists have demonstrated keen interest in the issue of ethnocultural norming in languages, behavior, ceremonies of different ethnic groups, as well as revealing ethnic peculiarities in ethnic groups' languages and intellectual cultures.

In compliance with that, it seems reasonable to consider the notions of “hereditary language”, “native language” and “second language”, which can be either of similar, or absolutely different meaning.

Hereditary language is, first of all, an ethnic group's language being its characteristic feature. Hereditary language forms a basis for ethnic unity and ensures communication within this or that ethnic group. In case if some members of the group abandon their hereditary language, it, nevertheless, remains an ethnic symbol defining an individual's readiness to follow the ethnocultural standards deeply-rooted since childhood. And the language life of different Evenki groups can be a splendid example.

Native language, one of the most significant notions in sociolinguistics and ethnology, is defined as 1) usually the first and naturally learnt, without any special training, from the parents who are native speakers; 2) the instrument of mental activity; 3) the most often used language; 4) regarding the presence/absence of inner emotional bond with a language, the native one is defined as the closest (poetry and other pieces of fiction are better understood when written in this language); 5) it is interrelated with outer identity (the way other people identify an individual's native language). According to the most prevailing theory, native language is the one that a person masters since early childhood without any special studying, just being in the corresponding language environment.

Since early childhood a person can somehow master several languages. In this case, this individual can consider two or more languages native. A language mastered by way of special training or in the relevant language environment in later years is called “second language” (there can be several as well) [6].

A number of authors differentiate between native language and the first one, regarding those cases, when a person gradually abandons their native language and starts to actively use another language mastered simultaneously or later [7].

In other words, Vakhtin N. and Golovko E. emphasize that “mother tongue is not obligatory native, and native language is not obligatory the first” [5].

As specified in another theory, native language can be identified with a language in which a person thinks without any additional self-check and in which they express their ideas easily and naturally in speaking and writing [1]. It is also a language that a person “managed to master at the highest level, in which their thoughts can be expressed more quickly and effortlessly, which is regarded as more habitual and favourable instrument of formulating ideas and communication” [4] (the main or functionally the first language).

Some scholars, to the contrary, believe that the terms of native and functionally first languages should be differentiated [9]. Certain sociolinguistic works point out the shortcomings of “native language” identification made by third parties with regard to some skills. It is not uncommon that bilinguals know one language better (if, for instance, they were educated in it), but they feel a strong emotional affection to another one, that they consider native [7].

### Language of ethnic self-identity

In accordance with the third most popular theory, native language is considered to be the language of a nation or an ethnic group, which a person belongs to; the language that serves as a link to his ancestors and their intellectual wealth, as well as the basis for ethnic and national self-identity [1], [9], [10], [11], [12].

The ethnic treatment of the term “native language” is repudiated by a number of researchers. Thus, Belikov V. and Krysin L. Differentiate the notion of native language from this term, defining the latter as “hereditary language” [4]. Native language can either correlate to nationality, or be far apart (a widespread phenomenon, especially in the face of global migration processes characteristic of the 20<sup>th</sup> – 21<sup>st</sup> centuries).

**Study material.** According to the data obtained from the Russian Census in 2010, the Republic of Sakha was listed as having 39936 representatives of indigenous small-numbered people of the North, including the Evenki – 21,008, the Even – 21,008, the Dolgans – 1,906, the Yukaghirs – 1,281 and the Chukchi – 670.

In compliance with Sakha’s (Yakutia) law “On the specification of the indigenous minorities of the North and their dense dwelling environments in the Sakha (Yakutia) Republic”, the territories of 21 uluses (districts) are considered to be dense dwelling environments. The percentage ratio of indigenous minority representatives living in these districts varies between 1,0% and 8,9% from their total number.

It is the Evenki and the Even that prevail in the ethnic structure of the indigenous small-numbered nations living in Yakutia. The Evenki account for over 50% of the total number of the Sakha native nations, with the Even making 30%. In Yakutia’s territory the north-west and south regions are considered the Evenki areas. As for the Even, they live in small groups in north-eastern uluses.

The current *social situation* is presented as simultaneous functioning of the social system parts [3, p. 36]. Specialists mark out the following relevant factors of the social situation that can be related to the Sakha (Yakutia) Republic as well: *the population ethnodemographical parameters, ways of its displacement, occupational and social structure, the population’s educational level.*

*The ethnodemographical data* demonstrate that the Even live in small groups scattered all over 21 districts. They mostly dwell in Aldansky, Neryungrinsky, Bulunsky, Zhigansky, Olenyoksky, Ust-Maysky and Olyokminsky districts.

The census data of 2010 show that the Republic witnesses an increase in the total number of the Evenki, which is caused not only by natural, but also by demographic population growth. That, in particular, includes the ethnicity retrieval for the halfzees registered under their fathers' nationality. The statistics prove that the fathers of most new-born children have different nationality.

As for *the population displacement*, it should be noted that the urbanization process has almost halted: the percentage ratio of city dwellers and rural people remains at the level of the year 1989 with 73% and 27% correspondingly. Specialists registered some decrease in number (of 48 people) among the Evenki rural population. Nevertheless, the Evenki tend to dwell in rural areas (in 1989 the number of the Evenki rural population made 12,867, and in 2002 – 12,819). The main reason is the ethnic group's preference for traditional husbandry, their poor professional training that cannot be enough to find a job in cities, etc.

Social and cultural diversity of urban and rural environments, different development levels of sociocultural infrastructures in the Republic and prevailing of rural displacement brought about the existing differences in educational institutions. Over recent years the Evenki educational level has sufficiently risen. As compared with the year 1989, in 2002 the total number of university graduates has grown in 4,3% [7, p.17].

As it can be seen, the described social situation contains one *favourable* factor for the Evenki language consisting in the predominance of rural displacement among the Evenki. To *unfavourable* factors the following ones can be referred: scattered settlements of the Evenki over the Republic territory, their small number, insufficient development of the population's social and professional structure that depends on external factors, etc.

*The communicative situation* is characterized with a vast communicative domain and composing it spheres of communication [3, p. 48]. Due to the predominance of Yakut and Russian population, the communicative domain is represented by the Yakut and Russian languages. That is why both languages are used in the main communication and information spheres (administration and paperwork management, education, science, etc.), though to different extents. The Yakut and Russian languages are state languages of the Republic. Communicative possibilities of Yakut and Russian are also unequal: in monoethnic rural districts Yakut is predominantly used in all spheres of life. Russian, in its turn, prevails in industrial regions and urban settlements. The dominant spoken language in the regions of small-numbered nation dwelling, including the Evenki, is Yakut. Only in one Evenki village, Iyengra in Neryungrinsky municipal district, the Russian language is used [11, p. 700].

The Evenki language is recognized the official language in dense dwelling localities of the Evenki, but is used to a limited extent. In the Republic the Evenki language is spoken in the education sphere (being used as an instrument of teaching), rather restrictedly in the mass media (the period of 1996-1996 witnessed the following percentage ratio: 54% of time was given to broadcasting in Yakut; 44% - to broadcasting in Russian and 1% - to broadcasting in languages of indigenous minorities of the North, including the Evenki language). The Evenki language is also used in professional spheres (such as reindeer breeding and hunting). Consumer services are performed by Evenki, Russian and Yakut- speaking personnel, but language choice mainly depends on the settlement ethnic type. The languages, including Evenki, spoken by the native minorities of the North in the Sakha (Yakutia) Republic can also be used in the cultural sphere. In other spheres, however, the Evenki language is not used.

*The current linguistic situation* is defined as a system of language functioning, interaction and reciprocal influence, formed under the action of extralinguistic and intralinguistic factors. The main relevant constituents of the linguistic situation are *linguistic competence and types of language interaction*.

*Linguistic competence* is defined as mastery of the corresponding nation's language, Russian and other languages. The main extralinguistic factors influencing linguistic competence are as follows: the number of an ethnic group members, the degree of ethnic homogeneity, types of urban and rural displacement, a system of self-government. Among the native nations of the North residing in the Republic (including the Evenki) the enumerated parameters are presented with the following figures: from 18,232 of the Evenki approximately 16,241 representatives speak Russian, 13,700 know Yakut and 1186 speak their native language.

In 1989 the level of native language maintenance among the Evenki (among both urban and rural population) was over 8,5%. The other native nations of the Republic provided the following indices: the Yakuts - 95,1%, the Evens - 34,7%, the Chukchi - 63,2%, the Yukaghirs - 35,2%, the Evenki - 8,5%.

The data obtained manifest that the process of language shifting towards the Russian and Yakut languages among the representatives of native minorities of the North (including the Evenki) is still going on [5, p. 46].

As for the type of language contacts in the Sakha (Yakutia) Republic, the interaction of Russian, Yakut and other languages of native minorities of the North throughout several centuries resulted in a distinctive linguistic situation: the region saw the development of bilingualism, multilingualism of various types and assimilation processes. For the Evenki of the Republic the characteristic types of bi- and multilingualism are Russian-Evenki, Yakut-Evenki and Yakut-Russian-Evenki.

In Neryungrinsky municipal district of the Republic the Evenki do not speak Yakut, so this district accounts for the Russian-Evenki type of bilingualism, but the young speak only Russian. In other uluses the Evenki have switched over to the Yakut language – here they have the Yakut-Evenki and Yakut-Russian-Evenki types.

Almost all the Evenki speak their native language, though at different levels of proficiency. The village witnesses plenty of inter-ethnic marriages (Evenki marrying people of another nationality), but children in such families learn the Evenki language and culture in the kindergarten. There are 156 Evenki families in the village and 75 of them are of mixed ethnicity. In recent years most children from such mixed families consider themselves Evenki. Modern Evenki of Iyengra are mostly settled. However, more than 30 families (that is 200-220 people) lead a nomadic life with little children. Their children of school age live and study in boarding schools.

Let us consider the linguistic situation in depth drawing on the example of two model villages – Iyengra of Neryungrinsky district and Khatystyr of Aldan district.

The Evenki village of Iyengra is the only locality, where the Evenki language is pretty well preserved nowadays. It is situated in Neryungrinsky municipal district of the Republic. Its rural population accounts only for 1,65% of the population of the region. The number of inhabitants is 1,700 and the number of those residing is 1,452. Among the village inhabitants one can find representatives of such ancient Evenki families, as Bellyot, Njurbagat, Sologon, Puyaghir, Butah, Donghoy, Keptjukeh, Longhorki, Battaki, Emis. The Timpton Evenki are famous for using their native language as everyday one.

Currently the village of Iyengra has 1,452 inhabitants. The ethnosocial structure of the population can be presented as follows: Evenki - 871 people. (60%); Russians - 30,1%; Yakuts - 2%; Buryats - 2%; representatives of other nationalities – over 5%.

The population sex-age structure is as follows: 33% - children below the age of 16; 58,7% - people of employable age; 7,5% - retired people, aged over 50-55. For these parameters the Evenki provide the following numbers: 37,5; 54,6; 7,9% correspondingly [8, p.12].

**Methods of research.** In order to provide an adequate assessment of the linguistic situation in the village of Iyengra, as well as to mark out factors bringing influence on it, the investigators conducted an optional questionnaire survey. The form included questions about sociological parameters, such as age, place of birth, education, occupation, nationality, information about parents and sociolinguistic ones concerning native language, spheres of language usage, teaching of native language in schools, estimation of their own level of native/second language proficiency, knowledge of folk texts in native language, desire to see their children preserving the native language.

Also the researchers analyzed the data obtained from the rural household registers of Village Zolotinsky Council. All Evenki in the village are bilingual, that is fluent in Russian. In mixed families Russian is the main common language, and the Evenki language is used only to communicate with elder relatives. In Evenki families parents and children usually speak Russian. The Evenki language is mainly used when discussing the issues that should be kept secret from children and strangers.

**Survey results.** To assess the degree of native language mastery the researchers used the following parameters: active usage of complex grammar forms, knowledge of vocabulary, verbal folklore. When answering the questions about the assumed level of language proficiency, the respondents tended to overstate these rates. To the maximum extent this trend could be observed among middle-aged people, to the minimum – among children below the age of 16. The majority of questioned schoolchildren below 16 said that they could understand Evenki, but did not speak it themselves or spoke at a very low level.

According to the received data, all adult Evenki residing in Iyengra would like their children to be able to speak the native language. Moreover, they find it useful to start teaching the Evenki language in the kindergarten and then continue in schools. The majority of Evenki children also expressed the desire to master their native language. Almost all the respondents (except for 3 people) aged from 26 to 60 mentioned that they had learned the native language in their families since early childhood, as a result being able to read and write in Evenki. It should be noted that a long stay out of the bounds of the Evenki-speaking domain does not affect much the level of language proficiency among those people, who already possess good language skills. The Evenki from Iyengra moved to Yakutsk or other localities speak their native language when they meet. Despite using their native language, the respondents (except for 9 people) prefer to read and listen to the radio in Russian. 50% of the respondents have works in the Evenki language in their private libraries, they also spoke for increasing the number of publications and broadcasting time in Evenki.

Iyengra inhabitants still preserve their folkloric tradition, though there are not many people left who remember Evenki fairytales and are able to tell them in Evenki.

Then and there, the current linguistic situation among the Evenki of Iyengra seems encouraging. As compared to other Evenki villages in the Sakha (Yakutia) Republic, Iyengra is that settlement, where the native language is most carefully preserved, and whose inhabitants demonstrate the highest level of ethnic awareness. The future development of the Evenki language depends on whether it will stay a common language of the younger generation, as well as whether its teaching in schools will be efficient enough for its preservation [13, p. 6].

The village Khatystyr witnessed quite a different situation. According to the data of the year 1989 the population size was 1,300 people. On 1.01.2001 it consisted of 1,372 people. As of 2014 the population numbered 1,656 people, among which there were 403 Yakuts, 23 Russians, etc. Prevalently, the Evenki are indigenous people of South Yakutia, whose main activities are hunting and reindeer breeding.

To draw a comparison let us provide the data of 2014 obtained from the survey on Khatystyr village in Aldan district of the Sakha (Yakutia) Republic, where Evenki inhabitants occupied with deer breeding and hunting make 74% of its population. The investigators also questioned 78 people (46 women and 32 men). 20 of them were university graduates, 12 respondents had advanced education, 16 – secondary education and 30 respondents were still at school.

28 respondents considered the Evenki language their native one (35,9%), 78 people found the Yakut language the most functional (100%), 21 respondents spoke for the necessity to preserve the Evenki language (26,9%), 15 people acknowledged the significance of the Evenki language (19,2%), but at the same time 96,2% of the respondents agreed about the role of the Evenki language in preserving the ethnic culture.

As it can be seen, even with minor language shifting towards the Yakut language observed among the Evenki from Khatystyr village, the inhabitants still prioritize their native language as an ethno-differentiating and ethno-preserving factor, defining his role in developing the awareness of affiliation to their ethnic group as essential. In public opinion the native language is regarded as the spiritual basis for a nation's ethnic authenticity.

Consequently, the characteristics of the linguistic situation in two model villages allow us to make a conclusion that the degrees of the Evenki language usage in these settlements are not equal.

### Conclusion

The conducted analysis of the main traits of social, communicative and linguistic situations makes it possible to put forward a general model of the linguistic situation among the Evenki in the Republic of Sakha (Yakutia). In sum, the linguistic situation in the Sakha Republic is characterized, firstly, by *exoglossia*, that is the Evenki and Yakut languages' confunction; secondly, by *disequilibrium*, that is quantitative and qualitative nonequivalence of social functions attested to the languages in Sakha; thirdly, by *a three-component system*, that is the existence of three functional types of languages: 1) Russian as a federal language performing the role of a macro-interlingua with the most general social functions; 2) the Yakut language being the language of a titular ethnic group and having some restricted functions; 3) the languages spoken by indigenous small-numbered nations of the North, that is the languages of native minorities having a narrow range of social functions [7, p. 154].

To conclude, in public opinion the native language acts as the spiritual basis for a nation's ethnic authenticity. Along with that, an individual's acknowledgment of a language as native does not imply its real knowledge and mastery and, therefore, its usage as the official one.

The research results prove that the process of language shifting towards the Russian and Yakut languages among the Evenki is still going on [5, p. 46]. The field materials demonstrate that the Evenki language is currently playing a symbolic role, rather than serving as an instrument of communication.

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以生态为中心的方法和设计新配置文件的问题  
ECO-CENTRIC APPROACH AND ISSUES  
FOR DESIGNING NEW PROFILES  
OF MODERN LINGUISTICS

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**摘要** 本文概述了生态语言学作为现代语言学研究的新模型的主要发展方向。考虑了语言研究作为形成人类和谐环境的工具的特点，以及国内外科学中最重要的社会互动手段。这篇文章指出了在现代交际语言学和社会语言学中发现生态学研究新特征的可能性。

**关键词：**生态语言学，交际实践，交际风险，生态环境，发展，正面/负面影响。

**Abstract.** *The article provides an overview of the main directions of development of ecolinguistics as a new model of research in modern linguistics. The features of approaches to the study of language as a tool for the formation of a harmonious environment of human life and the most important means of social interaction in domestic and foreign science are considered. The article notes the possibility of identifying new profiles of ecolinguistic research in modern communicative linguistics and sociolinguistics.*

**Keywords:** *ecolinguistics, communicative practices, communicative risks, ecological environment, development, positive / negative influence.*

The anthropocentric and eco-centric lines may be distinguished as competitive modes in the development of modern humanitarian sciences for the reason that they introduce different approaches to investigating processes and results of human activity. This article is written with the aim to state a key significance of eco-centric approach and to offer issues for designing new profiles in modern linguistics – an ecological branch of communicative linguistics which calls for stating new ethic values in evaluating both material and spiritual activity of people.

Anthropocentrism may be undoubtedly referred to a dominant paradigm of

modern sciences. Its comprehensive methodology has been gaining power since the 1970s of the 20<sup>th</sup> cen. when Man and the value of existence or survival were offered to be viewed as a merit of great significance in modern Europe. Owing to the 'post-non-classical' science paradigm a complex of interrelations that determines any item of human existence or activity – either in material or spiritual life of community – are put into the focus of attention thus aspiring the study and assessment of any objective criterion in its relation to Man and human environment [Ekolingvistika, 2003, p. 270]. With regard to “eco-dimensional” approach such phenomena as biosphere, noosphere and ecological systems are being introduced into scientific discourse on a large scale these days, stimulating the process of ‘ecologization’ in humanitarian sciences with the demand to examine facts of social and cultural life of peoples through the paradigm of human environment. Accordingly any activity of the person is considered to be a partly conscious «adjustment» to the biological laws of nature [Skovorodnikov, 1996, p. 64]. The ecological roll has influenced minds of modern linguists and several schools plead for a change in the commonly accepted anthropocentric interpretation associated with philosophy and methodology of humanitarian sciences [Fill, 2001; Finke, 2001; Halliday, 2001; Haugen, 1972, 2001; Mackey, 2001; Bernatskaya, 2003; Leontovich, 2010; Solodovnikova, Shakhovskiy, 2006 etc.].

An eco-centric model of consciousness is based on the assertion that Man shouldn't be esteemed as a core element of universe but a part of natural environment, eco-centric consciousness is associated correspondingly with the issues of diversity and harmony of Man's coexistence in natural environment rather than of intellectual domination and global convenience. The term «ecology» is said to be coined by Ernst Haeckel in 1866 to designate a new sub-discipline of biology aimed at studying the relationship between living organisms and the environment. However, the content of the term has been significantly modified and got far beyond its biological science lately. For more than the centenary period of its existence the term «ecology» has been transformed time and again, so “*ecology*” of today is an integrative study occupied with investigating a wide range of humanitarian issues.

The popularity of the eco-centric line and its implantation into some branches of modern linguistics may be explained undoubtedly by the global ecological changes in the 20<sup>th</sup> cen. thought to be caused mainly by human activity. Axiological aspect of natural environment preservation has contradicted the anthropocentric outlook, as a result the principles of ecological ethics are thought to be much more important for the issue of human survival than anthropocentric ideals of value. Many sociologists and linguistics are worried on the issue of cultural diversity and preservation, stating that under the pressures of global economics' demands lots of minor languages and cultures are at the level of extinction. Moreover, by them, it

menaces literacy levels of modern generations in civilized world as it may lead to the death of the writer and reader [Crystal, 2000; Harre et al, 1999; Kristeva etc.].

Due to the works by American linguist Einar Haugen the term “ecology” came into use in linguistics in the 70-90-s of the 20<sup>th</sup> century. The initial aim of Haugen’s ecology of language was to determine a new status of language in general paradigm of humanitarian sciences [Haugen, 1972]. In his report «The Ecology of language» the scientist pioneered a new paradigm of linguistic research that was focused not only on the social context in which language was embedded, but also on the ecological context in which societies were embedded. The goal of ecology of language was stated as studying correlation between cognitive and social aspects of language existence, language of an individual and of a society, as language is thought to exist only in the minds of people and have its material representation in communicative interactions between speakers [Haugen, 2001, p. 57].

In the further works some linguists made a number of attempts to enlarge the terminology of the branch, in particular, the notion of *language environment* was singled out as ‘language encirclement and a complex of social code factors’. In the works devoted to language social history several basic factors (“*ecological fluents*” as demographic, social, political, cultural, psychological, integrative, and linguistic ones) were singled out, they were thought to determine linguistic behavior of social groups and personalities [Calvet, 1999].

Alvin Fill’s works made a valuable contribution to scientific development of ecolinguistics into a new trend as the scientist introduced definitions of new fields in ecolinguistics: a) *ecolinguistics*, as a general term for all spheres of research that combine both ecology and linguistics; b) *ecology of language* (languages) that deals with interaction between languages and language diversity reservation; c) *ecological linguistics* with the applied methods and principles of ecology for studying language (for example, the notion of ecosystem); d) *linguistic ecology* that studies interconnection between language and ecological problems» [Fill, 2001].

It should be mentioned that in the 1990-s the issues of ecology of language and linguistic ecology were dominating. Michael Halliday, the British linguist, raised the question about the widespread destruction of ecosystems, thus making linguistics relevant to the issues and concerns of a new time. He noted correlation between ecological context and consequences of language usage [Halliday, 2001, p. 178]. The notion of correlation was firstly interpreted in the context of mutual influence of language and environment, which could result in changes of both objects as their interconnection creates «ecological system». R. Harré, J. Brockmeier, P. Mühlhäusler, et al were among the pioneers who introduced the methodological propositions of ecolinguistics with the following theses: “language and language structures (metaphors) are considered to be not closed units but a system of isolated structures interacting with outward things; it is impos-

sible to learn language apart from its natural and social surroundings” [Harre et al., 1999, 91-92].

Since their initial comments were made the fields of ecolinguistics have developed considerably. A French ecolinguist L.-J. Calvet focused on the problem of language modeling and introduced a gravitational model of languages (*‘linguistic galaxy’*). According to this ecolinguistic theory natural languages of the world could be subdivided into hypercentral, supercentral, central and peripheral. Supporting the idea of language diversity of inner, external, horizontal and vertical kinds, L.-J. Calvet suggested his own ecological linguistic policy and language modeling that could be useful in solving language problems for state, society and international organizations [Calvet, 1999, pp.75-99].

Due to works by A. Subetto [Subetto, 2006] the notions of ecological crisis and ecological catastrophe in the sphere of language were set for consideration. From his standpoint these phenomena are implemented in globally oriented world with the market and community unification, elimination of nation states and ethnic diversity, cultures unification under the “post-modern” slogan, Americanization of “mass culture” patterns and unification of languages after all. These processes are considered to be indicators of coming global spiritual, cultural, and anthropological catastrophe [Chernikova, 2001].

It should be stated that regardless of the long prehistory lingua-ecological ideas have not been united into a theory in modern Russian school of linguistics. However, there appear more and more investigations that combine linguistic and ecological issues, they are aimed at studying interaction between language and its social environment, at describing links between language personality and moral or ethical comfort of society. Language operations and human environment are viewed as ecosystem, and the notion of human environment enlarges the concept of language [Ivanova, 2007]. Respectfully, language is regarded as an essential component that links Man with nature and society.

Targeted at working out new priorities in human values modern researchers stand for regulating various types of human activity from novel positions developing eco-ideas and offering some other aspects for the development of the ecological paradigm [Ionova, 2010]. Firstly, Russian linguists raise voices against the ‘post-written era’ [Karasik, 1997] and warn against destructive power of new technologies that threaten standards of language correction. To retain the language linguists of Russia monitor standard of speech patterns in various types of discourse, dwell on stylistic and rhetoric aspects of communication [Gorbanevsky, 2007; Serdobintseva, 2008; *Horoshaya rech’*, 2009 et al]. In any case the efforts of linguists, who are busy with monitoring the language-in-use (collecting, analyzing, leveling language units from various types of discourse), are aimed at preserving native language, eliminating negative social trends in its usage, pre-

venting language regress that consists in impoverishment its literary and expressive means, leveling functional, rhetoric, axiological imbalances.

Secondly, an interlingual aspect of ecolinguistics may be singled out. It studies language in connection with its ethnic environment and investigates reasons of language extinction. To this field we would refer works on language history which accurately record every language, highlighting its cultural and social value for the history of humanity. According by the evidence of Prof. Yartseva [Yartseva, 1993, p. 10], the interlingual aspect of language ecology is associated with an issue of language historical changes, deterioration and death, the phenomena that are closely connected with natural history of the peoples, political, socio-economic and ecological catastrophes that are caused by military capture or sharp reduction of natural habitat.

Moreover, Russian linguists are developing a translingual aspect of the ecolinguistics in the context of language and culture interactions. It is aimed at studying processes of one language transformation under the influence of another, in other words, linguistic transposition of language units under the influence of another national (cultural) environment. Language is considered to be a means of culture translation within one society or among multilingual societies in intergenerational, diachronic and simultaneous perspectives. The scientists concentrate their efforts on the forms of language integration, lingual form coexistence, language tolerance, besides the principles of intercultural communication are noted.

The eco-centric line has brought another novel aspect into the focus of attention. As a result, an eco-communicative theory is under development, it offers to study the way people influence each other while communicating in situations of formal and informal types [Shakhovsky, 2010; Solodovnikova, Shakhovsky, 2010 et al]. Mental and speech acts, that represent full range of human activities with regard to such constituents as motivation (intention), aim, strategy and tactic, ways and means of aim achievement, results (spoken message) and emotional impact, are claimed to be included into the ecological paradigm of humanity survival. Accordingly, numerous speech acts that can hurt or insult humans (as hooliganism, humiliation with speech acts, lies, abasement, speech theft, fraud, etc.) are considered an excess of power and authority, they are announced to be equated to the types of criminal acts [Golev, 2000].

Finally, a group of researchers from Volgograd State University (Russia) has offered one more direction that unites the study of communication and text interpretation with some aspects of human environment (life security and survival), which is considered to be studying communicative environment of human speech activity [Ionova, 2010a, 2010b; Ilyinova 2008]. Language

power and speech creativity are viewed in ecolinguistic light. The art of text production is closely tied to such non-linguistic phenomena as author's intention, motives of speech activity, cognitive procedures of speech formation, and emotional effects of speech product on linguistic personality, small or large social groups. This new branch of linguistics has deep connections with intra-psyche states of Man or social and cultural aspects of social well-being and survival of civilization, its sacral values and cultural senses without which no state or nation can exist and develop [Likhachev, 1979]. Thus, it has been defined that human consciousness is a 'textualized' entity. Under 'textualization' we mean the ability to create and interpret speech that is presented either in oral or written form, but it is typical of Russian school of linguistics to think about the body of the text as space with some discrete components that are associated with the conceptual world, its lexical and grammatical representation, compositional models, etc. [Lotman, 2000, p. 282]. Textual space as one of the types of ecological environment is considered to be a range of verbal texts, it may be analyzed from the point of their appropriate ties and relations and "contemplation space" (perceptions and ideas of the "external" emotional experience) which is a category of consciousness, some content that functions as "equivalent of the real space in non-spatial consciousness and is closely connected with both text comprehension and interpretation" [Toporov, 1983, p. 228]. For a long time similar approached to research used to be carried out separately within the framework of psycholinguistics, ethno-linguistics, linguistic anthropology, sociolinguistics, and language sociology. In ecolinguistics they get a common methodological basis and practical purpose.

Ecology of communication seems to be a promising paradigm of linguistics, a vital part of the theory of speech that studies the ways personal communicative intentions are enforced during communication without weakening the opponent's communicative position or humiliating him by inappropriate speech acts. The detection of the mechanisms of text influence on the addressee, methods of verbal representation (relevant or not) of the referential situation image in textual forms seems to be prospective both in theoretical and practical values. The findings by this approach will allow to balance several issues of human environment instability and extend the facilities of ecosystem by integration of special notions, methods and ways of linguistic analysis and giving them status of universal instruments for humanitarian tasks implementation. Application of them into various spheres of modern communication will help to set principles of well-balanced information policy, reduce tension in interpersonal and cross-cultural communication, lessen conflicts and improve relations in the global community of the future.

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“伏尔加长江”合作形式的俄中区域间关系发展动态  
**DYNAMICS OF THE DEVELOPMENT OF INTERREGIONAL  
RUSSIAN-CHINESE RELATIONS IN THE "VOLGA-YANGTZE"  
FORMAT OF COOPERATION**

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注解。 本文以“伏尔加—扬子”合作形式讨论了俄中区域间关系的发展。 作者分析了楚瓦什国立大学（俄罗斯楚瓦什州）与中华人民共和国长江中上游地区之间人道互动的主要趋势，形式和方向。 应当指出，在国家的支持下，人道主义对话变得越来越重要，并已成为两国区域间政策的重要因素。

关键词：区域间合作，人道主义互动，教育，俄罗斯，中国，楚瓦什州立大学

**Annotation.** *This article discusses the development of inter-regional Russian-Chinese relations in the "Volga-Yangtze" format of cooperation. The author analyzes the main trends, forms and directions of humanitarian interaction between the Chuvash State University (Chuvashia, Russia) and the regions of the upper and middle reaches of the Yangtze River of the People's Republic of China. It is noted that thanks to state support, humanitarian dialogue is gaining more and more importance and becoming a significant factor in the inter-regional policies of the two countries.*

**Keywords:** *interregional cooperation, humanitarian interaction, education, Russia, China, Chuvash State University*

The interaction of Russian and Chinese regions in the Volga-Yangtze format has been implemented since 2013 as part of the instructions of the President of the Russian Federation Vladimir Putin to further strengthen and diversify comprehensive ties between Russia and China [1]. This format, named after the mother rivers of China and Russia, has become a new mechanism for inter-regional cooperation, fully meeting the nature of the strategic partnership between Moscow and Beijing. It unites 14 constituent entities of the Volga Federal District (hereinafter referred to as the VFD), as well as five provinces and a city of central subordination in the area of the Yangtze River - a total of 20 regions of the Russian Federation and China located deep in the national territories.

The official start of the “Volga-Yangtze” project took place in Wuhan (China) in 2013 at the first meeting of the leaders of the VFD regions and the upper and middle reaches of the Yangtze River (hereinafter - the Yangtze). In 2014 and 2015, steps were taken to develop relations, areas of cooperation in the trade, economic and humanitarian fields were actively discussed, this was facilitated by a meeting of the co-chairs of the Joint Working Group on Cooperation in Trade, Economic and Humanitarian Areas (December 22, 2014 in Ulyanovsk), a meeting of the joint working group on cooperation in the economic and humanitarian fields (February 25-26, 2014 in Chongqing), the fourth meeting of the Round Table of the leaders of the VFD and Yangtze regions (June 23, 2014 in Samara), cooperation agreements between the regions and enterprises of the Volga and Yangtze were signed [1].

An unprecedented level of cooperation was achieved at the Russian-Chinese summit in Shanghai in May 2014. Plenipotentiary Representative of the President of the Russian Federation in the VFD Mikhail Babich and member of the State Council of the People’s Republic of China Yang Jiechi signed a Memorandum of Understanding in the “Volga-Yangtze” format, annexes to which were the List of joint investment projects and the Roadmap for humanitarian cooperation.

In order to move from discussion and agreements to specific actions, in 2016, the “Volga-Yangtze” Council for Interregional Cooperation was created. It included senior officials of the VFD and Yangtze regions, as well as representatives of state authorities. In May 2019, the third meeting of this Council was held. Igor Komarov, plenipotentiary representative of the President of the Russian Federation at the VFD, specifically noted that the “Volga-Yangtze” interregional interaction mechanism has proved its relevance and is an indicative model of cooperation between Russia and China. ... Prior to the launch of the Volga-Yangtze format, three agreements were concluded between the VFD regions and the Yangtze provinces. Since the decision in 2013 on the creation of a new format of Russian-Chinese cooperation, the contractual framework has increased in a relatively short time to 38 interregional agreements” [2].

An integral part of the above format are humanitarian contacts.

The Foreign Policy Concept of the Russian Federation, approved by Decree of the President of the Russian Federation № 640 dated November 30, 2016, as one of the key foreign policy tasks of Russia designates “development, including using the resource of public diplomacy, international cultural and humanitarian cooperation as a means of establishing an inter-civilizational dialogue, reaching agreement and ensuring mutual understanding between peoples” [3]. So, the next step was the creation of the Association of Higher Education Institutions of the VFD Regions and the upper, middle reaches of the Yangtze River (June 16, 2017). The Association includes 50 Russian and 29 Chinese universities. Among the priority areas of work of this format are the identification of active potential, the integration and sharing of university opportunities, the establishment and further promotion of youth exchanges as an effective tool for public diplomacy.

An active participant in the Association is Chuvash State University, collaborating with universities of the People's Republic of China since 2012. As of December 2019, 13 cooperation contracts and agreements have been concluded with higher education institutions of China, 11 of which are located along the upper and middle reaches of the Yangtze River.

The interaction of the Chuvash State University with the Yangtze universities is carried out in two main areas: educational and research. The main forms of cooperation that have already been implemented are: official visits, academic exchanges between teachers and staff, academic mobility of students, conducting joint research, mutual participation in scientific and practical conferences, cross-cultural days of both countries, Russian-Chinese youth forums in the "Volga-Yangtze" format, congress activities, joint scientific publications, educational exhibitions, thematic schools and camps, the study of Chinese and Russian languages. All these forms contribute to a diversified exchange between the Russian and Chinese peoples.

As an example of the above events, the high-level cross-days of Anhui in Chuvashia (2014) and the Days of Chuvashia in Anhui (2015) should be mentioned. Since 2014, 5 annual Russian-Chinese youth forums in the Volga-Yangtze format have been held, in which more than 1,500 people from among the most talented and active youth of the two countries took part (25 of them were representatives of Chuvash State University). Since 2016, students of Chuvash State University, as part of academic mobility programs, annually undergo the "Chinese Language and Culture" program at Chinese universities.

For six consecutive years, representatives of Chuvash State University have been participating in the "One Belt, One Way" International Summer Camp, which is conducted by Anhui University. In order to deepen mutual understanding and create a humanitarian bridge of cooperation in 2019, the "Volga-Yangtze" Association of Universities held a video contest "My favorite Volga-Yangtze". The participants were to present videos with deep cultural content, showing the significance of the Yangtze River (Chinese students) and the Volga River (Russian students).

In order to develop scientific and humanitarian cooperation, the Academic Council of the Chuvash State University decided to establish the Center for the Study of China on November 1, 2015. On July 20, 2016, the opening of a joint with Anhui University Chinese cultural center took place. The Chinese delegation led by Deputy Governor of Anhui Ms. Liu Li attended the grand opening.

Thanks to integrated and systematic work, bilateral cultural and humanitarian ties are expanding markedly, while leaving a significant potential for effective interaction. To date, the interaction between the countries, according to the director of the Institute of Russia of the Chinese Academy of Contemporary International

Relations Feng Yujun, is still characterized (although to a lesser extent than a couple of decades ago) by "warm relations between governments, but cold relations between peoples" [4]. There are problems in attracting Chinese students to study in various Russian educational programs. Here, on our part, it is necessary to expand forms of cooperation by introducing new ones, such as distance education programs, online courses, courses, modules and programs in English, educational consortia, etc. [5].

Thus, the humanitarian sphere should become a platform for building strong and trusting relations between the two peoples. Today, there is great need and relevance of the unique "Volga-Yangtze" cooperation format. The engine in resolving these issues is the Interregional Cooperation Council in the format of the "Volga-Yangtze" and the Association of Universities of the "Volga-Yangtze". Their creation has already ensured the achievement of practical actions, enhanced contacts and the implementation of activities.

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儿童严重颅脑损伤急性期心律, 昼夜节律指数的结构变化动态  
**DYNAMICS OF STRUCTURAL CHANGES IN THE CIRCADIAN  
RHYTHM OF HEART RATE, CIRCADIAN INDEX IN THE ACUTE  
PERIOD OF SEVERE TRAUMATIC BRAIN INJURY IN CHILDREN**

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抽象。基于对100名患有严重脑外伤的儿童的数据的研究, 作者表明, 在STBI后的第一天, 最明显的心动过速发生在3岁以下的儿童中。在第3天, 第1组的3岁以下HR眼球膜减少, 在第14天, 较重的第2组, 在急性期的30天中, 第3组最重的HR持续增加。第3-7天的HR昼夜节律中值最高。儿童的HR昼夜节律测量值是一个不可或缺指标, 可以客观反映儿童各个年龄段的应激反应的严重程度和对STBI的全身性炎症反应的严重程度。昼夜节律的HR波动范围可靠地与昼夜节律的幅度相关。STBI急性期的CI以所有儿童的心律僵硬为特征, 在第3组中最为明显, 反映了交感肾上腺系统的持续反应。

关键词: 重度颅脑损伤, 昼夜节律, 昼夜节律指数, 心率, 儿童期, 急性期。

**Abstract.** *Based on a study of the data of 100 children with severe traumatic brain injury, the authors showed that on the first day after STBI the most pronounced tachycardia was in children under 3 years of age. A decrease in the HR mesor under the age of 3 in the 1st group was detected on the 3rd day, in the heavier 2nd group on the 14th day, the heaviest 3rd group during the 30 days of the acute period there was a persistent increase in the HR circadian rhythm median with the highest values on the 3rd-7th day. The HR circadian rhythm mesor in children is an integral indicator that objectively reflects the severity of the stress*

*reaction and the severity of the systemic inflammatory response to STBI in all age groups in children. The range of HR fluctuations in the circadian rhythm reliably correlates with the amplitude of the circadian rhythm. The CI in the acute period of STBI was characterized by heart rate stiffness in all children, most pronounced in group 3, reflecting the persistent response of the sympathoadrenal system.*

**Keywords:** *severe traumatic brain injury, circadian rhythm, circadian index, heart rate, childhood, acute period.*

**Relevance.** Pulse reduction is an external marker of cardiovascular maturation in older children and adolescents. A decrease in heart rate at night is associated with a weakening of the tension of the sympathoadrenal system with age and a gradual increase in vagal influences on the rhythm, which are manifested by an increase in sinus arrhythmia. It has been shown that in older children, one of the most important pathophysiological mechanisms for the development of rhythm disturbances, including life-threatening ones, is the reduction of the adaptive-trophic effects of the sympathetic part of the autonomic nervous system on the heart [1,3].

The circadian index (CI) of the heart rate of a healthy person is an important parameter for examining the heart and blood vessels, usually in the range of 1.2-1.4. If this figure is less than 1.2, then they speak of the apparent rigidity of the circadian rhythm, and this is a consequence of the defeat of the intracardial nervous system. In clinical practice, a reduced circadian index leads to the development of arrhythmias, cardiomyopathies, coronary heart disease and may be one of the causes of sudden death syndrome [2,3].

**Purpose.** Study the effect of severe traumatic brain injury on the dynamics of the structural characteristics of the circadian rhythm of heart rate, the circadian index in the acute period of severe traumatic brain injury in children.

**Material and research methods.** Patients with severe traumatic brain injury (STBI) (100) were presented in three age groups: group 1 - from 9 months to 3 years (30), 2 - 3.1-7 years (31), older than 7.1 to 18 years old (39). Depending on the severity of the condition, which we determined by the duration of intensive care under ICU conditions, each age group was studied, dividing them into 3 groups: in 1 subgroup, the duration of treatment in the ICU was from 5 to 10 days - only 43 children (43%); the 2nd subgroup included 29 (29%) patients (the length of stay in the ICU is 11-20 days); subgroup 3 - 28 children (28%). We studied the indicators of central and peripheral hemodynamics: heart rate (HR) systolic (SBP), diastolic (DBP), minute volume of blood (MBV), total peripheral vascular resistance (TPVR). All patients were monitored for laboratory and clinical indicators, such as general analysis, biochemical blood parameters, coagulography. To obtain the necessary circadian index (CI) data, we took the average heart rate for the entire wakeful period (from 08:00 to 23:00) to the average heart rate during sleep, this is from 24:00 in the evening to 07:00 in the morning [3].

**Results and its discussion.** As can be seen from the data presented in Table 1, on the first day after STBI, the highest value of the average daily HR indicator was revealed in children under 3 years of age up to  $140.8 \pm 8.1$  beats per minute. In the 1st group of infants, a progressive decrease was found in relation to the indicator on day 1 of the median HR by 3,4,5,6,7 days by 8%, 12%, 14%, 13%, 19% ( $p < 0.05$ , respectively) In the 2nd group up to 3 years, on 2.3 days, an increase in the median of the HR circadian rhythm by 10%, 12% ( $p < 0.05$ ) was detected, and only on the 14.15 day there was a significantly significant decrease in the median HR to standard values by 12%, 13% ( $p < 0.05$ , respectively). In group 3 up to 3 years, a significant increase in the median of the HR circadian rhythm relative to the data of group 1 by 9%, 8%, 12%, 19% ( $p < 0.05$ , respectively) was found on days 3-7, which corresponded not only to the severity of STBI, but also in time and the growing nature of the development of the systemic inflammatory response of the body to severe trauma.

In patients of group 1 at the age of 3.1-7 years, on the 1st day, the mesor index was 21% less ( $p < 0.05$ ) of the same indicator in children under 3 years of age, remaining less by 2-6 days by 7%, 19%, 10%, 8%, 15% ( $p < 0.05$ , respectively).

In group 2 of children aged 3.1-7 years, a significant decrease in the HR circadian rhythm mesor relative to the indicator on the day of admission to the clinic by 13%, 26%, 21%, 15%, 19%, 10%, 15% ( $p < 0, 05$ , respectively) was detected only on days 14-19. In group 3 of 3.1-7 years on day 2, an increase in the HR circadian rhythm mesor by 8% was observed ( $p < 0.05$ ), which is explained by the progression of the body's stress response to STBI (Table 1), despite the traditional stress limiting decongestant, anti-inflammatory therapy.

In group 1 older than 7.1 years, the median HR was significantly lower than that of group 1 up to 3 years on days 1-7 by 18%, 15%, 18%, 18%, 17%, 12%, 7% ( $p < 0, 05$ ). The latter can be explained by the anatomical and functional maturity of the regulation of cardiac activity relative to young children, which made it possible to perform a more economically beneficial functional response of the cardiovascular system during adaptation in the acute period of STBI in children of group 1 at an older age. Significant differences in the median of the HR circadian rhythm in group 2 relative to the median on day 1 over the age of 7.1 years were not detected. In the 3rd group older than 7.1 years, the increase in the median of the HR circadian rhythm relative to the indicator in the 1st group of this age by 2-5.7.9 days was significantly greater by 7%, 12%, 13%, 12%, 9%, 18% ( $p < 0.05$ , respectively). The upward trend in tachycardia at 3.4 days confirms the close relationship of the severity of damage caused by STBI with the severity of the inflammatory response of the body in the acute stage of STBI. Thus, the greatest severity of deviations in the median of the HR circadian rhythm in the acute period of STBI was due to the immaturity of the regulatory centers of cardiac function at the age of 3 years.

**Table 1**  
*Dynamics of Mesor of the circadian rhythm of heart rate in the acute period of severe traumatic brain injury*

days	up to 3 years			3.1-7years			over 7 years old		
	1gr	2gr	3gr	1gr	2gr	3gr	1gr	2gr	3gr
1	140,8±8,1	136,3±8,4	125,5±7,2	110,6±4,9*	119,5±8,3	123,6±5,8	115,9±4,3*	107,4±4,8	116,6±4,2
2	132,5±6,2	136,9±4,1	138,2±4,6	122,5±3,2*	123,9±3,4	133,6±2,1***	117,3±2,2*	105,2±3,7	127,9±2,9***
3	128,4±2,7**	145,9±10,1*	140,2±3,6*	114,2±3,0*	111,2±5,5	123,3±4,3	105,1±3,6*	104,7±4,9	118,5±4,1***
4	124,1±2,5**	133,1±7,0	134,7±3,2*	111,7±3,4*	104,4±5,0	118,0±3,3	101,1±1,8*	99,8±2,4	115,0±2,9***
5	120,8±2,3**	121,3±5,3	136,8±4,0*	100,1±2,5*	106,1±2,9	119,4±1,8	99,4±3,0*	100,3±3,5	111,9±2,4***
6	122,8±2,2**	129,2±4,9	135,4±2,2*	103,3±2,5*	109,8±3,5	115,2±3,1	107,2±1,6*	99,5±1,8	111,2±3,0***
7	113,2±4,3**	122,0±3,0	136,3±3,3*	120,4±3,6	111,2±4,2	117,0±2,5	105,7±2,6*	98,7±1,9	115,5±2,9***
8		120,4±3,4	134,1±4,0	113,6±3,1	114,0±2,0	118,9±1,7	108,9±3,6	98,7±2,3	114,4±2,2***
9		129,2±5,0	132,6±5,0	100,3±3,8	111,5±2,7	121,0±3,0	96,2±4,8	99,2±1,9	114,8±3,7***
10		127,3±5,0	139,3±2,8		110,8±2,6	117,7±5,2		105,8±2,1	114,6±2,1
11		119,1±2,2	131,5±3,5		110,7±3,1	120,3±3,0		108,5±4,1	109,2±2,5
12		122,1±4,8	137,2±2,3		108,5±4,2	114,5±2,7		105,9±3,2	110,5±2,3
13		123,5±6,4	132,2±5,1		104,3±4,5**	111,7±1,9		96,0±2,8**	109,4±2,7
14		119,1±5,2**	128,8±3,9		87,9±7,3**	112,4±3,9		95,7±4,7**	110,0±3,7
15		118,3±4,7**	123,0±4,4		92,9±11,1**	112,8±4,9		99,6±3,8	110,9±3,6
16		126,4±6,7	124,6±4,4		101,8±4,0**	115,5±2,6		104,9±4,4	110,5±2,9
17			121,5±2,5		96,8±4,1**	115,8±4,4		106,1±4,7	112,1±3,5
18			126,4±2,3		99,3±5,1**	116,9±3,0		93,5±8,3**	112,8±2,9
19			125,4±3,7		101,2±4,5**	118,2±2,6			111,6±3,1
20			129,3±3,1			116,0±6,1			112,9±2,5
21			125,0±4,3			118,1±2,0			111,3±3,0
22			122,6±3,1			114,7±2,6			113,9±4,4
23			127,3±4,2			114,1±3,5			116,1±2,4
24			134,2±4,7			117,7±4,1			110,9±4,7
25			119,5±3,7			119,7±3,6			106,5±2,9
26			132,2±3,4			116,7±3,5			113,6±2,9
27			132,6±3,4			116,3±3,4			112,7±3,5
28			127,0±2,4			114,7±3,4			113,2±3,2
29			128,6±3,0			112,8±3,4			115,0±5,3
30			136,5±2,6			111,2±3,3			111,8±2,4
31						115,5±4,8			115,7±3,7
32						115,6±3,9			115,6±3,3
33						114,9±5,4			109,3±4,0
34						128,3±5,6			111,2±3,4
35						130,1±2,7			111,4±3,4
36						124,2±3,7			106,9±2,7
37						119,6±5,3			109,9±4,1
38						122,9±2,1			111,5±3,2
39						120,9±5,2			114,2±2,4
40						119,0±3,3			111,9±3,2
41									109,9±4,0
42									114,5±2,8

\*- authentic relative to data in 1 group up to 3 years  
 \*\*- authentic relative to the result in the first day  
 \*\*\*- authentic relative to the indicator in the previous group for the severity of STBI

A restoration of normal HR was found later on the 14th day in heavier children of the 2nd group of infants, while in the 1st group, a significant decrease in HR was detected on 3,4,5,6,7 days (Table 1).

In children of 2 group older than 7 years, a decrease in the median of the HR circadian rhythm relative to the 1-day indicator was found on 13,14,18 days by 10%, 10%, 13% ( $p < 0.05$ , respectively). That is, in group 2, only on day 13 a decrease in the degree of stress response of the heart rate driver to STBI was noted. In group 3 older than 7 years, on day 2, a significant increase in the median of the HR circadian rhythm by 11% relative to the first day was revealed, which indicates an inflammatory reaction to STBI, the severity of which corresponds to the severity of STBI in this group (Table 1). In the first 2 - 9 days in children of 3 group older than 7 years, the median of the circadian rhythm was significantly more than synchronous data of the 2 group by 22%, 15%, 11%, 11%, 11%, 16%, 15%, 14%, respectively ( $p < 0.05$ ).

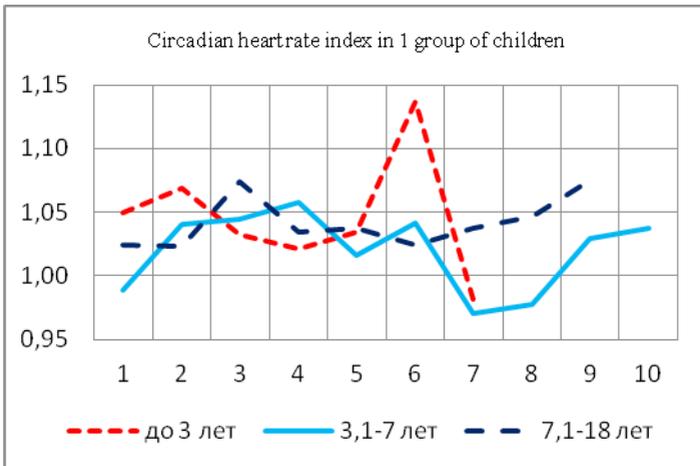
As shown in Table 2, Figures 1,2,3, the circadian index (CI) in the acute period of STBI was characterized by rigidity due to persistent tachycardia at night due to the persistent response of the sympathoadrenal system throughout the treatment period at ICU.

**Table 2**  
*Changes in the circadian HR index in the acute STBI period*

days	9 months-3 years			3.1-7 years			7.1-18 years		
	1 group	2 group	3 group	1 group	2 group	3 group	1 group	2 group	3 group
1	1.05	0.96	0.92	0.99	1.00	1.00	1.02	0.95	0.99
2	1.07	1.14	0.98	1.04	1.03	1.02	1.02	1.06	1.01
3	1.03	1.09	1.01	1.04	1.09	1.07	1.07	1.06	1.05
4	1.02	1.06	1.03	1.06	1.09	1.01	1.03	1.04	1.02
5	1.03	1.01	1.07	1.02	1.02	1.03	1.04	1.07	1.01
6	1.14	1.02	0.99	1.04	1.05	0.96	1.02	0.99	1.04
7	0.98	0.99	1.03	0.97	0.96	1.02	1.04	1.00	1.05
8		1.06	1.04	0.98	1.01	1.00	1.05	1.02	1.02
9		1.07	0.98	1.03	1.05	1.02	1.07	1.00	1.04
10		0.99	1.00	1.04	1.03	1.03		1.00	1.01
11		1.08	1.05		1.04	1.03		1.08	1.00
12		1.11	1.02		1.02	1.03		1.05	1.00
13		1.08	1.06		1.06	1.00		1.03	1.06
14		1.03	1.04		1.11	1.05		1.10	1.04
15		1.08	1.07		1.03	1.06		1.07	1.04
16			1.06		1.01	1.03		1.06	1.01
17			1.04		0.93	1.07		1.03	1.05
18			1.01		0.98	1.02		1.19	1.03
19			1.04		1.01	1.03			1.06
20			1.04			1.08			1.03
21			1.05			1.00			0.97
22			1.03			1.08			1.05
23			1.03			1.02			1.01
24			1.07			1.07			1.08
25			1.05			1.03			1.02
26			1.01			1.06			1.03

*Table 2 (continuation)*

days	9 months-3 years		3.1-7 years		7.1-18 years				
	1 group	2 group	3 group	1 group	2 group	3 group	1 group	2 group	3 group
27			1,03			1,05			1,02
28			1,03			0,96			0,99
29			1,01			1,04			1,08
30			1,00			1,00			1,01
31						1,03			0,95
32						1,04			1,04
33						1,09			1,00
34						0,99			0,99
35						1,02			1,00
36						1,03			1,03
37						1,06			1,06
38						1,02			1,03
39						1,04			1,02
40						1,01			1,01
41									1,02
42									0,99



*Fig.1*

As can be seen from the data in Fig. 1 insignificant favorable tendency of changes in CI of the daily fluctuation of HR was revealed in children of the 1st group under the age of 3 years on the 6th day.

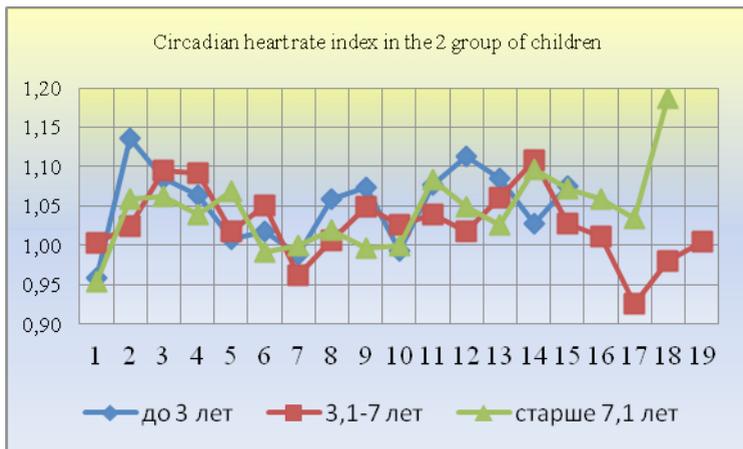


Fig.2

The approximation of the CI of the daily fluctuation of the heart rate to the lower limit of the norm was found only on day 18 in the 2nd group of children older than 7.1 years (Fig. 2).

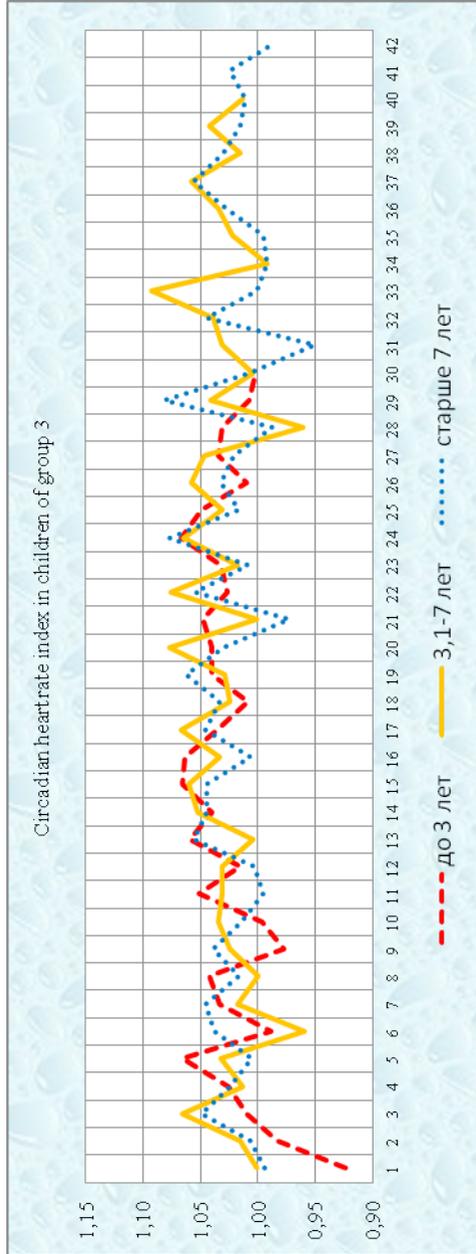
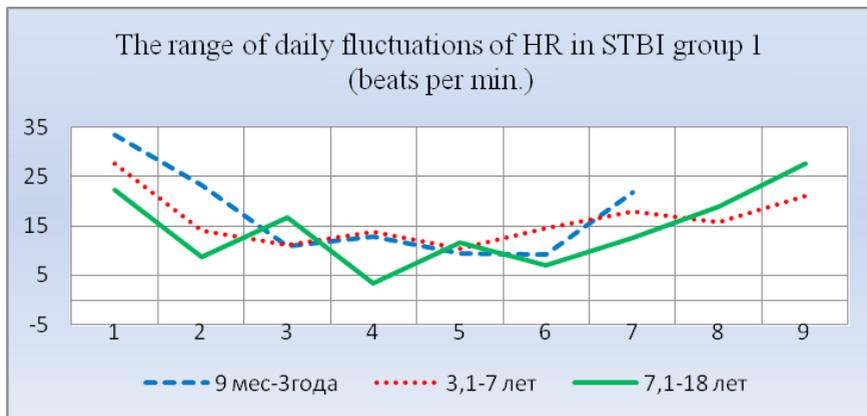


Fig.3

As can be seen from the data presented in Fig. 3, in all children of the 3rd group, throughout the acute period of STBI, a pronounced sympathotonic reaction was observed, characterized by a pronounced rigidity of the circadian rhythm of cardiac activity.

**Table 3.**

HR Circadian rhythm acrophase migration									
	1 group			2 group			3 group		
	up to 3 years	3.1-7 years	over 7 years old	up to 3 years	3.1-7 years	over 7 years old	up to 3 years	3.1-7 years	over 7 years old
8-14h	71% (5 out of 7)	44% (4 out of 9)	33% (3 out of 9)	27% (4 out of 15)	42% (8 out of 19)	44% (8 out of 18)	60% (18 out of 30)	55% (22 out of 40)	57% (24 out of 42)
15-23h	14,5% (1 out of 7)	44% (4 out of 9)	55% (5 out of 9)	46% (7 out of 15)	42% (8 out of 19)	44% (8 out of 18)	36% (11 out of 30)	35% (14 out of 40)	28% (12 out of 42)
24-7h	14,5% (1 out of 7)	12% (1 out of 9)	12% (1 out of 9)	27% (4 out of 15)	16% (3 out of 19)	12% (2 out of 18)	6% (1 out of 30)	10% (4 out of 40)	15% (4 out of 42)
HR circadian rhythm bathyphase migration									
8-14h	71% (5 out of 7)	33% (3 out of 9)	12% (1 out of 9)	20% (3 out of 15)	21% (4 out of 19)	24% (4 out of 18)	33% (10 out of 30)	10% (4 out of 40)	16% (6 out of 42)
15-23h	14,5% (1 out of 7)	44% (4 out of 9)	24% (2 out of 9)	20% (3 out of 15)	21% (4 out of 19)	12% (2 out of 18)	20% (6 out of 30)	10% (10 out of 40)	42% (13 out of 42)
24-7h	14,5% (1 out of 7)	23% (2 out of 9)	64% (6 out of 9)	60% (9 out of 15)	58% (11 out of 19)	64% (12 out of 18)	47% (14 out of 30)	80% (26 out of 40)	42% (13 out of 42)



**Fig.4**

As shown in Table 3, the normal projection of acrophase in the morning in children of group 3 was detected only during 57% of the time older than 7.1 years, 55% at the age of 3.1-7 years and 60% up to 3 years. Moreover, the inversion of the bathyphase in the morning hours occurred in children 7.1-18 years old for 16%, 3.1-7 years old 10%, up to 3 years 33% of the duration of the acute period. Thus, based on the indicators of migration of acrophase and bathyphase of the heart rhythm presented in Table 3, the traditional intensive therapy in the acute period of STBI was not able to sufficiently effectively correct the time shifts of the maximum values of the HR circadian rhythm.

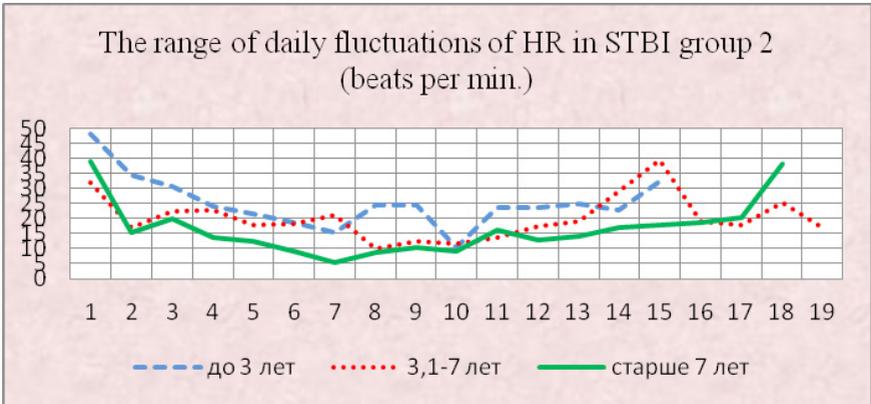


Fig.5

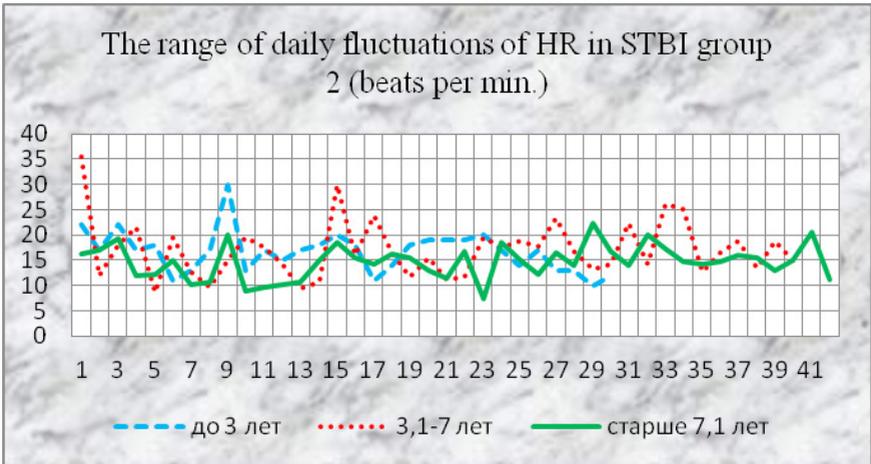


Fig.6

The correlation between the magnitude and daily fluctuations in the 1st group up to 3 years old was 0.9641, at the age of 3.1-7 years old - 0.9502, over 7.1 years old - 0.9771. In the 2nd group under 3 years old, the correlation of the magnitude and amplitude of the circadian HR rhythm was 0.7653, 3.1-7 years old - 0.9375, over 7 years - 0.7890. In group 3, a direct correlation between the daily magnitude and amplitude of HR fluctuations at the age of up to 3 years was 0.5282, at the age of 3.1-7 years - 0.7366, over 7.1 years of age 0.8289 (Fig. 4.5, 6). Thus, the revealed direct strong correlation between the magnitude and amplitude of the daily fluctuations of HR allows us to identify the magnitude of the daily fluctuation of HR with the amplitude of the circadian rhythm of HR, with the exception of children of group 3 under the age of 3 years.

**Conclusions.** On the first day after STBI, the most pronounced tachycardia was detected in children under the age of 3 years. A decrease in the HR mesor under the age of 3 years was revealed in group 1 on the 3rd day, in group 2 on day 14, and in group 3 during the 30 days of the acute period, there was a persistent increase in the median HR circadian rhythm with the highest values on day 3-7. At the age of 3.1-7 years, a significant decrease in the HR circadian rhythm mesor was found in group 2 on day 13 and subsequent days. The HR circadian rhythm mesor in traumatized children over 7 years of age on days 2–9 was significantly higher than the values in group 2. Thus, the indicator of HR circadian rhythm mesor in children is an integral indicator that objectively reflects not only the severity of the stress reaction, but also the severity of the systemic inflammatory response to STBI in all age groups in children. The range of HR fluctuations in the circadian rhythm reliably correlates with the amplitude of the circadian rhythm. The CI in the acute period of STBI was characterized by heart rate stiffness in all children, most pronounced in group 3, reflecting the persistent response of the sympathoadrenal system. The latter confirms the need for further study and development of methods to neutralize the damaging effect of the adaptive-trophic effects of the sympathetic department of the autonomic nervous system on the heart with STBI in children.

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女性因适应不良而导致的性欲低潮和生殖器部位的状况  
**COITAL ANORGASMIA DUE TO MALADAPTIVE MASTURBATION  
IN WOMEN AND THE CONDITION OF THE GENITAL AREA**

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抽象。 该文章讨论了女性适应不良的手淫与性交性快感的关系。 给出了适应不良的手淫的定义，其主要形式和次要形式，以及阴道菌群状态（阴道念珠菌病）与性欲低潮之间的关系。 描述了性活动前一段时间内因适应不良性手淫而导致的性欲低潮的治疗选择。

关键词：性欲减退，性交性厌食，手淫，适应不良的手淫，阴道菌群，阴道念珠菌病。

**Abstract.** *The article discusses the relationship of maladaptive masturbation and coital anorgasmia in women. The definition of maladaptive masturbation, its primary and secondary forms, as well as the relationship between the state of the vaginal flora (vaginal candidiasis) and coital anorgasmia is given. The treatment options for coital anorgasmia that developed as a result of maladaptive masturbation in the period before sexual activity are described.*

**Keywords:** *anorgasmia, coital anorgasmia, masturbation, maladaptive masturbation, vaginal flora, vaginal candidiasis.*

Maladaptive masturbation is the cause of coital anorgasmia, accounting for up to 18% of all cases of coital anorgasmia in women.

This situation becomes a fairly significant social problem associated with a decrease in the level of comfort of both personal and married intimate life, which, ultimately, has a negative impact on the strength of marital relations /1/.

Maladaptive masturbation is any type of masturbation, in the implementation of which the actions, sensations or fantasies are significantly different from the actions, sensations or the actual situation of partner sex, including the preliminary period of coitus.

The most famous and common types of maladaptive masturbation in women include manipulation of the shower (Havelock Ellis syndrome), myocompression effect on the pelvic and/ or perineal region, and the use of a mechanical vibrator. In men, variants with exaggerated effects on the penis in terms of speed of movement or the force of compression of the penis by the palm of the hand, the use of an artificial vagina, specific effects on the head of the penis in the presence of phimosis are common.

You can divide maladaptive masturbation into: primary and secondary. Primary maladaptive masturbation appears before the onset of sexual activity, its achievement is unconscious, it, as a rule, remains the only source of sexual arousal and satisfaction before the onset of partner sex.

Secondary maladaptive masturbation is a manifestation of a woman's conscious choice against the background of an existing sex life and/ or another type of masturbation. In this case, masturbation becomes a manifestation of curiosity, dissatisfaction with the existing sensations, random influence from the outside /2/.

The primary maladaptive masturbation that precedes the onset of sexual activity has a pathogenic effect on the development of sexuality. In such cases, masturbation promotes the formation of reflex chains, leading to fairly persistent reflexes that do not allow the physiological erogenous zones of the first order to function.

Maladaptive masturbation is not an accidental find; in the same way as adaptive masturbation depends on the location of the main erogenous zones, the sensitivity of the receptors, and the safety of the conducting nerve pathways /3/.

The presence of inadequate erogenous zones located in places inaccessible to external stimulation does not allow the girl/ woman to physiologically respond to increasing sexual arousal, which eventually forms a non-physiological response (for example, as in the case of myotonic orgasm).

Therefore, over time, the stimulation technique adapts to the existing physiological characteristics.

Since masturbation for a rather long time remains the only source of achieving orgasm and satisfaction, the development of other erogenous zones is difficult, and the technical methods of stimulation are not experienced as possible ways to increase excitement /4/.

It should be recalled that in nature there is the principle of "minimal, but enough." In this case, this is expressed in the fact that the coital orgasm in 60% of women is clitoral, in 40% vaginal, but both types of orgasm are found in only 10% of women. Likewise, with maladaptive masturbation with an orgasm from special erogenous zones or in a special way, it prevents the formation of more adequate erogenous zones that could provide a coital orgasm /5/.

Secondary maladaptive masturbation is much less likely to negatively affect the state of ordinary erogenous zones due to the presence of already formed reflex excitation chains. In such cases, there is an "excessive" presence of erogenous zones of the genitals, which provides that ten percent probability of having two types of orgasm.

We examined 88 women who complained of a lack of coital orgasm due to a mismatch between the sexual proximity scenario and preliminary requests. An in-depth questioning and filling out examination cards in 79 women revealed the presence of primary maladaptive masturbation from childhood to adolescence to the present. All women continue to masturbate amid constant partnerships /6/.

All of these women were referred for consultation by a gynecologist, and regularly sought help in connection with the development of vaginal candidiasis after coition. All women were married or had a regular partner and constantly used a condom.

The observed contingent was divided into three subgroups:

I. 28 women (35%), who, along with maladaptive masturbation, also had adaptive masturbation with orgasm, as well as excitement and orgasm during petting.

II. 22 women (28%), in whom an orgasm could occur as part of partner sex during the maladaptive effect of the woman herself.

III. 29 women (37%), in whom coital arousal and coital orgasm were absent, but were achievable with the usual masturbation.

For all women, maladaptive masturbation was their own find at the age of 9 + -2.2 years. In 54% of cases, masturbation developed according to the type of myotonic arousal and orgasm. In 2 girls aged 10-12 years, maladaptive masturbation with a jet of water began during hygiene measures after they were no longer controlled by their mothers. Both women were assigned to subgroup III.

The psycho-sexual development of all women did not have significant features, only 3 patients from group II had a delay of psycho-sexual development for 2-3 years at the stage of formation of erotic libido.

Before the onset of sexual activity, none of the patients thought about the type of masturbation and the possible presence of certain own characteristics. 61 women found out that masturbation is maladaptive from the media, 18 from a gynecologist.

Prior to treatment, 43 women associated coital anorgasmia with maladaptive masturbation, the remaining 36 tried to refute such a connection, blaming only the partner's inability to reproduce actions imitating masturbation /7/.

In group I, by the end of the third month of therapy, 24 women regarded their condition as achieving a positive result (out of 28). Satisfactory - the remaining 4 patients.

In the II group, 18 women out of 22 noted the achievement of a positive result. At the same time, 16 patients focused on a new attitude to their partner, on awakening/ strengthening the feeling of love and indispensability of him both in intimate matters and in general relationships.

In group III, by the end of the third month of therapy, the situation was more mosaic. Only in 12 women did the efforts to educate new erogenous zones lead to pleasure in self-stimulation of the genitals and perineum; in 4 patients sexual arousal began to appear with affection on the part of the partner; however, in these cases, the achievement of orgasm was not recorded. In the remaining 13 women, external erogenous zones did not appear. However, 16 women felt that their condition had changed for the better, despite the lack of an initial request for an orgasm with affection and intercourse. They explained this by a change in relations with a partner, the resolution of internal conflict, the removal of psychological stress about the "wrong" masturbation.

A control question for self-esteem of their comfort in intimate relationships and the effectiveness of their sexuality was asked by all patients at the end of a three-month course of therapy: "Would you seek sexual help if your condition were as today?"

Answers:

"no, because everything is fine" - 39 women (44.3%);

"possibly because everything is not perfect" - 28 patients (31.8%);

"yes, because the problem did not go away/ the problem went away, but another appeared" - 12 women (13.6%).

### **Conclusions**

Maladaptive masturbation, practiced before the onset of sexual activity, in some cases leads to coital anorgasmia, the independent resolution of which, as a rule, is impossible. Some women achieve an orgasm during partner sex, performing the usual maladaptive actions, but this behavior is more likely to disconnect partners, since the presence of a man during masturbation does not affect the arousal of a woman.

In the process of a three-month marital sex therapy with the mandatory participation of a partner, depending on the condition, the observed women were divided into two groups. In the first group, sensitivity of the natural erogenous zones of the genitals was raised.

In the second group, the emphasis was on shifting the attention of women from genital reactions to participation and the role of the partner, increasing the importance of partnership.

44.3% of patients rated the result of the three-month therapy as positive, 31.8% as incomplete, 13.6% as failure to achieve the result.

Gynecological status at the end of the course of therapy showed positive changes. In the first group, candidiasis was diagnosed only in 4 out of 28 women, in the second in 6 out of 22, in the third in 18 out of 29. Moreover, the presence of candidiasis was noted in those patients who did not have an improvement in sexual performance.

Thus, coital anorgasmia in women who practice maladaptive masturbation before sexual activity is sufficiently amenable to individually constructed conjugal sex therapy.

Uncomfortable intimate life, coital anorgasmia contributes to the development of non-specific vaginal candidiasis, which regresses without additional therapy as the woman's sexual condition improves.

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在肝脏缺血再灌注实验模型背景下改变血液中微量元素和宏观元素的平衡  
**CHANGING THE BALANCE OF MICRO AND MACRO ELEMENTS  
OF BLOOD AGAINST THE BACKGROUND OF AN EXPERIMENTAL  
MODEL OF LIVER ISCHEMIA-REPERFUSION**

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抽象。再灌注综合症会导致毒血症，血液中微观和宏观元素的失衡很重要。因此，该研究的目的是在缺血-再灌注实验模型背景下确定血液中微量和宏观元素含量的变化。实验是在白色近交大鼠上进行的，在该大鼠中，通过对肝动脉施加结扎来创建缺血模型。作为研究结果，发现动物血液中钠，氯，铁，钙和锰离子的含量在缺血期间降低，在再灌注期间继续降低。这伴随着铁，钙和锰离子水平的降低。动物血液中的钾含量增加。所有这些变化随着缺血持续时间的增加而增加。

血液中磷和钙水平的变化与缺血期的持续时间之间存在关系。缺血持续时间长达20分钟的增加导致在再灌注期间血液中的磷含量减少和钙含量增加。而在缺血10分钟背景下进行再灌注时，观察到离子，磷和钙的水平增加。

关键字。再灌注综合征，Na, K, Ca, P, Cl, Fe, Cu, Mn, Zn

**Abstract.** *With reperfusion syndrome, toxemia develops, and an imbalance in the micro and macro elements of the blood is important. Therefore, the aim of the research was against the background of an experimental model of ischemia-reperfusion to determine changes in the content of micro and macro elements in the blood. The experiment was carried out on white outbred rats in which a model of ischemia was created by applying a ligature to the hepatic artery. As a result of studies, it was found that the content of sodium, chlorine, iron, calcium and manganese ions in the blood of animals decreases during the period of ischemia and continues to decrease during the reperfusion period. This is accompanied by a decrease in the level of iron, calcium and manganese ions. The potassium content in the blood of animals increases. All these changes increase with increasing duration of ischemia.*

*There is a relationship between a change in the level of phosphorus and calcium in the blood and the duration of periods of ischemia. An increase in the duration of ischemia up to 20 minutes led to a decrease in the phosphorus content*

*and an increase in the calcium content in the blood during the reperfusion period. Whereas during reperfusion on the background of 10 minute ischemia, an increase in the level of ions and phosphorus and calcium was observed.*

**Keywords.** *Reperfusion syndrome, Na, K, Ca, P, Cl, Fe, Cu, Mn, Zn*

Due to the deterioration of the ecology and lifestyle of people, the number of patients with liver-incompatible liver lesions of various genesis is increasing every year. Liver transplantation in such cases is often the only life-saving option. In terms of the frequency of liver transplant surgery, it occupies the second place among operations for transplantation of other organs together [1].

In the postoperative restoration of the blood supply to the liver, toxic products of ischemia, as well as functional and morphological disorders of the organ, cause serious complications, such as transplant rejection, the development of inflammatory processes, and necrosis of liver cells [2]. Therefore, today many scientific studies are aimed at identifying the mechanisms of these processes and the possibilities of reducing the pathological effect of ischemia-reperfusion on the liver. It was revealed that liver reperfusion often causes severe damage to hepatocytes, capillary endothelium and epithelium of the bile ducts and causes transplant rejection in 10% of patients in the postoperative period [3]. Reperfusion syndrome after a liver transplantation has its own pathogenetic features. Studies have shown that various changes occur in the transplant for transplantation as a result of ischemia of the donor organ. As a result of these changes, there is a violation of the integrity of cell membranes, activation of lipid peroxidation. The resulting toxic intermediates, along with the edema caused by them, simultaneously activate reabsorption [4.] and cause the development of endogenous intoxication. As a result of cell destruction, many biologically active compounds are released. One of such substances is biogenic elements, such as cobalt, iron, manganese, copper, tin, and others. Presumably, these substances, entering various metabolic systems, can stimulate the pathological processes of the reperfusion syndrome.

**The purpose** of the examine is to study the effect of reperfusion liver syndrome on the content of macro- and microelements in the blood.

**Materials and research methods.** The experiments were performed on 66 white outbred rats weighing 170-210 grams, divided into 4 groups: group 1 - the intact group, consisted of 6 white rats. In 2-4 groups, liver ischemia was simulated. At the same time, the 2nd group — the model group, consisting of 12 rats, was divided into 2 subgroups of 6 animals each. In animals belonging to the 1st subgroup, a model of ischemia lasting 10 minutes, in the 2nd subgroup within 20 minutes was created. After, the animals were killed by decapitation, blood and liver were taken for biochemical studies.

In the 3rd group, consisting of 24 rats, reperfusion was performed after modeling of liver ischemia lasting 10 minutes, and in the 4th group (24 animals) hepatic ischemia was performed for 20 minutes. Animals in these groups were divided into 4 subgroups of 6 animals each. Animals of the 1st subgroup underwent reperfusion for 1 hour, the 2nd subgroup for 2 hours, the 3rd subgroup for 24 hours, the 4th subgroup for 72 hours.

**Method for modeling ischemia and reperfusion of the liver.** In accordance with the recommendation of the European Committee on Bioethics for the humane treatment of experimental animals, we injected 0.4 ml of calyptol solution intramuscularly with experimental animals to anesthetize the procedures. After anesthesia, the abdominal cavity was opened along the upper midline. At the same time, a well-visible field was obtained in the area of the liver gate. After the introduction of a 2 ml solution of procaine hydrochloride in the hepatic artery bed, a bed of an artery extending to the right lobe of the liver was opened and a ligature was performed under it. By tightening the ligatures, a model of ischemia was created, and by relaxation, a reperfusion model was created.

In the blood, the content of macrocells, such as Na, K, Ca, P, Cl, and trace elements - Fe, Cu, Mn, Zn, was determined. Statistical analysis of the obtained experimental data was carried out in accordance with modern requirements by the nonparametric Wilcoxon-Mann-Whitney criterion.

**Results.** Against the background of ischemia lasting 10 minutes, compared with intact values in the blood of animals, the content of sodium ions decreased by 2%, potassium ions increased by 6.3%, and chlorine ions decreased by 3.4%. Iron ions decreased by 1.9%, calcium ions - by 9.8%, manganese ions - by 4.0%, and phosphorus ions increased by 17.7%.

Against the background of reperfusion, the following changes occurred:

Against the background of reperfusion for 60 minutes, the content of sodium ions decreased by 3.8%, potassium ions increased by 18.5%, chlorine ions decreased by 3.5%, iron ions decreased by 12.5%, calcium ions by 14.7%, manganese ions - by 4.2%, and the content of phosphorus ions increased by 10.9%.

Against the background of reperfusion lasting 3 hours, the content of sodium ions decreased by 18.1%, potassium ions increased by 47.8%, chlorine ions decreased by 6.9%, iron ions by 14.0%, calcium ions by 29.5%, manganese ions - by 9.0%, and the content of phosphorus ions increased by 17.6%.

Against the background of reperfusion lasting 24 hours, the content of sodium ions decreased by 28.1%, potassium ions increased by 62.2%, chlorine ions decreased by 18.0%, iron ions decreased by 19.3%, calcium ions by 46.5%, manganese ions - by 13.2%, and phosphorus ions increased by 14.4%.

Against the background of reperfusion lasting 72 hours, the changes continued unidirectionally with the previous period. The content of sodium ions decreased by 33.2%, potassium ions increased by 92.2%, chlorine ions decreased by 27.2%, iron ions by 30.2%, calcium ions by 60.5%, manganese ions by 17.0%, and phosphorus ions increased by 7.5%.

Thus, against the background of liver ischemia lasting 10 minutes, reperfusion in all periods led to an increase in pathological changes in all studied parameters.

Studies on the background of ischemia lasting 20 minutes showed that, compared with intact values, the content of sodium ions decreased by 6.6%, potassium ions increased by 15.0%, chlorine ions decreased by 6.9%, and iron ions by 3.2%, calcium ions - by 24.5%, manganese ions - by 8.1%, and phosphorus ions increased by 22.6%.

Thus, against the background of ischemia lasting 20 minutes, pathological shifts of the studied parameters occur. When the blood flow in the liver was restored, the following picture was observed: against the background of reperfusion lasting 60 minutes, the content of sodium ions increased by 0.5%, potassium ions - by 16.1%, and chlorine ions by 0.2%. The content of iron ions decreased by 14.4%, calcium ions - by 23.1%, manganese ions - by 5.2%, and phosphorus ions decreased by 14.6%.

Against the background of reperfusion lasting 3 hours, these indicators continued to change: the content of sodium ions decreased by 7.8%, potassium ions - 32.9%, and chlorine ions - 7.4%, iron ions - 19.8%, ions calcium - by 45.4%, manganese ions - by 15.3%, the content of phosphorus ions decreased by 27.6%.

Against the background of reperfusion lasting 24 hours, the content of sodium ions decreased by 12.9%, potassium ions - 54.5%, and chlorine ions - 13.8%, iron ions - 30.2%, calcium ions - 63, 0%, manganese ions - 23.0%, phosphorus ions - 35.2%.

Against the background of reperfusion lasting 72 hours, the content of sodium ions in the blood also continued to decrease and turned out to be reduced during this period by 20.4%, potassium ions decreased by 92.8%, chlorine ions - by 28.2%, iron ions - by 46, 4%, manganese ions - by 23.0%, phosphorus ions - by 35.2%. The content of calcium ions gradually increased and was reduced by only 7.3%.

Thus, against the background of ischemia lasting 20 minutes, reperfusion of the liver led to pathological changes in the studied parameters, but these changes were less pronounced than during reperfusion against the background of 10 minute ischemia.

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孕期妇女生活质量评估  
**ASSESSMENT OF QUALITY OF LIFE IN WOMEN DURING  
PREGNANCY**

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摘要。 这篇文章介绍了女性在怀孕前生活质量和心理情绪状态变化的结果，同时考虑了月经周期的各个阶段。 根据研究结果，发现健康女性的QOL评估指标具有明显的每月节律。 同时，在月经周期的卵泡期，BP, GH, VT水平明显升高，在黄体期则为PF, RP, SF, RE和MH ( $p < 0.05$ )。 在怀孕期间，在三个月的孕期中对妇女的QOL指标进行了评估，结果显示，健康的心理情感成分有所增加，而身体成分却有所减少，这可以追溯到怀孕的第一至第三个月。 健康的心理-情绪成分的最低指标，反之亦然，在孕妇的头三个月中观察到身体成分的高值。

关键词：生活质量，焦虑，月经周期，怀孕。

**Abstract.** *The article presents the results of changes in the quality of life and psychoemotional state in women before pregnancy, taking into account the phases of the menstrual cycle. According to the results of the study, it was found that QOL assessment indicators in healthy women have a pronounced monthly rhythm. At the same time, the level of BP, GH, VT is significantly higher in the follicular phase of the menstrual cycle, and PF, RP, SF, RE and MH in the luteal phase ( $p < 0.05$ ). During pregnancy, an assessment of QOL indicators in women, carried out in three trimesters, showed an increase in the psycho-emotional component of health while reducing the physical component, which can be traced from I to III trimester of pregnancy. The lowest indicators of the psycho-emotional component of health and vice versa, high values of the physical component are observed in the first trimester in pregnant women.*

**Keywords:** *quality of life, anxiety, menstrual cycle, pregnancy.*

**Introduction.** Currently, the most relevant issues are considered from the standpoint of assessing the quality of life of a healthy person in different environmental conditions, under the influence of hormonal physiological processes in the human body, patients of medical institutions with various diseases of organs and systems [1, 5]. With the development of a civilized society and the growth of technological progress, the integration of research, which is also supported by a subjective assessment of a person's life quality, ones level of changes in both physical and mental state, is of the greatest value. Such an approach to study enables a person to measure their own comfort zone and express it, and we, in turn, have the opportunity of an individual approach that takes into account assessment factors hidden for us in an objective study. Using this evaluation criterion in clinical practice, first of all, there is a shift in attention to the patient himself, and not only to their disease [3, 4].

A holistic view of a person's quality of life includes the study of the physical functioning of the body and the relationship with possible daily activities. Subjective assessment of pain, combined with the ability to engage in normal activities, as a factor limiting physical activity. It is necessary to give an opportunity to describe the general state of health, well-being, resistance to aggressive environmental factors and the body's adaptation to them. It is important to know how active a person is and whether there is a surge of strength and energy, whether one has a desire to actively interact in the surrounding space, performing daily tasks. Satisfaction from communication with family, friends and colleagues is an indicator of social adaptation in society, as well as the presence of the ability to carry out this process most freely from restrictions on physical and mental state. The quality of a person's life is directly related to his perception and emotional coloring of the events taking place with him and assessment of his well-being, the mental component of a healthy or sick body, an active or passive life position in society, understanding one's own mental health. Studies on the quality of life make it possible to combine many objective and subjective factors, conduct a comprehensive assessment, which is so necessary in modern medicine, give scientifically based answers, open new ways to improve physical and mental health by increasing satisfaction and improving the individual components of the quality of human life [1,6].

As is known, with the onset of pregnancy in women, the hormonal background changes and a gestational dominant appears, which significantly affects the physical and psychological state and the quality of her life. The most pronounced changes in the quality of life and their relationship with the psychoemotional state of pregnant women with an assessment for each trimester. Thus, a comparative assessment of the quality of life and the psychological state of women in various phases of the menstrual cycle and during pregnancy is the most relevant.

**Purpose of the study.** To conduct a comparative assessment of the quality of life and the psychological state of women before and during pregnancy.

**Materials and methods.** 120 women aged 20-45 years were examined: among them 60 women with physiological pregnancy, in trimesters and 60 women in various phases of the menstrual cycle, in the follicular phase (FP) on days 6-9 and luteal (LP) on 19-22 day. The average age was  $31.8 \pm 0.5$  years.

Quality of life was assessed using the international standardized questionnaire SF-36 [7]. The SF-36 questionnaire includes 36 questions, which are grouped into 8 scales. Of these, 4 scales allow characterizing the physical total component of health (Physical Component Summary's, PSH): physical functioning (PF); role-based functioning due to physical condition (RP); pain intensity (BP); general health (GH). The other 4 scales characterize the mental total component of respondents' health (Mental Component Summary's, MSH): vital activity (VT); social functioning (SF); role-based functioning due to emotional state (RE); mental health (MH). Scale values can vary from 0 to 100 points. At the same time, 100 points correspond to the greatest welfare, 0 points indicate the maximum restriction of vital activity according to the corresponding indicator. Thus, the higher the scale, the more well the respondent on this criterion.

To assess the psychological state, the Spilberger - Hanin questionnaire (State-Trait Anxiety Inventory - STAI) was used, consisting of 2 scales of self-assessment of anxiety - situational and personal. The questionnaire was created by C. D. Spielberger, and translated and adapted into Russian by Yu. L. Khanin. Personal anxiety is a character trait and a feature of the psyche. Situational anxiety, or reactive, manifests itself as a reaction to a change in circumstances.

The results of the study were subjected to statistical processing using the Statistica-8 program. Comparison of two independent samples was carried out using nonparametric criteria (Wald-Wolfowitz, Kolmogorov-Smirnov and Mann-Whitney) [2]. When testing statistical hypotheses, the critical significance level ( $p$ ) in the work was taken equal to 0.05.

**Results and its discussion.** An analysis of the data showed that the indicators of QOL assessment in healthy women have a pronounced monthly rhythm (Table 1). So, the level of BP, GH, VT is significantly higher in FP, and PF, RP, SF, RE and MH in LP ( $p < 0.05$ ).

A comparative analysis of the obtained data according to the evaluation criteria for the total indicator of the physical and mental health component indicates a significant decrease in the follicular phase of the menstrual cycle compared with the luteal phase ( $p < 0.05$ ). This is consistent with data from other authors [1, 4].

**Table 1.** Assessment of the quality of life in women in different phases of the menstrual cycle

Scales SF-36	FP	LP
PF	87,7±1,3	92,2±1,2*
RP	77,5±2,9	85,8±2,4*
BP	81,4±2,1*	73,6±2,7
GH	79,8±1,4*	72,1±1,2
VT	67,6±1,2*	63,4±0,9
SF	75,3±2,7	82,8±2,1*
RE	69,3±3,1	78,8±2,5*
MH	68,3±0,9	72,6±0,8*
PSH	50,7±0,5	53,3±0,6*
MSH	46,9±0,5	49,6±0,6*

Note: \* - statistically significant difference (p <0.05).

A comparative analysis of the data showed that the values of the assessment of situational and personal anxiety on the Spilberger-Hanin scale are significantly higher in FP compared with luteal (Table 2). At the same time, the values of the personal anxiety scale significantly prevail over the situational anxiety (p <0.05). This is consistent with data from other authors [1, 3, 6].

An analysis of the correlation relationships revealed a direct relationship between personal and situational anxiety, where the Pearson coefficient is 0.5 in FP of the menstrual cycle and 0.6 in LP. An inverse correlation is also observed between the physical total component of health and personal anxiety in FP (-0.02) and in the luteal phase (-0.3) of the menstrual cycle.

**Table 2.** Assessment of anxiety in women on the Spielberger-Hanin scale in different phases of the menstrual cycle

Spielberger-Hanin Scales	FP	LP
Situational anxiety	41,7±1,3*	36,4±1,2
Personal anxiety	47,6±0,8*	44,1±1,1

Note: \* - statistically significant difference (p<0,05).

From the data presented in table 3, it can be seen that PF and RP are significantly limited in the third trimester compared with other phases of the menstrual cycle in non-pregnant women (p <0.05). This indicates that pregnant women by the third trimester are experiencing limitations in the performance of physical activity, as well as daily activities.

BP perception of pain was more pronounced in women during pregnancy, especially in the first and second trimesters, compared with the phases of the menstrual cycle in non-pregnant women ( $p < 0.05$ ).

Differences in the GH and VT scales indicate that a higher self-esteem of the general state of health and vital activity was noted in the II trimester compared with others and were significantly interrelated ( $r = 0.59$ ;  $p < 0.01$ ).

Data analysis showed that the highest values on the SF scales ( $84.8 \pm 2.1$  points). RE ( $81.67 \pm 4.2$  points) and MH  $78.4 \pm 1.9$  were observed in the II trimester, this is associated with an increase in the psychoemotional state of the body during this period of pregnancy.

From the data presented in table 3, it can be seen that the values of the assessment of the total indicator of physical and mental health components are in pronounced antiphase during the period from I to III trimester of pregnancy. Thus, restrictions in the psycho-emotional state and its decline in the first trimester are replaced by its gradual growth by the third trimester. Conversely, restrictions on the physical condition and functioning of women increase from I to III trimester of pregnancy.

An analysis of the correlation relationships revealed a direct relationship between the physical and mental components of health, which was in the II (0.29) and III (0.22) trimesters of pregnancy, feedback in the I trimester (-0.65).

**Table 3.** *Assessment of quality of life in women in different trimesters of pregnancy*

Scales SF-36	I trimester	II trimester	III trimester
PF	77,5±2,2	84,5±1,8	54,5±3,2
RP	56,2±5,4	71,3±4,9	41,2±5,2
BP	91,8±1,7	90,1±1,6	77,05±3,01
GH	67,1±1,4	71,8±1,7	69,55±1,3
VT	54,25±3,4	67,0±1,9	62,0±2,2
SF	78,75±1,8	84,8±2,1	78,13±2,1
RE	48,3±36,1	81,67±4,2	63,33±2,01
MH	63,8±2,8	78,4±1,9	74,2±1,7
PSH	50,8±0,8	50,5±0,7	41,32±1,1
MSH	42,3±1,8	51,5±1,1	51,35±1,1

Note: \* - statistically significant difference ( $p < 0,05$ ).

A comparative analysis of the data obtained according to the assessment criteria on the Spilberger-Khanin scale, situational and personal anxiety has high rates in the first trimester, wave-wise decreases in the second trimester and slightly increases in the third trimester (Table 4). The values of the personal anxiety scale in all trimesters are significantly higher than the situational.

**Table 4.** Assessment of anxiety in women on the Spielberger – Hanin scale in different trimesters of pregnancy

Spielberger-Hanin Scales	I trimester	II trimester	III trimester
Situational anxiety	41,9±1,9	31,1±0,8	35,5±1,4
Personal anxiety	45,5±1,5	37,2±0,8	40,2±1,2

Note: \* - statistically significant difference ( $p < 0,05$ ).

An analysis of the correlation relationships revealed a direct relationship between personal and situational anxiety, where the Pearson coefficient is 0.9 in the first trimester, 0.4 in the second trimester, and 0.8 in the third trimester. A direct correlation is also observed between the physical component of health and personal anxiety in the I trimester (0.6), and feedback in the II (-0.2) and III (-0.3) trimesters.

**Conclusions.** According to the results of the study, it was found that QOL assessment indicators in healthy women have a pronounced monthly rhythm. At the same time, the level of BP, GH, VT is significantly higher in the follicular phase of the menstrual cycle, and PF, RP, SF, RE and MH in the luteal phase ( $p < 0.05$ ). During pregnancy, an assessment of QOL indicators in women, carried out in three trimesters, showed an increase in the psycho-emotional component of health while reducing the physical component, which can be traced from I to III trimester of pregnancy. The lowest indicators of the psycho-emotional component of health and, on the contrary, high values of the physical component are observed in the first trimester in pregnant women. Anxiety, both personal and situational, increases in the follicular menstrual cycle compared with the luteal phase. Anxiety in pregnant women varies from I to III trimester, least of all it bothers in the II trimester. Indicators of personal anxiety are significantly lower than situational.

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锯齿草干提取物对雄性大鼠性行为的影响

**THE EFFECT OF DRY EXTRACT OF SERRATULA CENTAUROIDES  
L. ON THE SEXUAL BEHAVIOR OF MALE RATS**

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抽象。在大鼠实验中,研究了锯齿草(*Serratula centauroides* L.) (菊科)的dru提取物对雄性大鼠生殖功能的影响。研究发现,在纯净水中以100和150 mg / kg的剂量稀释的*Serratula centauroides* L.干燥提取物的体积为10 ml / kg,刺激了性行为的各个方面,并增强了雄性大鼠的生殖功能。

关键词: 锯齿草干燥提取物, 生殖功能, 雄性大鼠

**Abstract.** *The effect of the dru extract of Serratula centauroides L. (Asteraceae) on the reproductive function of male rats was studied In experiments on rats. It was found that dry extract of Serratula centauroides L., diluted in purified water at a dose of 100 and 150 mg / kg in a volume of 10 ml / kg, stimulated various aspects of sexual behavior and increases the reproductive function of male rats.*

**Keywords:** *dry extract of Serratula centauroides L., reproductive function, male rats*

The study of the functioning of the reproductive system and the possibility of its regulation is not only of fundamental interest, but is of great practical importance, since reproductive health is an important factor determining the quality of human life. The most promising direction in this regard is the development of adaptogenic preparations based on raw materials of natural origin, which have a number of advantages compared with synthetic agents: they contain, as a rule, a wide range of biologically active substances; have several types of pharmacological activity; are characterized by a smooth increase in the pharmacological effect [5]. An important property of drugs of natural origin is low toxicity and the absence of adverse side reactions with long-term use, which is of particular importance in view of the wide spread of drug disease [7].

In connection with the above, the dry extract of *Serratula centauroides* L. was developed in the Department of Biologically Active Substances of the IGEB SB RAS

The aim of this study was to determine the effect of *Serratula centauroides* L. on the processes of reproduction of male rats.

### **MATERIALS AND METHODS**

Medicinal plant materials were collected in the summer of 2017 in the Aginsky and Mogotuisky districts of the Transbaikal Territory. When collecting them, the requirements of the State Pharmacopoeia [4] for the preparation of plant materials were taken into account, the collected raw materials were dried in a well-ventilated room. The moisture content of the dried raw material was determined by the method recommended by the State Pharmacopoeia [4].

The object of the study was dry extract from the aerial part of cornflower blue serratula (*Serratula centauroides* L.), obtained by three times extraction with ethyl alcohol, followed by evaporation, ultrasonic drying and grinding. The extract is the sum of extractive substances belonging to various classes of chemical compounds: ecdysteroids, flavonoids, saponins, polysaccharides, amino acids, tannins, vitamins, etc.

The method was used [2] in the study of acute toxicity. An aqueous solution of *S. centauroides* extract was administered once intragastrically and intraperitoneally at doses of 3500, 5000, 6500 and 8000 mg / kg in a volume of 10 ml / kg. It was found that with an intraperitoneal administration of a dose of 5000 mg / kg, one rat died after 1.5 hours. In the group receiving the test extract at a dose of 6500 mg / kg, 2 rats died after 1 hour after extract administration. With an increase in the concentration of the studied drug to 8000 mg / kg, all animals died in the first hour after administration. At the same time, signs of intoxication were observed in the form of decreased activity, tachycardia, and increased breathing. Subsequently, breathing became superficial, clonic-tonic seizures were developed in animals. The death of animals occurred due to respiratory arrested. With subsequent autopsy of the animals, exudate was observed in the abdominal cavity and hemorrhage in the chest cavity, indicating toxic shock. With intragastric administration of the test substance in the indicated doses, all animals survived. The calculated LD50 value for intraperitoneal administration was  $5700 \pm 150$  mg / kg, which allows us to attribute the dry extract of *S. centauroides* to practically non-toxic agents according to the classification of K. Sidorov (1973) and H. Hodges, R. Sterner [1].

The studies were conducted in the summer-autumn period on sexually mature outbred white rats of the Wistar line: 50 males and 50 females of 4 months of age, weighing 200 - 210 g. Animals were kept in a vivarium, taking into account the rules adopted by the International Convention for the Protection of Vertebrate Animals used in experiments for scientific purposes (Strasbourg, 1986). Before the start of the experiments, male rats were divided into 5 equal groups (10 animals each): the 1st group was the control (intact) group, and the 2nd, 3rd and 4th groups were experimental, which were intragastrically injected with DCDE (dry corn-

flower blueberry extract) diluted in purified water at doses of 50, 100 and 150 mg / kg, respectively, in a volume of 10 ml / kg daily for 14 days, 1 time per day. As a comparison drug, in the 5th group, we used a dealcoholized liquid safflower-like levzea extract (DLCLE) at a dose of 5.0 ml / kg (an isoeffective dose established experimentally). Animals of the control group received an equivolume amount of purified water according to a similar scheme.

Testing of sexual behavior was carried out at the “site of zoosocial preferences” on the second day after completion of the course of the introduction of DCBE or a comparison drug [3]. At the same time, an intact female was placed on the test male, placed on the site 20 minutes before the test. The pair was monitored for one hour under infrared light. During this period, the males recorded the latent period of the first approach to the intact female and the duration of sexual behavior, which took into account proceptive behavior (latent period and time spent near the female) and receptive behavior (according to the number of emotional approaches and lords, indicating the male’s readiness for mating ) The parameter “emotional approaches to the female” took into account elements of sniffing and mutual grooming. Mating was performed for 14 days.

In the second series of experiments, the sexual behavior of male rats was tested on the “site of zoosocial preferences”, separated by a partition with closed “doors” (shutter), also on the second day after completion of the course of administration of DCBE or a comparison drug [3]. Before the start of the experiment, rats (male and female) for getting used to the compartment (adaptation to the "compartment") were placed in different "chambers" isolated from each other and kept for 2-3 hours under infrared light. After adaptation, the shutter was opened and rat behavior was observed for an hour. When testing sexual behavior, an assessment was carried out in the same way as in the previous experiment, and the time of the male's movement into the female compartment was also noted.

At the end of the observations, the males were taken out of the experiment, regulated by the method of decapitation [2] under ether anesthesia.

Statistical data processing was carried out by generally accepted methods using the Biostat-6 software package. To assess the significance level of the obtained results, the Mann-Whitney U test was used. The differences were considered statistically significant with a probability of 95% ( $P \leq 0.05$ ) [6].

## **RESULTS AND ITS DISCUSSION**

As a result, in the first series of experiments, it was found that when females rats were placed with male receiving DCBE at doses of 50, 100, and 150 mg / kg on the “site of zoosocial preferences,” the time of proceptive behavior was shortened by 20% , 31 % and 27%, compared with intact control, and receptive behavior lengthened by 11%, 35% and 33%, respectively, indicating a male’s readiness for mating. The amount of sniffing and grooming increased by 42 in

the 3rd experimental group and 31%, and by 37 and 23%, in the 4th group respectively (Table 1). The same indicators were equated to indicators of intact control in group 2. When examining smears under a microscope, the presence of sperm (single) in the vaginal content in female rats of groups 3 and 4 was detected, and the presence of sperm was not detected in the 2nd experimental group. In the sexual behavior of male rats treated with the DLSLE comparison drug, the time of proceptive behavior was shortened by 22%, and the receptive behavior was extended by only 10%. The number of sniffing and grooming did not differ from the level of intact control. Microscopy in vaginal contents in female rats did not detect sperm.

In the second series of experiments, when testing the sexual behavior of male rats receiving DCBE at doses of 50, 100 and 150 mg / kg on a “site of zoosocial preferences” with a divided septum, it was found that the latent period of transition of the male to the “compartment” of the female was shortened compared to intact control for 3 minutes (9%), 14 min. (41%) and 9 min. (25%), respectively. This time was shortened by 4 min (12%) for rats, receiving the comparison drug DLSLE. The time of proceptive behavior in groups 2, 3, and 4 was also shortened by comparison with intact control by 32%, 43%, and 40%, and this time was shortened by 30% in 5 group. Receptive behavior was elongated in groups 2, 3, and 4 by 9%, 48%, and 37%, respectively, which also indicates the male’s readiness for mating, with a 12% elongation of receptive behavior in the 5th experimental group treated with DLSLE. Also, the number of sniffing and grooming in rats of the 2nd, 3rd and 4th groups receiving DCBE increased by 18% and 15%, 25 and 21%, 22 and 24%, respectively, and in rats receiving DEHL the same indicators remained at the level of intact control (table 2). When examining smears in female rats of that were in contact with male rats receiving 100 and 150 mg / kg of DCBE, sperm cells (single) in the vaginal content were detected under a microscope.

Thus, an analysis of the research results suggests that DCBE in doses of 100 and 150 mg / kg body weight stimulates the reproductive function of male rats.

### CONCLUSION

Based on the results of the studies, it can be concluded that there is a noticeable stimulation of various aspects of sexual behavior and an increase in the reproductive function of male rats taking DCBE. Thus, the extract of dry cornflower bluegrass diluted in purified water at doses of 100 and 150 mg / kg in a volume of 10 ml / kg shortens proceptive behavior, lengthens receptive behavior, increases the number of sniffing and grooming, which indicates the male’s readiness for mating. Moreover, in both series of experiments in the study of smears in female rats that were in contact with male rats who received DCBE the presence of spermatozoa in the vaginal content was detected under a microscope.

### Thanks

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**Table 1**

*The effect of ESSV on the sexual desire of male white rats*

Group of animals	The latent period of the first approach to an intact female and the duration of sexual behavior					
	Dose of remedy, mg/kg	Proceptive behavior (min)	Receptive Behavior (amount)	Sniffing (amount)	Grooming (mutual) (amount)	Pairing (the presence of sperm in vaginal secretion)
Intact group (n = 10)		13.0 ± 1.0	4.5 ± 0.1	3.5 ± 0.2	2.7 ± 0.3	-
ESSV (n = 10)	50 мг/кг	10.4 ± 1.0	5.0 ± 0.1*	3.7 ± 0.1	3.0 ± 0.1	-
ESSV (n = 10)	100 мг/кг	9.0 ± 1.0*	6.1 ± 0.4*	5.0 ± 0.2*	3.9 ± 0.3*	+
ESSV (n = 10)	150 мг/кг	9.5 ± 1.0*	6.0 ± 0.3*	4.8 ± 0.3*	3.0 ± 0.2	+
DEZHLS (n = 10)	5.0 мл/кг	10.2 ± 1.0	5.0 ± 0.1*	3.8 ± 0.1	3.0 ± 0.1	-

Note to Table. 1-2: \* - means that the differences are significant compared to the intact control at  $P \leq 0.05$

**Table 2**

*The effect of ESSV on the latent period of the transition of the male into the “compartment” of the female*

Group of animals	The latent period of the first approach to an intact female and the duration of sexual behavior						
	Dose of remedy, mg/kg	Proceptive behavior (min)	Receptive Behavior (amount)	Sniffing (amount)	Grooming (mutual) (amount)	Pairing (the presence of sperm in vaginal secretion)	The latent period of the transition of the male into the “compartment” of the female (min)
Intact group (n = 10)		26.5 ± 3.0	2.2 ± 0.5	2.2 ± 0.1	2.2 ± 0.1	-	34.0 ± 5.0
ESSV (n = 10)	50 мг/кг	18.0 ± 1.0*	2.4 ± 0.2	2.6 ± 0.1*	2.8 ± 0.1*	-	31.0 ± 4.0
ESSV (n = 10)	100 мг/кг	15.0 ± 2.0*	3.8 ± 0.4*	2.9 ± 0.4	2.8 ± 0.1*	+	20.0 ± 3.0*
ESSV (n = 10)	150 мг/кг	16.0 ± 2.0*	3.5 ± 0.5	2.8 ± 0.1*	2.9 ± 0.1*	+	20.5 ± 5.0
DEZHLS (n = 10)	5,0 мл/кг	18.7 ± 1.0*	2.5 ± 0.1	2.7 ± 0.1	2.3 ± 0.2	-	30.0 ± 4.0

在不同运动训练期间预测16-17岁足球运动员功能状态的可能性  
**POSSIBILITIES FOR PREDICTING THE FUNCTIONAL STATE  
OF FOOTBALL PLAYERS OF 16-17 YEARS IN DIFFERENT PERIODS  
OF SPORTS TRAINING**

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抽象。通过诊断硬件组合“ OMEGA-SPORT”（圣彼得堡，“ DYNAMICS”）获得的计算指标“功能状态%”与指标“根据cu的调查对医生的专家评估”之间的关系揭示了我们归因于年度培训周期中培训过程特征的体育医生。结果表明，“功能状态百分比”指标的降低伴随着对医生就诊次数的增加，这可以通过指标“医生的专家评估，cu”的增加来证明。“功能状态百分比”指标的预期下降是调节心律的系统压力的结果。基于对心率变异性的统计和频谱参数的分析和“医生的专业评估，cu”的指标，“功能状态百分比”适合用于监视和纠正16岁以下运动员的训练及伴随效果17。

关键字：健康水平，指标“功能状态百分比”，“医生，铜的专家评估”，足球，运动训练。

**Abstract.** *The relationship between the calculated indicator “functional state %” obtained through the diagnostic hardware complex “OMEGA-SPORT” (“DYNAMICS”, St. Petersburg) and the indicator “expert assessment of a doctor, cu”, determined according to a survey of sports doctors, which we attribute to the features of the training process in the annual training cycle are revealed. It is shown that a decrease in the “functional state %” indicator is accompanied by an increase in visits to the doctor, as evidenced by an increase in the indicator “expert assessment of a doctor, cu”). The anticipatory decrease in the “functional state %” indicator is a consequence of the stress of the systems that regulate the heart rhythm. The indicator “functional state %”, based on the analysis of statistical and spectral parameters of heart rate variability and “expert assessment of a doctor, cu”, is fit to use for monitoring and correction of training and accompanying effects for players aged 16-17.*

**Keywords:** *health level, indicator “functional state %”, “expert assessment of a doctor, cu”, football, sports training.*

### **Introduction**

The effectiveness of adaptive rearrangements, their stability and sufficiency is determined by the level of functional reserves of the body. The study of heart rhythm allows you to obtain predictive information on functional changes in the body under the influence of various influences (Bayevsky, R. M., Makarova G. A., Povarechenkova Yu. A., Kozlov A. A., Panyukov M. V, Naimushena A G. and others). Today, the search and identification of informative and reliable markers predicting the appearance of pre-pathological changes in the body of athletes is an actual area of sports science.

The purpose of the work - is to identify the prospects of using the “functional state %” indicator to predict changes in the functional status of professional football players of 16-17 years old during a one-year cycle of sports training.

### **Methodology and organization of research**

40 youths 16-17 years old professionally involved in football were examined. Testing was conducted from January 10, 2018 to November 8, 2019. At the same time of the day from 9:00 to 10:00 hours under standard environmental conditions. The electrical activity of the heart was recorded in the second standard lead. The recording time was 5-7 minutes, approximately 300 cardiac complexes. The subjects were in a sitting position during registration, arms and legs were not crossed, breathing was unstressed, eyes were closed, saliva was not swallowed, did not cough, did not move. After each recording of the electrical activity of the heart, the data was sent to the cloud for automatic analysis of 14 indicators of heart rate variability (HRV), ranking and reporting on the integral indicator "functional state, %". The study used the stationary hardware complex OMEGA-SPORT (“Dynamics”, St. Petersburg, Russia). Two recording electrodes were placed on the right and left hand in the region of the wrist joints. The skin surface at the points of attachment of the electrodes was well moistened with water.

An expert assessment was regularly conducted by 5 specialists in sports medicine in order to determine the level of health of athletes. The level of health was evaluated by the doctor throughout the study period. Depending on the number of requests and the severity of the complaint, points were set: 0 - “everything is in order, no complaints and injuries”, 1-3 - “excellent” health, 4-7 points - “good”, 8-10 - “satisfactory”, 11-12 - “injuries, disorders, diseases that entailed skipping of training sessions”.

Statistical analysis was carried out in the application programs “STATISTICA 7.0” and “Microsoft Office Excel 2013”. The following were recorded: arithmetic mean, standard deviation, linear regression, Pearson correlation coefficient and significance of differences according to the Mani-Whitney Z-test at a significance level of  $p > 0.05$ .



**Fig. 1** - Dynamics of the indicator “functional state %” (FS,%) and expert assessment of doctors (EED, cu) in the group of 16-17 year old football players over a year-long cycle of sports training

## Results and discussion

The level of health of athletes correlates with the optimality of their functional state and the reserve capabilities of the body of athletes. We used the expert assessment of a doctor to assess the level of health. "Functional state %" is an integral indicator, which is calculated on the basis of HRV parameters and reflects the urgent adaptive reactions of the body to the training loads and the effects that accompany them, determining the "physiological price" of adaptation according to the degree of tension of the systems that regulate the heart rhythm. Based on the average group monitoring data for the indicator "functional state %" (FS%) and "expert evaluation of doctors, cu" (EED, cu), a schedule was built during the annual sports training cycle (Fig. 1).

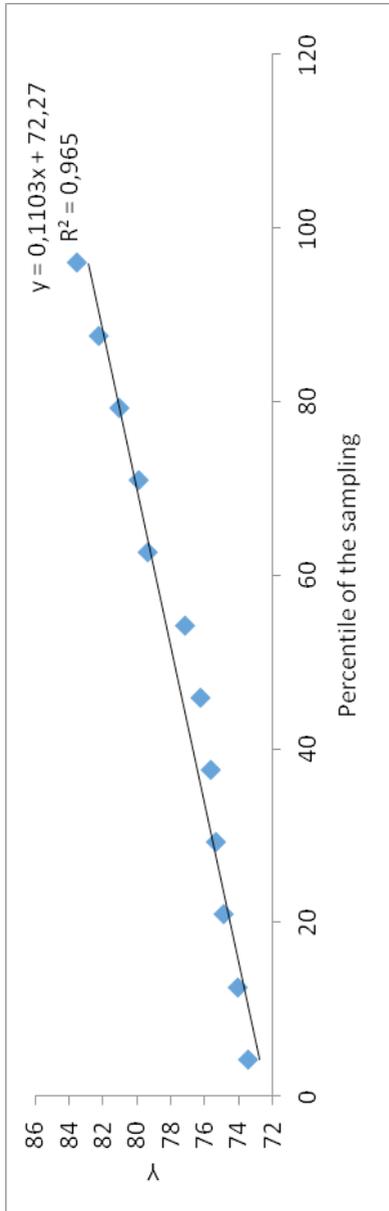
The connection is observed between the functional state and level of health of the examined youth football players. The relative stability and optimality of the adaptive reactions of the players fell on the competitive period (May - early October), as indicated by the graph "functional state %". It is worth noting that during functional downturns (a decrease in the FS indicator, % in the figure), the expert assessment of a doctor testified to an increase in complaints of health, the presence of diseases and injuries among football players.

Figure 2 shows a linear regression of the relationship between the "FS%" indicator and "EED (cu)", the level and correlation coefficient are determined: 16-17 years ( $r = 0.929$ ). The functional state of the cardiovascular system characterizes its adaptive potential (Baevsky R. M.). Thus, a decrease in the adaptive potential of the circulatory system affects the modulation of the "functional state %" indicator and is accompanied by an increase in the incidence rate and the appearance of various injuries. In fig. 2 it can be seen that in the study group linear regression grows, "signaling that the circulatory system has a certain margin of safety and certain functional reserves" (A. Naimushena, 2011), this, we believe, is associated with an increase in adaptive potential and an expansion body reserves of athletes.

It is possible that the identified patterns were also influenced by such factors as climatic conditions, social, psychological and similar loads, and in combination with the uneconomical expenditure of energy resources during the game season, leads to a decrease in the adaptive capacity of the body of football players, which leads to a significant number of morbidity and injuries.

## Conclusion

The data from our study indicate that a decrease in the "functional state %" will lead to an increase in the number of professional football players going to sports doctors with ailments, injuries, and illnesses. It was revealed that the indicator "functional state %" changes somewhat earlier than the indicator "expert assessment of a doctor, cu", signaling changes in the adaptive reactions of the body of athletes. Therefore, for a quantitative assessment of the functional state and health in the annual training cycle of sports training, it is advisable to consider the indicators "functional state %" and "expert assessment of a doctor, cu."



**Fig. 2** Linear regression analysis of the indicator “functional state %” (FS, %) and expert assessment of doctors (EED, cu) in the group of 16-17 year old football players

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混合镧铈铈ter磷酸盐的发光性质  
**LUMINESCENT PROPERTIES**  
**OF MIXED LANTHANUM-CERIUM-TERBIUM PHOSPHATES**

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抽象。 提出了一种制备组成为 $\text{La}_{0,8}\text{Ce}_{0,15}\text{Tb}_{0,05}\text{PO}_4$ 和 $\text{La}_{0,8}\text{Ce}_{0,15}\text{Tb}_{0,05}(\text{PO}_3)_3$ 的composition活化磷酸镧铈铈的方法,与已知方法相比,其主要优点是较低的温度和处理时间 方法。 磷光体在450–620 nm区域显示强烈的绿色发光。 已经发现,与简单的磷酸ter相比,在获得的化合物中,在存在 $\text{La}^{3+}$ 和 $\text{Ce}^{3+}$ 离子的情况下, $\text{Tb}^{3+}$ 离子的发光强度显着增加,这表明激发能向 $\text{Tb}^{3+}$ 离子的转移增加。 激活剂的存在。

关键字: REE磷酸盐, 活化剂, 发光。

**Abstract.** *A method is proposed for the preparation of terbium activated lanthanum cerium phosphates of the composition  $\text{La}_{0,8}\text{Ce}_{0,15}\text{Tb}_{0,05}\text{PO}_4$  and  $\text{La}_{0,8}\text{Ce}_{0,15}\text{Tb}_{0,05}(\text{PO}_3)_3$ , the main advantages of which are lower temperature and process time compared to known methods. Phosphors show intense green luminescence in the region of 450–620 nm. It was found that, compared with simple terbium phosphates, in the obtained compounds, the luminescence intensity of the  $\text{Tb}^{3+}$  ion in the presence of  $\text{La}^{3+}$  and  $\text{Ce}^{3+}$  ions significantly increases, which indicates an increase in the transfer of excitation energy to  $\text{Tb}^{3+}$  ion in the presence of activators.*

**Keywords:** *REE phosphates, activators, luminescence.*

The synthesis and study of rare-earth phosphors remains relevant in connection with their wide practical use. In particular, materials based on rare-earth oxysulfides and phosphates, activated by europium and terbium, are widely used in color television and cathode ray tubes for various purposes, for the manufacture of fluorescent lamps, gas discharge indicators, protective coatings, and X-ray phosphors [1-5].

A certain combination of rare-earth ions in the phosphor can lead to a modification of its luminescent characteristics [5]. An important role is played by the used method of synthesis of functional material, which affects both the composition, structure, particle size, and the manufacturability of the production process. Solid-phase methods are most often used to obtain phosphors. So, to obtain a cathodoluminophore based on yttrium oxides and a europium activator and terbium and praseodymium coactivators, mineralizers are added to a mixture of the starting oxides of these rare-earth elements: alkali metal and sulfur carbonates, and the resulting mixture is annealed at a temperature of 1050–1150°C for 3-4 hours [6].

Along with high-temperature methods of solid-phase synthesis of functional materials, so-called “soft chemistry” methods are proposed, for example, extraction-pyrolytic [7, 8]. This method allows one to obtain simple and complex oxides of REE based on low-temperature pyrolysis of precursors.

This report presents data on a modified low-temperature method [9] for the synthesis and study of the luminescent characteristics of phosphors based on lanthanum - cerium phosphates activated by terbium.

#### Experimental part

To obtain terbium-activated lanthanum cerium phosphates, the procedure described in [9] was used.

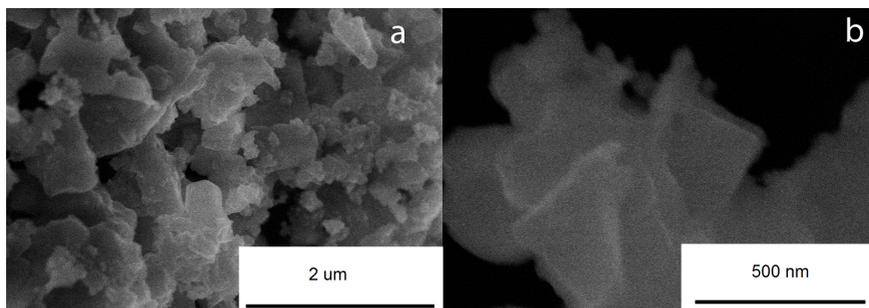
Terbium and lanthanum were extracted from nitric acid solutions of  $6.6 \cdot 10^{-3}$  mol/L of terbium or 0.012 mol/L of lanthanum with benzene solutions of 1.95 mol/L of acetylacetone (AA) and 0.0167 mol/L of phenanthroline. Cerium was extracted from a nitric acid solution (cerium concentration 0.15 mol/L) with a benzene solution containing 1.59 mol/L caproic acid and 1.95 mol/L AA. The pH value of the aqueous phases, which was necessary to obtain saturated REE organic phases, equal to 7.5, was created by adding an aqueous solution of ammonia. The pH of the aqueous phase was monitored using a Radelkis OP-211/1 pH meter. The organic and aqueous phases in a ratio of 1: 1 were intensively mixed at room temperature for 30 min on a mechanical shaker SK-30 (Korea). The composition of the aqueous and organic phases was controlled by atomic absorption and X-ray fluorescence analysis methods. After extraction, the phases were separated. The obtained extracts containing lanthanum, terbium and cerium were mixed in a certain proportion with tributyl phosphate or triphenylphosphine oxide. The mixed extract was evaporated at 60-80°C, the precursor was subjected to pyrolysis at 600-700°C for 2 hours.

X-ray diffraction patterns of the samples after pyrolysis were recorded on a DRON-2.0 diffractometer in  $\text{CuK}_\alpha$ -radiation. IR spectra of samples prepared as suspensions in liquid paraffin on *KRS-5* glass were recorded at room temperature on a Vertex 70 instrument in the region of 4000-400  $\text{cm}^{-1}$ . AFM images of the obtained powders were examined using a Hitachi S 5500 high-resolution electron scanning microscope and an atomic force microscope manufactured by NT-MDT ZAO (Zelenograd). The luminescence excitation spectra at 300 K were recorded on a Shimadzu RF-5301 PC spectrofluorimeter.

### Results and its discussion

The disadvantages of the known methods for the synthesis of lanthanum activated by cerium and terbium [6], as noted above, are the multistepness and duration of the process, and in some cases also the need to use highly toxic solvents, for example, methanol [10]. The elimination of these drawbacks and the simplification of the method for the synthesis of lanthanum phosphate activated by cerium and terbium can be achieved by lowering the temperature and time of the process using the extraction-pyrolytic method [8, 9, 11]. The main advantages of the proposed method for the production of phosphors of lanthanum-cerium phosphates activated by terbium, composition  $\text{La}_{0,8}\text{Ce}_{0,15}\text{Tb}_{0,05}\text{PO}_4$  and  $\text{La}_{0,8}\text{Ce}_{0,15}\text{Tb}_{0,05}(\text{PO}_3)_3$ , compared with known methods are the reduction of temperature and time of the process. For example, activated lanthanum phosphate is obtained by adding diammonium dihydrogen phosphate to nitrate or chloride REE solution, calcining the obtained precipitate in the temperature range 200 – 1200°C for 10-14 hours [12].

A change in the ratio in the precursor of the main components: Ln and TBP or TFFO affects the phase composition of the pyrolysis products. After calcining the precursors with the ratio Ln: TBP or TFFO = 1: 1  $\text{La}_{0,8}\text{Ce}_{0,15}\text{Tb}_{0,05}\text{PO}_4$ , was obtained, and with the ratio Ln: TBP or TFFO = 1: 7, -  $\text{La}_{0,8}\text{Ce}_{0,15}\text{Tb}_{0,05}(\text{PO}_3)_3$ . At the same time, the use of precursors with TFFO makes it possible to synthesize these compounds at a lower temperature of the pyrolysis process (700°C for TBP and 600°C for TFFO).



**Fig. 1.** Micrograph of sample  $\text{La}_{0,8}\text{Ce}_{0,15}\text{Tb}_{0,05}\text{PO}_4$

According to AFM, the obtained powders of phosphate lanthanum-cerium phosphors doped with terbium consist of lamellar particles collected in agglomerates. Figure 1 shows, for example, micrographs of phosphor  $\text{La}_{0,8}\text{Ce}_{0,15}\text{Tb}_{0,05}\text{PO}_4$  before (Fig. 1, a) and after (Fig. 1, b) dispersion in ethyl alcohol or acetone. The particle sizes in the phosphor samples after dispersion were less than 100 nm.

The IR spectrum of  $\text{La}_{0,8}\text{Ce}_{0,15}\text{Tb}_{0,05}\text{PO}_4$  (Fig. 2a) contains intense absorption bands with maxima at  $951\text{ cm}^{-1}(\nu_1\text{PO}_4)$ ,  $991,1038,1092\text{ cm}^{-1}(\nu_3\text{PO}_4)$  and at  $536, 561, 575\text{ cm}^{-1}(\nu_4\text{PO}_4)$ .

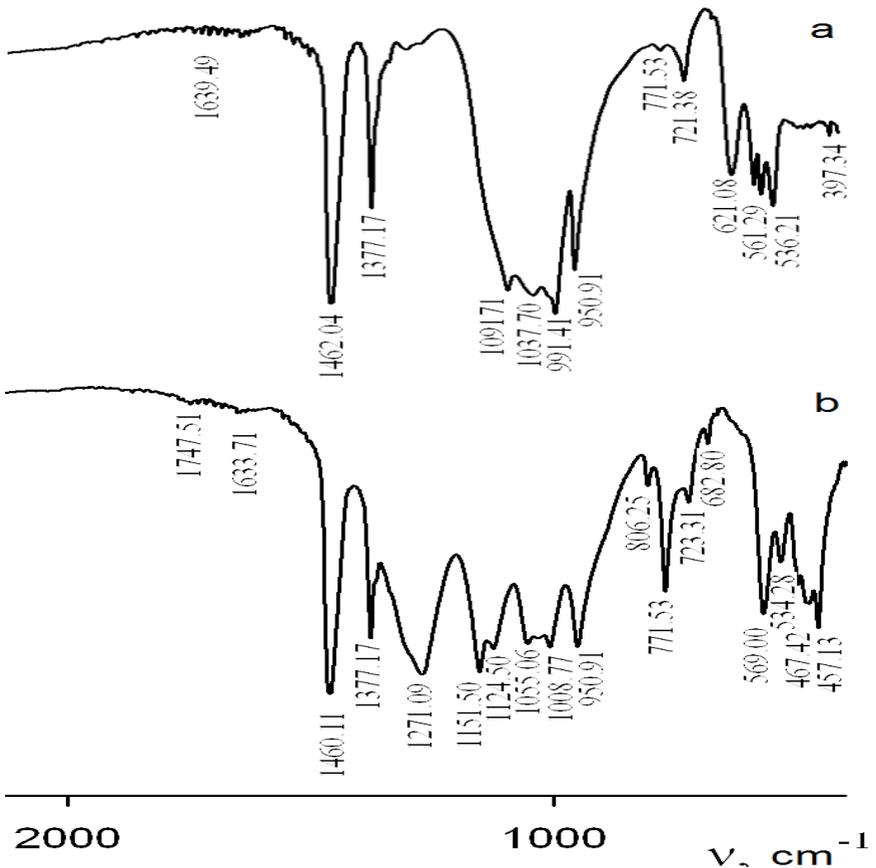
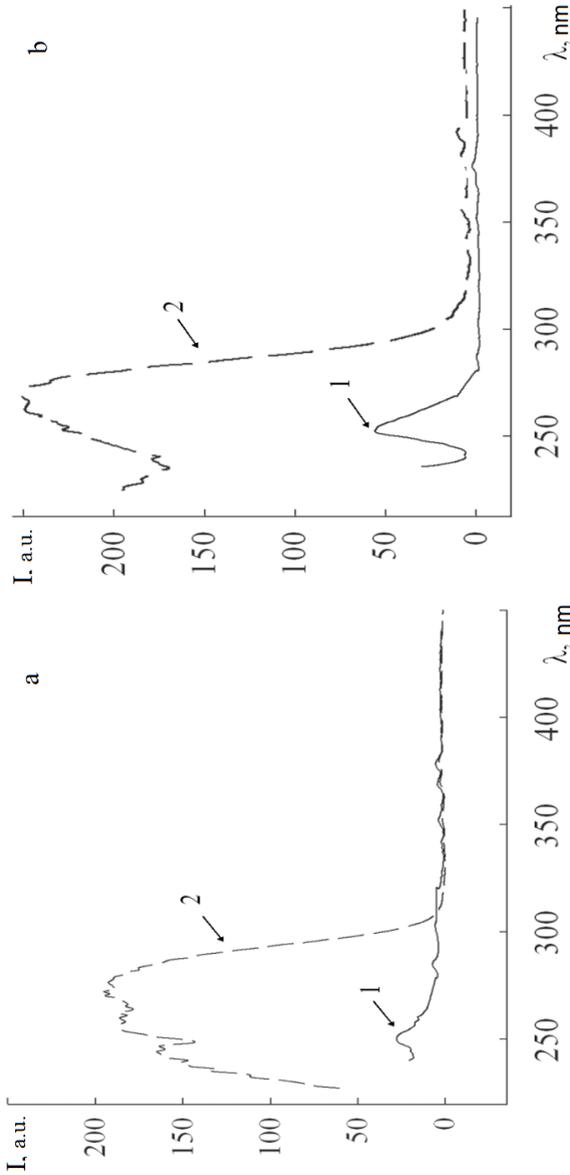


Fig. 2. IR spectra: a -  $\text{La}_{0.8}\text{Ce}_{0.15}\text{Tb}_{0.05}\text{PO}_4$  and b -  $\text{La}_{0.8}\text{Ce}_{0.15}\text{Tb}_{0.05}(\text{PO}_3)_3$

The splitting of the absorption bands of triple degenerate vibrations into three components indicates, according to [13], that the symmetry of the tetrahedral  $\text{PO}_4^{3-}$  ion is reduced to  $\text{C}_{2v}$ , which is probably a consequence of the bidentate coordination of  $\text{PO}_4$ - groups.

In contrast to the  $\text{La}_{0.8}\text{Ce}_{0.15}\text{Tb}_{0.05}\text{PO}_4$  sample, in the IR spectrum of  $\text{La}_{0.8}\text{Ce}_{0.15}\text{Tb}_{0.05}(\text{PO}_3)_3$  (Fig. 2b), five absorption bands with maxima at 457, 476, 498, 534 and 569  $\text{cm}^{-1}$  appear in the vibrational region  $\nu_4$  of the P-O bond. In the region of stretching vibrations  $\nu_3$  of the P-O bond, seven absorption bands are present in the range from 1000 to 1300  $\text{cm}^{-1}$ . This allows, in accordance with [13], to assign the  $\text{P}_3\text{O}_9^{3-}$  anion in this sample to the polyphosphate type with a repeating unit of a tetrahedrally coordinated four oxygen atoms phosphate group.



**Fig. 3.** Luminescence excitation spectra of the  $Tb^{3+}$  ion ( $\lambda_{em} = 545 \text{ nm}$ ) in phosphates  $TbPO_4$  (a - 1),  $La_{0.8}Ce_{0.15}Tb_{0.05}PO_4$  (a - 2) and  $Tb(PO_3)_3$  (b - 1),  $La_{0.8}Ce_{0.15}Tb_{0.05}(PO_3)_3$  (b - 2); 300 K.

The luminescent properties of lanthanum phosphate samples of the composition  $\text{La}_{0,8}\text{Ce}_{0,15}\text{Tb}_{0,05}\text{PO}_4$  and  $\text{La}_{0,8}\text{Ce}_{0,15}\text{Tb}_{0,05}(\text{PO}_3)_3$  were estimated from the luminescence excitation spectra, which were recorded at 300 K under identical conditions, which allowed a comparative analysis of their spectral luminescent characteristics, including those with simple phosphates of the  $\text{TbPO}_4$  and  $\text{Tb}(\text{PO}_3)_3$ . The luminescence excitation wavelength  $\lambda_{\text{ex}} = 277$  nm when registering the luminescence spectra of the samples of compounds was chosen according to the most intense line after recording their luminescence excitation spectra.

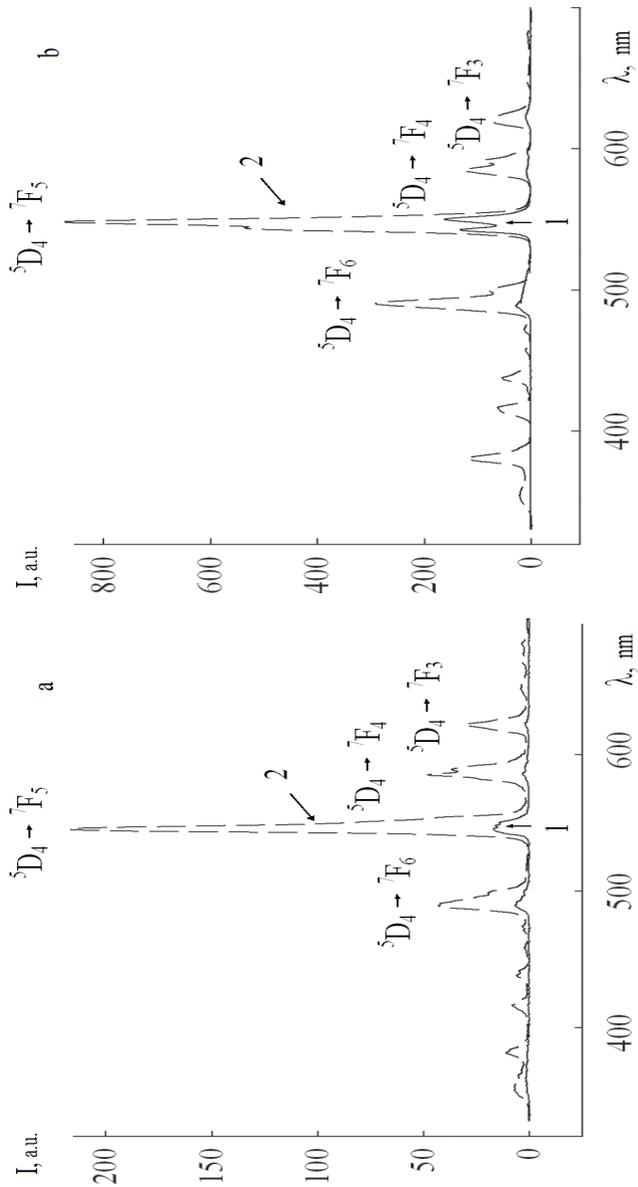
In the luminescence excitation spectra of the luminophores  $\text{La}_{0,8}\text{Ce}_{0,15}\text{Tb}_{0,05}\text{PO}_4$  (Fig. 3, a - 2) and  $\text{La}_{0,8}\text{Ce}_{0,15}\text{Tb}_{0,05}(\text{PO}_3)_3$  (Fig. 3, b - 2) there is an intense wide band  $\lambda = 250 - 300$  nm) due to the transfer of excitation energy to the  $\text{Tb}^{3+}$  ion.

The excitation spectrum of the  $\text{Tb}^{3+}$  terbium ion in the  $\text{TbPO}_4$  terbium phosphate sample (Fig. 3, a - 1) shows a single narrow band of the transfer of excitation energy to the  $\text{Tb}^{3+}$  ion at 250 nm, but the intensity of these bands in the spectrum of the  $\text{La}_{0,8}\text{Ce}_{0,15}\text{Tb}_{0,05}\text{PO}_4$  phosphor is much higher. A similar dependence of the band intensities is also observed in the luminescence excitation spectra of the  $\text{Tb}^{3+}$  ion in the phosphates  $\text{Tb}(\text{PO}_3)_3$  (Fig. 3, b - 1) and  $\text{La}_{0,8}\text{Ce}_{0,15}\text{Tb}_{0,05}(\text{PO}_3)_3$  (Fig. 3, b - 2).

In the region of 450–620 nm, phosphors show intense green luminescence characteristic of the  $\text{Tb}^{3+}$  ion [14, 15] (Fig. 4).

As can be seen from the luminescence spectra of simple phosphates  $\text{TbPO}_4$  (Fig. 4, a - 1) and  $\text{Tb}(\text{PO}_3)_3$  (Fig. 4, b - 1) and compounds  $\text{La}_{0,8}\text{Ce}_{0,15}\text{Tb}_{0,05}\text{PO}_4$  (Fig. 4, a - 2) and  $\text{La}_{0,8}\text{Ce}_{0,15}\text{Tb}_{0,05}(\text{PO}_3)_3$  (Fig. 4b - 2), recorded under identical conditions, the luminescence intensity of the  $\text{Tb}^{3+}$  ion in the presence of  $\text{La}^{3+}$  and  $\text{Ce}^{3+}$  ions increases significantly. An increase in the intensity of the bands in the luminescence excitation spectra indicates an increase in the transfer of excitation energy to the  $\text{Tb}^{3+}$  ion in the presence of activators – lanthanum and cerium.

In the luminescence spectra of the synthesized compounds, the  ${}^5\text{D}_4 - {}^7\text{F}_5$  transition band of the  $\text{Tb}^{3+}$  ion  $\sim 545$  nm has the maximum intensity. The intensity of this band in the spectrum of the luminophore  $\text{La}_{0,8}\text{Ce}_{0,15}\text{Tb}_{0,05}(\text{PO}_3)_3$  is approximately three times higher than in the spectrum of  $\text{La}_{0,8}\text{Ce}_{0,15}\text{Tb}_{0,05}\text{PO}_4$ . This fact is probably associated with an increase in the efficiency of excitation energy transfer to the  $\text{Tb}^{3+}$  ion in the  $\text{La}_{0,8}\text{Ce}_{0,15}\text{Tb}_{0,05}(\text{PO}_3)_3$  compound due to the presence of repeating units from the tetrahedrally coordinated polyphosphate anion  $\text{P}_3\text{O}_9^{3-}$  [13]. Moreover, in the luminescence spectra of the obtained phosphates, depending on the composition, there are some changes in the intensity redistribution over transitions characteristic of the  $\text{Tb}^{3+}$   ${}^5\text{D}_4 - {}^7\text{F}_j$  ion ( $j = 1-6$ ) as well as small differences in the fine structure of the splitting of the  ${}^5\text{D}_4 - {}^7\text{F}_6$ ,  ${}^5\text{D}_4 - {}^7\text{F}_5$  and  ${}^5\text{D}_4 - {}^7\text{F}_4$  transitions.



**Fig. 4.** Luminescence spectra of the Tb<sup>3+</sup> ion ( $\lambda_{\text{ex}} = 277$  nm) in phosphates TbPO<sub>4</sub> (a - 1), La<sub>0.8</sub>Ce<sub>0.15</sub>Tb<sub>0.05</sub>PO<sub>4</sub> (a - 2) and Tb(PO<sub>3</sub>)<sub>3</sub> (b - 1), La<sub>0.8</sub>Ce<sub>0.15</sub>Tb<sub>0.05</sub>(PO<sub>3</sub>)<sub>3</sub> (b - 2); 300 K

The method proposed in this work makes it possible to simplify the production of luminophores of green color with different composition  $\text{La}_{0,8}\text{Ce}_{0,15}\text{Tb}_{0,05}\text{PO}_4$  and  $\text{La}_{0,8}\text{Ce}_{0,15}\text{Tb}_{0,05}(\text{PO}_3)_3$  due to a decrease in the temperature and time of the process. It was shown that the introduction of activators in terbium phosphates leads to a significant increase in the luminescence intensity, indicating an increase in the transfer of excitation energy to  $\text{Tb}^{3+}$  ion in the presence of lanthanum and cerium. Obviously, the phosphors obtained by this method can be both active components in light-emitting devices, and materials for plasma displays.

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氢氟酸化学精制天然石墨

**CHEMICAL PURIFICATION OF NATURAL GRAPHITE  
WITH AMMONIUM HYDRODIFLUORIDE**

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抽象。 本文介绍了通过氢二氟化铵处理高碳原料提纯天然石墨的可能性的研究结果。 已经发现,使用过量20%的 $\text{NH}_4\text{HF}_2$ 的氟化过程可以实现石墨中存在的杂质组分的完全氟化。 已经开发了实验室程序,用于从全氟化杂质元素中纯化石墨精矿,以获得碳含量为99.5和99.98%的浓缩产品。

关键字: 石墨精矿, 氢二氟化铵, 氟化, 浸出。

**Abstract.** *The paper presents the results of a study of the possibility of purifying natural graphite by treating high-carbon raw materials with ammonium hydrodifluoride. It was found that the fluorination process using a 20% excess of  $\text{NH}_4\text{HF}_2$  allows complete fluorination of the impurity components present in graphite to be achieved. Laboratory procedures have been developed for purifying graphite concentrate from profluorinated impurity elements to obtain enrichment products with a carbon content of 99.5 and 99.98%.*

**Keywords:** *graphite concentrate, ammonium hydrodifluoride, fluorination, leaching.*

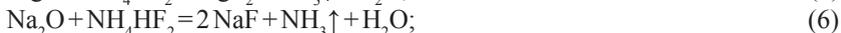
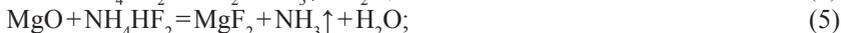
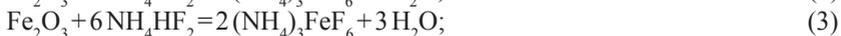
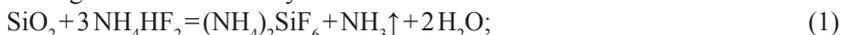
In graphites of natural origin, impurities are always present. The main minerals accompanying graphite ores are mica, aluminosilicates, quartz, iron oxides, rutile, calcite, etc. [1]. All known methods of purification of natural graphite can be attributed to three types - chemical treatment, thermal and gas-thermal refining. Thermal purification of graphite is the most common method, although refining

processes are very energy-intensive, since they are carried out at a temperature of 2500-3000°C [2]. Chemical purification involves sintering graphite powder with an aqueous solution of an alkaline agent and subsequent washing with water and dilute acid [3, 4]. To obtain the purest mineral graphites, combined methods and multi-stage purification are used.

This paper presents the results of a study of the possibility of chemical purification of natural graphite by treating high-carbon raw materials with an acid fluorinating reagent with ammonium hydrodifluoride.

A batch of graphite concentrate obtained by enriching natural graphite by the flotation method containing (*mass%*) SiO<sub>2</sub> - 3.8, Al<sub>2</sub>O<sub>3</sub> - 1.4, Fe<sub>2</sub>O<sub>3</sub> - 0.72, CaO - 0.32, MgO - 0.18, Na<sub>2</sub>O - 1.0 and K<sub>2</sub>O - 0.37 was selected for research. The ash content of the studied graphite concentrate was 6.08%. As a reagent for the purification of the concentrate, ammonia hydrodifluoride of the "chda" brand was used.

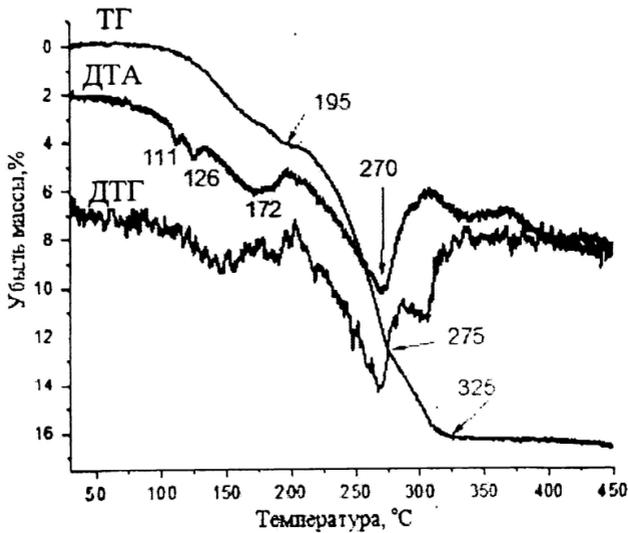
The study showed that when graphite concentrate was mixed with ammonium hydrodifluoride and held at room temperature, the next day, (NH<sub>4</sub>)<sub>3</sub>FeF<sub>6</sub> and (NH<sub>4</sub>)<sub>2</sub>SiF<sub>6</sub> reflections appear on the x-ray of the charge, and (NH<sub>4</sub>)<sub>3</sub>AlF<sub>6</sub> reflexes after 7 days. Thus, the chemical treatment of graphite concentrate with ammonium hydrofluoride proceeds with the interaction of impurity elements of the concentrate with NH<sub>4</sub>HF<sub>2</sub> to form complex or simple fluorides, and, based on the chemical composition of the concentrate, the following reactions are possible during its processing with ammonium hydrofluoride:



It should be noted that the complex fluoromonium salts of silicon, aluminum and iron and alkali metal fluorides formed during fluorination are highly soluble in water, and they can be easily separated by aqueous leaching of the fluorinated product. So, by the mass of soluble salts formed during the fluorination of components-impurities of graphite concentrate, it was found that at room temperature the degree of the process for 20 days of interaction reaches 68%.

A thermogravimetric study of the interaction of the components-impurities of graphite concentrate with ammonium hydrodifluoride (Fig. 1) showed that the fluorination reaction of impurities of graphite concentrate with ammonium hydrodifluoride begins at ~70°C. Recording on the thermogram of a higher temperature the beginning of the interaction of graphite impurity elements with NH<sub>4</sub>HF<sub>2</sub> is due to the fact that the first portions of the ammonia released during fluorination

are absorbed by ammonium hydrodifluoride to form  $\text{NH}_4\text{F}$ , which is indicated by the endothermic effect at  $111^\circ\text{C}$ , associated with the melting of a small amount of eutectic  $\text{NH}_4\text{HF}_2\text{-NH}_4\text{F}$  ( $t_{\text{melt. Eutectic}} = 109^\circ\text{C}$ ), and thus, in the beginning, the interaction proceeds without apparent loss of mass. Above  $126^\circ\text{C}$ , the endothermic melting effect of the fluorinating reagent is superimposed on this process, and then the reaction proceeds in the melt, with a maximum speed at  $172^\circ\text{C}$  and ends at  $195^\circ\text{C}$ . The product isolated at a temperature of  $195^\circ\text{C}$ , according to x-ray phase analysis, is graphite with an admixture of predominantly complex fluoroammonium salts of iron, aluminum, silicon, as well as simple calcium and sodium fluorides.

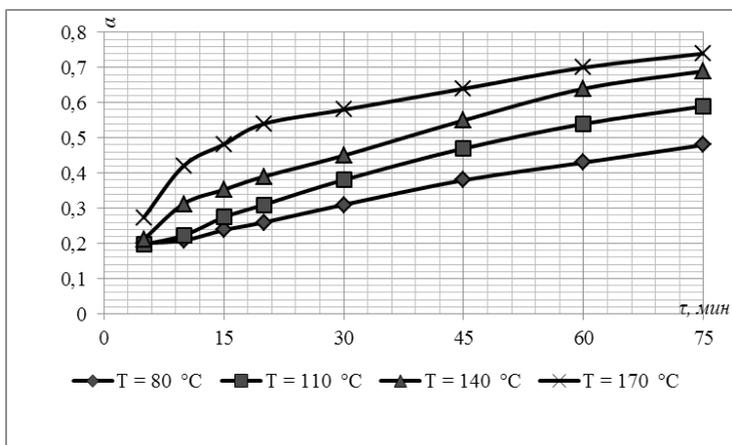


*Fig. 1. Thermogram of the interaction of graphite concentrate with  $\text{NH}_4\text{HF}_2$ .*

Kinetic studies of the treatment of a graphite concentrate with ammonium hydrodifluoride were carried out under isothermal conditions at temperatures of 80, 110, 140, and  $170^\circ\text{C}$  on 10 g samples of the concentrate. The amount of  $\text{NH}_4\text{HF}_2$  calculated from equations (1) - (7) for uniform distribution and close contact with the concentrate was dissolved in 20 ml of  $\text{H}_2\text{O}$ , the resulting solution was poured into 10 g of graphite and stirred until a homogeneous mass. The reaction mixture was prepared immediately before the experiment. Samples were placed in a furnace heated to a given temperature. The calculation of the kinetic parameters of the fluorination process was carried out by the content of soluble silicon, aluminum, and iron soluble fluoroammonium salts formed during the interaction. The process of leaching of the fluorinated concentrate was carried out at room

temperature by 4 times dissolving 10 g of the product in 100 ml of water and then filtering through a “blue ribbon” filter. The obtained filtrates were combined and the contents of Si, Al and Fe were determined by atomic absorption method. The degree of occurrence of the fluorination reaction was evaluated by comparing the content of these elements in the filtrates with the calculated data obtained from reaction equations (1) - (3) taking into account the content of the reduced impurity components in graphite.

An analysis of the results of atomic absorption determination of the contents of Si, Al, and Fe in the filtrates showed that the total rate of the hydrodifluoride treatment of the graphite concentrate determines the rate of  $Al_2O_3$  conversion, therefore, the kinetic parameters were calculated based on the time dependence of the formation of the aluminum fluoroammonium salt. The results of kinetic test are presented in Fig. 2.



**Fig. 2.** The dependence of the degree of fluorination of  $Al_2O_3$  impurities on time at various temperatures.

It can be seen from the obtained kinetic curves that, with the stoichiometric ratio of the concentrate to the fluorinating reagent, it is not possible to achieve complete interaction of impurity elements with  $NH_4HF_2$ . This is also indicated by a small coating of the fluorinating reagent on the lid of the reaction crucible, which confirms the partial (~10-15%) sublimation and removal of  $NH_4HF_2$  from the reaction zone under these conditions. The study showed that complete fluorination of impurity components present in graphite can be achieved only by using an excess of fluorinating reagent. Thus, during the processing of graphite concentrate treatment using a 20% excess of  $NH_4HF_2$ , the degree of fluorination at 170°C reached 97.5% in 1 h and 99.98% in 1.5 h.

Based on the obtained experimental data on the degree of fluorination of the  $\text{Al}_2\text{O}_3$  impurity, the rate constants of the reaction were calculated at various temperatures and the activation energy of the process of hydrodifluoride treatment of graphite concentrate. For the calculation, we used the generalized topochemical Kolmogorov-Erofeev equation. The results are shown in the table.

**Table.** *The main kinetic parameters of the process of fluorination of components-impurities of graphite concentrate*

Temperature, °C	Speed constant $k$ , $\text{min}^{-1}$	Activation energy $E_{\text{act}}$ , kJ/mol
80	0.001	37.350
110	0.003	
140	0.008	
170	0.152	

It can be seen from the table that the fluorination rate of concentrate impurity elements depends on the temperature of the process, while in the melt of the fluorinating reagent, the interaction rate increases sharply. The low value of activation energy indicates the possibility of chemical purification of graphite concentrate by treatment with ammonium hydrodifluoride at low temperatures.

The complex fluorine ammonium salts of silicon, aluminum and iron and alkali metal fluorides formed during the fluorination of graphite concentrate are highly soluble in water, therefore, they can be separated by aqueous leaching of the fluorinated product. The study showed that during the water leaching of the fluorinated concentrate, impurities of silicon and iron, up to 90% of aluminum, half of magnesium and an insignificant part of calcium, pass almost completely into the solution. A partial transition to a solution of magnesium and calcium may be due to the low solubility of their fluorides. The purity of graphite purified in this way was 99.5-99.6%, and fluorite  $\text{CaF}_2$  remains the main impurity in graphite.

It is possible to purify the fluorinated graphite concentrate from  $\text{CaF}_2$  impurities during acid leaching. Thus, leaching of a profluorinated graphite concentrate with a 10% solution of hydrochloric acid or a 15% solution of nitric acid, followed by washing the product with water until a neutral reaction results in 99.97-99.98% purity of graphite.

Based on the studies conducted, purification schemes for graphite concentrate were developed to obtain enrichment products with a carbon content of at least 99.5% (including fluorination of graphite concentrate with a 20% excess of ammonium hydrodifluoride at a temperature of 170-180°C followed by water leaching and washing with water) and carbon content of 99.98% (including fluorination of graphite concentrate with a 20% excess of ammonium hydrodifluoride at a temperature of 170-180°C followed by acid leaching and washing with water).

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提高使用激光技术进行识别的效率  
**INCREASE IN EFFICIENCY OF USE OF LASER TECHNOLOGIES  
FOR IDENTIFICATION**

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抽象。研究了工业产品的特性与激光生产技术的特定特征之间的联系。考虑到材料的微观结构，化学成分和物理学家-机械特性，给出了用于计算激光辐射在材料中的穿透深度的分析表达式，以提高最佳使用激光技术的效率，从而选择激光参数。提出了在考虑所使用的材料的热特性的不确定性的情况下，在技术选择和激光设备的实现方式多样化的情况下的技术模式任务的紧急任务的解决方案。复杂的指示器大大简化了激光辐射参数的选择，从而创建了材料的热扩散图集

关键字：激光技术，雕刻，材料，热性能，它是艺术-工业产品，热扩散率。

**Abstract.** *The research of communication of properties of industrial products and specific features of technology of laser production is conducted. The analytical expressions for calculation of a penetration depth of laser radiation in material allowing to increase efficiency of use of laser technologies optimum are given to choose parameters of the laser, considering a microstructure, the chemical composition and the physicist – mechanical characteristics of material. The solution of an urgent task of a task of the technological modes in case of diversity of implementations of the choice of technology and the laser equipment taking into account uncertainty of thermal properties of the used material is proposed. The complex indicator much simplifying the choice of parameters of laser radiation allowing to create the atlas of heat diffusivities of materials is allocated*

**Keywords:** *laser technology, engraving, material, thermal properties, it is art – industrial products, heat diffusivity.*

Now laser marking and an engraving are applied practically in all industries of industrial production, in instrument making, to identification and protective coding of industrial designs, drawing texts on dashboards, the measuring tool, keyboard fields, production of plates and shield, to art finishing of products. Development

of scientific and technical progress increased need of esthetic enhancement of all industrial output. The equipment represents one of the most important components of spiritual wealth, an organic part of objective world, artificial living environment of the person, and the farther, the deeper and more extensive its penetration into all areas of human life. Therefore awareness of importance of harmonization of the richest and most difficult world of subject forms and their interrelation with each other comes to the level of social tasks of society, purchasing educational, ideological nature, increases relevance of creation convenient in consumption, complete in a form, esthetically perfect industrial products meeting at the same time high technical and economic requirements, possessing high degree of art expressiveness.

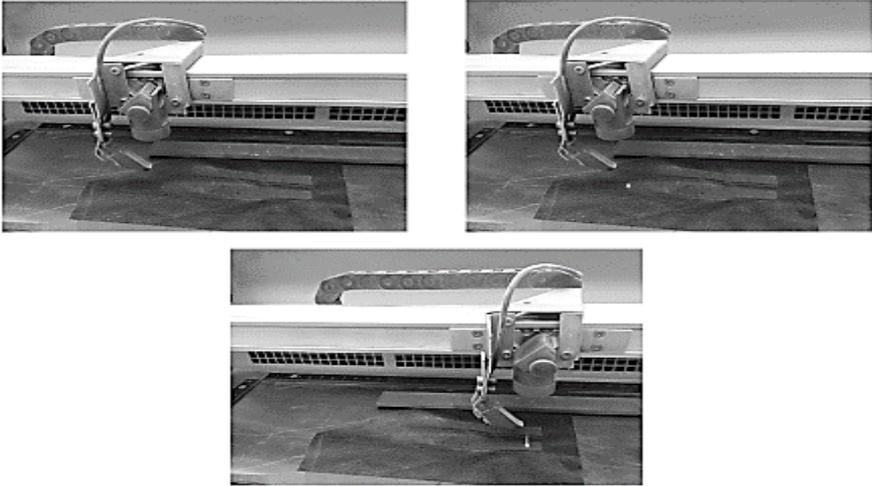
Each industrial product has Specific features, independence of an author's plan, art taste, skill of execution. Disclosure of properties of art material — its color wealth, softness, plasticity dependence of a form of an art and industrial product on its appointment, interrelation between function and the composite decision, between a form and a design, material, manufacturing techniques determine [1].

Now there is an expansion of functionality of devices, complication of a form of products, disaggregation of a relief increases, the surface geometry becomes complicated, original color schemes are proposed by means of what high art expressiveness of finished goods is reached. But process of production of products manually is extremely labor-consuming and requires considerable time expenditure, from - for what cost value of manual operation is enough bike. As a result of development and enhancement of high technologies mechanical manual handling was replaced with automatic. Including replaces machining laser [2]. Handling by laser radiation more exact and already cheaper, allows to make organic compound of design with industrial production.

Laser technologies represent set of methods of handling, change of a condition, properties and a form of material by means of laser radiation. In the majority of processes of laser technologies the thermal action of a laser beam caused by absorption of energy of a light flow in the processed material is used. Efficiency of laser technologies is caused by a high density of a flow of energy of laser radiation in a handling zone, a possibility of focusing of radiation by means of optical systems in a light beam diameter in the 100-th shares of microns, a possibility of conducting engineering procedures in any transparent environment, a small zone of heating, a possibility of contactless energy supply to a handling zone in the closed amount through transparent walls or special windows in an opaque cover [3]. Production of products of instrument making on laser machines – perspective technology with a high esthetic potential. However insufficient study of fabrication stages of a product doesn't allow to use design opportunities of laser technology fully. Process of preparation of production of a product (an integrated approach to the material choice, creation of model, the managing program, a task of optimum technological operating modes of the laser machine) rather labor-consuming therefore it is especially important to design competently process of production for increase in production efficiency, high-quality product receipts.

The purpose of this work is the opportunity research increase in efficiency of use of laser technologies during creation of industrial products from glass, ceramics, plexiglas, plastic, metal and other material types

At laser impact on all types of materials there is a thermal process of division reminding burning process, the figure 1. The thermal effect at influence of laser radiation is defined both by radiation parameters, and the thermal properties of material depending on his microstructure[4].



*Figure 1. Impact of laser radiation on material*

As a result of thermal impact by laser radiation material begins to heat up. For example, for organic materials, at a temperature up to 100... 105 °C occur only removal of moisture by evaporation or boiling. When heating to temperature of 105... 150 °C process of drying come to an end and begin allocation of gaseous products of decomposition. Material purchases yellow and yellowish-brown color. Temperature increase in this stage happens only at the expense of an external source of heat energy. In the range of temperature 150... 275 °C amplify release of gases and vapors of resinous substances begin to be emitted. Separate flashes of the formed gases begin in case of 225... 235 °C. Material darkens, its decomposition generally continues only at the expense of an external source of heat. Decomposition of material with allocation of heat (exothermic reaction) begins at an ignition temperature, about 275... 290 °C, are formed many combustible vapors and gases, gaseous products of pyrolysis. If, heating to such temperature doesn't happen, then after removal of a source of heat material ceases to burn. The described process is suitable also for industrial products from organic glass, fabric, skin, glass, ceramics, a stone, process of separation takes place in this way in case of other temperature conditions.

Proceeding from stated, with use of the expressions given in [5], interaction of laser radiation with material if the laser beam has a Gaussian profile, and density of the flow of energy absorbed on a surface is permanent and equal to  $F_0$ , distribution of temperature in solid material and its change in time is described by expression:

$$T(r, z, t) = \frac{d^2 \chi^{\frac{1}{2}} F_0}{K \pi^{\frac{1}{2}}} \int_0^t \frac{e^{-\frac{z^2}{4\chi t}} e^{-\frac{r^2}{4\chi t + d^2}}}{t^{\frac{1}{2}} (4\chi t + d^2)} dt \quad (1),$$

where  $F_0$  – density of the stream of energy absorbed on a surface,  $W/m^2$ ;  
 $d$  – is the diameter of the laser beam on the surface of the material, m;  
 $r$  – distance from the center of the heated spot, m;  
 $z$  – the heating depth counted from a surface, m; (А быть может дать картинку, на которой показатъкоординаты  $r$   $z$ ? И нет лишних вопросов.  
 $T$  – temperature, K;  
 $\chi$  – heat diffusivity,  $m^2 / with$   
 $K$  – heat conductivity,  $W / K$   
 $t$  – a time interval from the beginning of influence of laser radiation;  
 $d$  - diameter of a laser beam on the surface of material, m

For determination of temperature in material in case of identical and the fixed distance from center of the heated spot and depth of heating digitized from a surface, computation of integral which integrand expression the exponential function enters, using for integration a convergence method by means of changeover of a variable to the integral containing degree and algebraic functions, expression (1) will be transformed to a look:

$$T(t) = \frac{F_0 d}{K \pi^{\frac{1}{2}}} \arctg\left(\frac{4\chi t}{d^2}\right)^{\frac{1}{2}} \quad (2).$$

As a result of decomposition of the trigonometrical  $\arctg(x)$  function in a row and uses of the three first members of a row that the error brings less than 5%, but significantly simplifies calculations, it is received:

$$T(t) = \frac{F_0 d}{K \pi^{\frac{1}{2}}} \left[ \left(\frac{4\chi t}{d^2}\right)^{\frac{1}{2}} - \frac{\left(\frac{4\chi t}{d^2}\right)^{\frac{3}{2}}}{3} + \frac{\left(\frac{4\chi t}{d^2}\right)^{\frac{5}{2}}}{5} \right] \quad (3).$$

Using a ratio for the description of dependence between key parameters of radiation and material [6], expression for determination of depth of penetration of radiation into material is received:

$$h = \frac{4P}{C_p \rho T \pi d^2} \quad (4),$$

where  $P$  – the power of radiation, W;

- $C_p$  – a thermal capacity of material, J / K;
- $\rho$  – density of material, kg/m<sup>3</sup>;
- $h$  – depth of penetration of radiation into material, m;
- $d$  - diameter of a laser beam on the surface of material, m;
- $T(t)$  – change of temperature of material when heating, K;

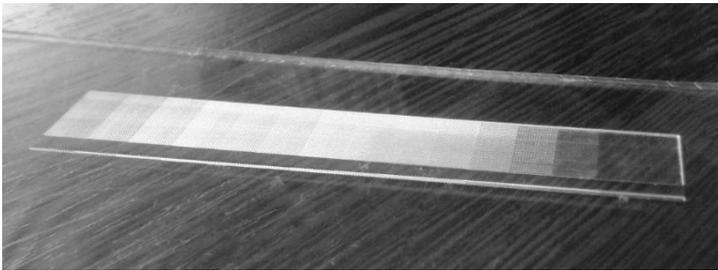
Considering that heat diffusivity of nonmetallic materials about  $10^{-8} \text{ m}^2/\text{s}$ , in expression (3) are possible it will be limited to the first member of a row, having substituted (3) in expression (4), we will receive:

$$h = \frac{2PK}{C_p \rho F_0 d \pi^2 \chi^2 t^2} \quad (5)$$

by replace  $\frac{2K}{C_p \rho F_0 d \pi^2 \chi^2 t^2} = \gamma$ , be hit

$$h = \frac{\gamma P}{\chi^2} \quad (6).$$

As thermal properties of materials not linearly changes with change of temperature, for check of a correctness of application of expression (6) for calculation of a penetration depth of laser radiation in material the wedge [GOST 24930-81. Facsimile equipment gray scale. Technical requirements] from white to the black field, the figure 2, on the laser engraver of the Speedy series of Trotec (Austria) with use of CORELDRAW, JOBCONTROL software products was reproduced gray-scale, in case of change of capacity of laser radiation from 2 to 12 W, speed of movement of a laser beam from 10 to 180 cm/sec., resolution from 100 to 1000 dpi., frequencies of impulses from 500 to 1000 Hz, diameter of the focused laser beam on material from 0.05 to 1,0 mm. hade of a laser beam from 0° to 45°, and combination of these modes.



**Figure 2.** Gray-scale a wedge from white to the black field.

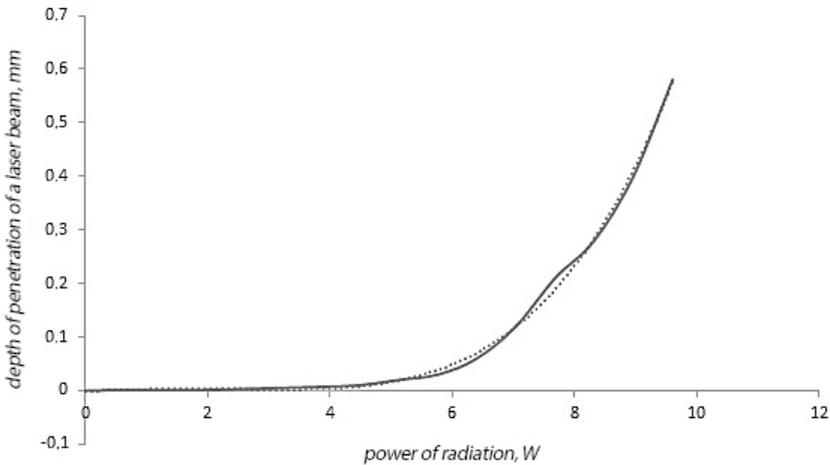
Depth of penetration of laser radiation into material at change of power of radiation of the laser is presented in the figure 3. The dot curve has represented approximation by polynomial function of the fourth order.

Approximation of dependence of depth of penetration of laser radiation into material at change of power of radiation of the laser is optimum described by polynomial function of the fourth order:

$$h = 0.00001P^4 - 0.0005P^3 - 0.001P^2 + 0.0052P - 0.0014 \quad (7)$$

It means that heat diffusivity as the physical quantity characterizing the speed of change of temperature of material in nonequilibrium thermal processes allows to consider in a complex nonlinear change of thermal properties of the materials caused by change of physical, mechanical, chemical, esthetic properties of materials because of heterogeneity of a microstructure, caused by volume uncertainty and diversity of implementation of characteristics of the used material.

Allocation of a complex indicator considerably simplifies the choice of parameters of laser radiation as allows to create the atlas of heat diffusivities of materials as set governed on an arrangement and designation of materials which establish an order an arrangement of materials according to their heat diffusivities in such a way that the properties of materials are more similar, the more closely to each other they have to settle down, and also a method of designation of location of material in the sequence of heat diffusivities.



**Figure 3.** Depth of penetration of radiation into material at change of power of radiation of the laser

Use of the offered atlas will allow to simplify the choice of numerical coefficients in expression (7). As a result of mathematical calculations, the analysis and expert poll it is received that depth of penetration of laser radiation into material on 0.3 – 0.5 mm is necessary for obtaining the most accurate and contrast image [7]. It is enough for receiving a stable contour of cutting, a highly artistic contrast type of images and patterns, necessary adhesion when filling the image with dye. On the basis of analytical dependence operating modes of the laser machine for drawing the images on material [8] are selected:

- Laser engraving speed of 18.0 cm/h.
- Resolution of 500 dpi.
- Pulse frequency 1000 Hz.
- The diameter of the focused laser beam on the material is 0.1 mm.
- The angle of incidence of the laser beam  $0^\circ$

Thus, the theory and practice of laser handling of materials confirms huge opportunities of laser engineering procedures which allow to solve effectively large production and art problems. At the same time use of the laser equipment removes production on new highly intellectual level. The conducted researches allow to increase efficiency of use of laser technologies during creation art industrial an izdeliyna the basis of analytical dependence operating modes of the laser machine for drawing the images on material [8] are selected:

#### Conclusions

The practical importance of work is determined by the developed offers applicable to the solution of urgent tasks of a task of the modes of laser handling for decorative handling of materials in case of diversity of implementations in the conditions of uncertainty of characteristics of the used material. The offered method allows to keep as much as possible the unique natural drawing, to successfully compensate the available natural heterogeneities of material and to provide steadily good results in case of industrial production of highly artistic exclusive products.

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在远东地区可持续发展的条件下使用新材料进行表面处理  
**SURFACE MATERIALOLOGY DURING SURFACING  
WITH NEW MATERIALS IN THE CONDITIONS OF SUSTAINABLE  
DEVELOPMENT OF THE FAR EASTERN REGION**

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抽象。给出了解决资源生产区一些重要问题的方法，并提出了在利用高科技开采矿产资源的过程中实现资源生产区可持续发展的假说。俄罗斯联邦远东地区的发展计划得到了科学发展的支持，并利用当地原料生产了有前途的材料和产品。考虑了堆焊工艺各组成部分的相互作用方案。合金焊接和堆焊材料的生产显示了表面材料学发展的新方向，这些材料提供了产品表面的高性能。显示了一种用于研究带滑移的滚动摩擦下的耐磨性的装置，该装置可以模拟在600至1000° C的温度下的热轧过程。

关键词：材料学，表面，耐磨性，堆焊，用于耐磨性研究的安装。

**Abstract.** *The solution of some important problems of resource-producing regions is shown, the hypothesis of achieving sustainable development of resource-producing regions during the processing of mineral raw materials in the mining region using high technologies is confirmed. The development scheme of the Far Eastern region of the Russian Federation is shown with the support of the development of science and the production of promising materials and products from local raw materials. The interaction scheme of the constituent parts of the welding-surfacing process is considered. A new direction of the development of surface materialology is shown in the production of alloyed welding and surfacing materials that provide high performance properties of product surfaces. A setup for studying wear resistance under rolling friction with slippage is shown, which allows simulating the hot rolling process at temperatures in the range from 600 to 1000°C.*

**Keywords:** *materialology, surface, wear resistance, surfacing, installation for the study of wear resistance.*

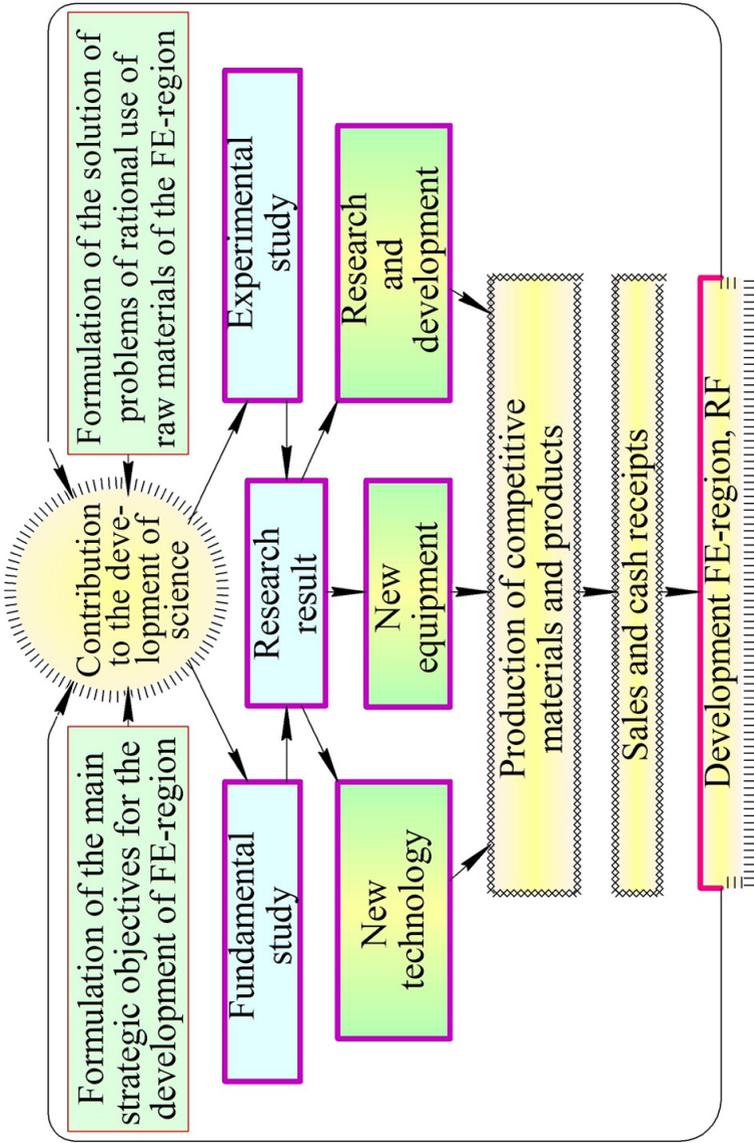
### **Introduction**

At the turn of the XX-XXI centuries, the most important problems that have arisen before mankind are the depletion of natural, primarily non-renewable resources and an increasing environmental hazard. The critical level of relations between man, society and nature, the scarcity of resources and environmental degradation result in a conflict of interests both within countries and internationally. In this connection, it becomes necessary to change the paradigm of human development for sustainable development, including for Russia [1]. A new approach to the problem of obtaining materials and products is needed. The problem of sustainable development is especially acute for resource-producing regions. This problem is multifaceted, complex and important and its solution can be based on the scientific base of materialology [2, 3]. The receipt of materials in the biosphere of the Earth should be carried out taking into account the fundamentals of materialology. One of the goals of materialology is the creation of new materials using mineral raw materials (MRM) in resource-producing regions. The Far East Region (FE) of the Russian Federation has large reserves of MRM, which contains refractory materials Ti, Zr, W, as well as boron and other valuable elements. In the aspect of creating new promising materials, it is of considerable scientific and practical interest to create welding and surfacing materials based on local MRM, which makes it possible to obtain alloyed welding and surfacing materials that provide high performance properties of manufactured means of activity.

FE practically does not have its own final product, traditionally supplies MRM, and depends on its centralized supply, including welding and surfacing materials. In this regard, it is necessary to develop research in the field of materialology, taking into account the knowledge of the local raw material base and the features of ore complexes, as well as current trends in the creation of new materials using the latest advances in science and technology. A FE development scheme is proposed with the support of the development of science in order to obtain promising materials and products from them from local raw materials (Fig. 1).

Undoubtedly, the widespread introduction of high-tech methods for processing FE raw materials will require significant and justified financial investments in science and production. The existing estimates of existing export markets clearly record the multiple benefits from the sale of the resulting materials and, especially, products compared with the sale of unprocessed natural raw materials for nothing.

Back in the 80s of the last century, receiving materials from MRM using concentrated energy flows, according to the President of the USSR Academy of Sciences, three times Hero of Socialist Labor Anatoly Petrovich Alexandrov and academician, secretary of the Department of Chemistry and Materials Science, Hero of Socialist Labor Nikolai Mikhailovich Zhavoronkov, should be the task of the Institute of Materials Science of the Khabarovsk Scientific Center (IM KSC FEB RAS) in Khabarovsk [4].



*Fig. 1. FE development scheme supported by the development of science in order to obtain promising materials and products from local raw materials*

The aim of this work is the shaping of the hardened surface of parts using the surfacing process and the fundamental provisions of materialology. The goal was achieved by creating and using new welding and surfacing materials containing the MRM FE region based on the developed methodology for this, as well as the latest achievements in mineralogical materials science for the creation of alloying slag systems.

### **Methodology, materials and equipment**

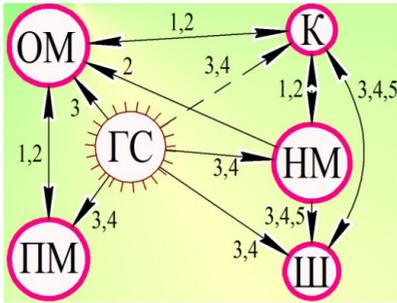
We have proposed criteria for the selection and evaluation of the raw materials: a) the presence of carbide-boro-nitride-forming: Ti-V-Cr; Zr-Nb-Mo; Hf-Ta-W; b) the presence of reducing agents: CaF<sub>2</sub>; C; Al; c) solubility, wettability; d) the location of the stocks of raw materials (the shortest time of cycles of their processing and the distance between them). They were used in the preparation of electrode materials, based on the principles: 1) use local MRM as gas-forming, stabilizing, deoxidizing and other components of the charge; 2) increase the level of properties of the surfacing and welded material due to the introduction of MRM containing elements capable of forming wear-resistant, durable, heat-resistant compounds (carbides, borides, nitrides); 3) use MRM comprehensively.

Based on the proposed methodology [5], a hypothesis was formulated using a number of concentrates to obtain a doped charge – scheelite, baddeleyite, datolite and other concentrates. It consisted in the assumption that under the action of concentrated energy flows, including an arc discharge on the MRM (with or without a reducing agent), the raw material can be completely or partially reduced to form metals or products (industrial products) with the formation of carbides, borides. The second hypothesis was the assumption that in order to select the composition, structure, properties of the mixture, the technology for its use, as well as to develop a theory of the recovery of multicomponent oxide systems under the action of concentrated energy flows, a preliminary study of changes in the composition, structure and properties of concentrates before and after exposure to arc discharges.

The work was carried out in IM KSC FEB RAS, FESTU. MRM FE concentrates of the region were used: scheelite and baddeleyite, electroslag remelting (ESR) technology, electric-spark and electric arc action (EAA), aluminothermy method, mechanical activation processes; used equipment and installations developed at FESTU, as well as: D8 ADVANCE diffractometers; WDS/EDS JXA-8100 microanalyzer; EVO-50XVP scanning electron microscope, D8 ADVANCE diffractometer; microscopes “MIM-10”, “BIOLAM-M”; microhardness meter “PMT-3M”.

### **Results and discussion**

The interaction pattern of the components of the welding-surfacing process during the formation of the hardened surface is revealed (Fig. 2). The process takes place in a gaseous medium and consists of a number of constituent units: transfer of liquid metal, mixing, oxidation, transfer of elements, alloying. As a result of surfacing, a hardened surfacing layer is formed on the base metal.



**Fig. 2.** Scheme of interaction of the components of the welding and surfacing process:

- 1 - liquid metal transfer;
- 2 - mixing; 3 - oxidation;
- 4 - transfer of element;
- 5 - alloying; OM - base metal;
- PM - filler metal;
- K - drop of electrode metal;
- HM - surfacing metal;
- GC - gas medium; III - slag tub

Obtaining surfacing wire was carried out using MRM. Initially, EAA at MRM produced sinter, which was subjected to metallographic research (Fig. 3), as well as to the study of chemical and phase composition. With EAA, concentrate recovery was observed. In this regard, the hypothesis was proposed that when using ESR, active recovery of concentrates will be observed.

These studies confirmed the hypothesis of the recovery of scheelite concentrate (SC) and baddeleyite concentrate (CD) with EAA, as well as with ESR. In this case, full or partial recovery occurs, depending on the use of electric modes and the interelectrode medium.

It was shown that Lermontovsky GOK SC (up to 47.4% W in the form of  $\text{CaWO}_4$ ) and Dalnegorsky BC (up to 41.4% Zr in the form of  $\text{ZrO}_2$ ,  $\text{ZrSiO}_4$ ) can be used as raw materials. To do this, at the laboratory facility developed at

FESTU, sinter was obtained by the ESR method (Fig. 3). As working electrodes, W and graphite rods were used under the following conditions:  $J = 50\text{-}220\text{ A}$ ;  $U = 25\text{-}60\text{ B}$ ; arc exposure time 3-3.5 min. The research data was used to obtain functional composite electrode materials for surfacing material, spark alloying and EDM. The resulting materials were ground to fractions of  $\sim 125\ \mu\text{m}$  and the particle size, chemical, and phase compositions were studied.

During BC treatment (Fig. 3-a), both “dark” and “bright” areas consisted of particles and interlayers of Si, Ca, Zr oxides with a small amount of other elements (up to 4.1 wt.%); bright areas, mainly Zr oxides, were formed during the recovery of the concentrate, which occurs unequally in different parts of the sinter. When processing BC, almost complete removal of  $\text{SiO}_2$  was observed, opening of BC to the formation of zirconium ceramics, which can be used for surfacing, providing a high level of properties:  $\text{ZrO}_2$  (Me),  $\text{ZrO}_2$  (cub.). The Zr content also decreased to 28.1%, which requires a more detailed study, in particular, of the composition of the evaporation products, since upon decomposition of BC, intense evaporation of volatile oxides and decomposition of  $\text{ZrSiO}_4$  in the presence of carbon occurs. The phase composition showed that, in most cases, separate  $\text{ZrSiO}_4$  lines are present,

while processing with a W electrode,  $ZrO_2$  and  $ZrSiO_4$  are present. When processing with BC W-electrode with additives of 10% C, the composition of the cake consisted of  $ZrO_2$  (with monocl and cubic lattices) and C. At a content of 20% C in the charge, complete decomposition of  $ZrSiO_4$  into  $ZrO_2$  and  $SiO_2$  and the appearance of W due to its transfer from the electrode with the formation of  $CaWO_4$  in the sinter were observed. When BC was treated with a graphite electrode, the Si content decreased; the carbon content was slightly higher than when processing SC (12.2-19.1 wt.%).

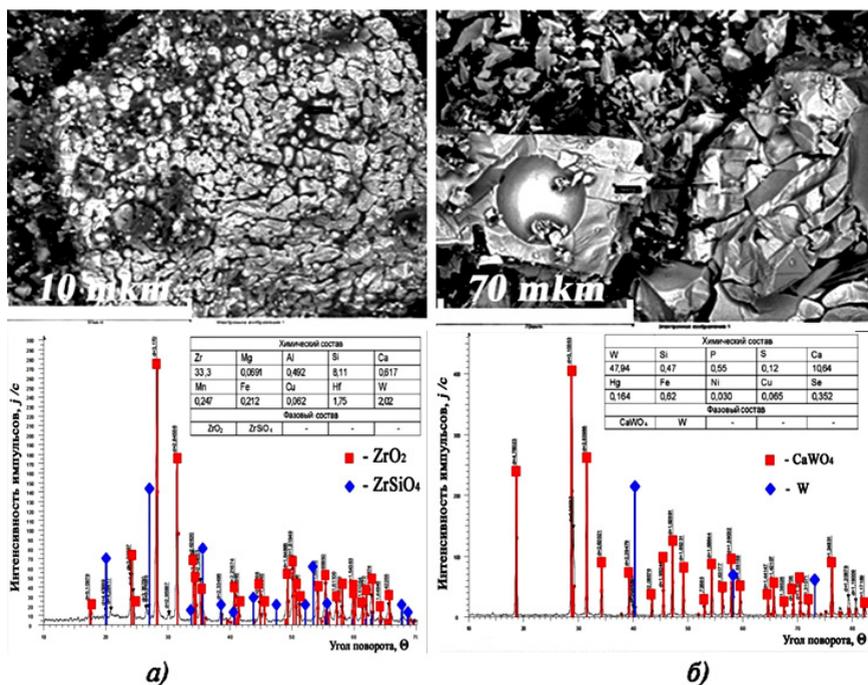


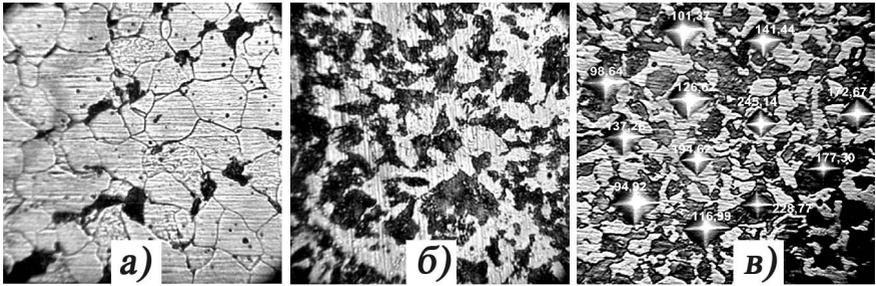
Fig. 3. Sinter sites after ESR BC (a) and SC (b) and spectra of their chemical compositions

The “bright” regions of SC particles consisted of W (Fig. 3b), and the “dark” regions consisted of W, Ca, Si oxides. When SC was processed using a graphite electrode, the W content increased to 44.6–46.4%; a significant carbon content (12–14%) was observed in the composition of the obtained sinter. When using a W electrode, the W content in the sinter increased to 48% due to its transfer to the sinter. When processing SC with a carbon reducing agent content of 5 to 20 wt.%, W is formed in the sinter, and when using  $\geq 20\%$  C,  $W_2C$  carbides are formed.

Moreover, the W content in the sinter decreases to 7-10% due to the removal of volatile  $WO_3$  oxides, especially with an increase in the carbon content in the charge.

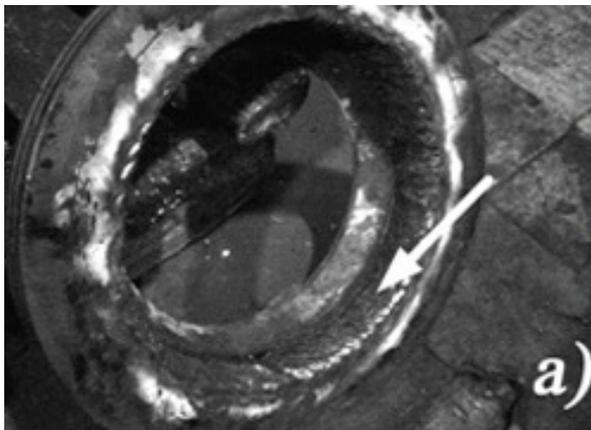
When using graphite, the recovery process for SC and BC concentrates was improved. Thus, it was observed that in the ESR process, the process of concentrate recovery occurs in separate sections of the sinter (Fig. 3).

Then, using ESR, a number of new materials were obtained [5, 6, 7], as well as flux-cored wires: PP-Np-90G13N4TSS-T-S-2.8 in accordance with GOST 26101-84, which increased wear resistance of the surfacing layer is 1.5 times higher than the standard grade EA-395/9 (Fig. 4).



**Fig. 4.** The microstructure of the surfacing metal wire: a) PP-PMS-1 ( $\times 1000$ ) and b) PP-Np-25GS ( $\times 1000$ ) with indication of microhardness: c) ( $\times 800$ )

Surfacing was performed for parts such as bodies of rotation on a developed installation based on a lathe (Fig. 5).





*Fig. 5. The surfacing labyrinth ring (a) and installation for surfacing parts such as bodies of rotation (b)*

Steel products operating at elevated temperatures, such as hot-rolling rolls, dies, shut-off valves, are surfaced using flux-cored wires of various chemical composition, for example, from 3X2B8 and 25HFMS materials GOST 5959-2000. The chemical composition and properties of the surfacing metal are given in the table.

**Table**  
*Chemical composition and properties of surfacing metal*

Coating	Mn, mass. %	C, mass. %	Zr, mass. %	HB	Wear resistance
1	10,3	0,9	0,15	246	1,4
2	11,7	0,85	0,17	223	1,5
3	12,5	0,85	0,15	207	1,35

Studies of the cold resistance of the formed coating showed that up to a temperature of -80°C the deposited metal does not have a pronounced cold brittleness threshold, which is probably due to the presence of nickel and zirconium, which increase the cold resistance. An analysis of the structure in reflected electrons showed that intercrystalline inclusions are absent. The presence of internal defects (pores, cracks) was evaluated by an ARINA-3 X-ray apparatus. According to the research it was found that these internal defects are absent.

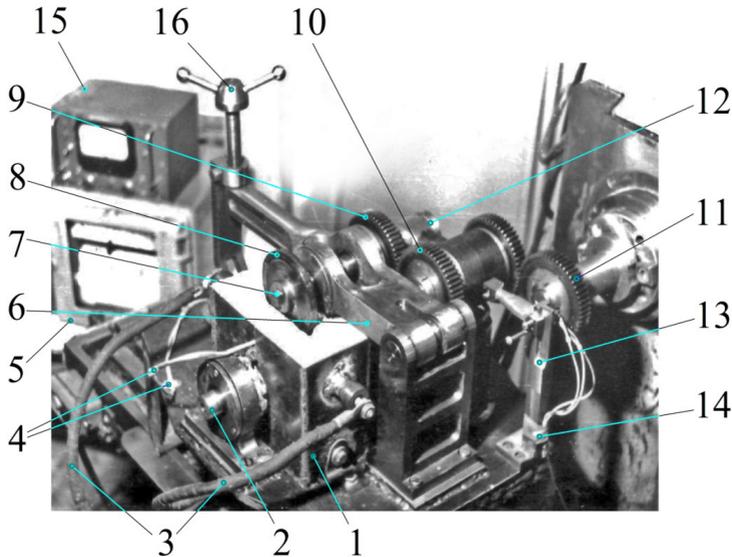
Thus, experimental studies have proved the possibility of forming a surface by surfacing from a material obtained using the MRM FE region. The material of the deposited metal layer corresponded to steel 110G13L, and its wear resistance

was 1.5 times higher than the wear resistance of the layer deposited with standard EA-395/9 grade electrodes. The developed flux-cored wire is assigned the grade PP-Np-90G13N4TSS-T-S-2.8 in accordance with GOST 26101-84.

Of interest was the wear of the surfacing of parts such as bodies of revolution at elevated temperatures. Various installations are known for studying wear resistance under sliding friction conditions. To study the wear resistance under conditions of rolling friction with slippage, a unit was designed and manufactured that allows simulating the hot rolling process at temperatures ranging from 600 to 1000°C (Fig. 6).

The installation is a welded steel casing (1), on which a driven shaft (2) of heat-resistant steel is mounted in rolling bearings on the central neck of which a counter-ring made of high-speed steel is fixed (steel P18 GOST 19265-73).

A heating furnace was made to heat the counterbody. For the lining of the furnace, refractory brick was used, which was placed in the metal case of the furnace (1). An asbestos gasket was installed between the brick lining and the metal casing. To carry out the assembly, the furnace is designed from two halves with a vertical connector. In the brick lining, a bore is provided for installing a corset heating element. The heating element is made of a nichrome strip 6 mm wide with a U-shaped profile and two leads for connecting the power wires (3). The heating element was powered by a step-down transformer.



**Fig. 6.** Installation for studying the wear resistance of specimens with surfacing at elevated temperatures under rolling friction

To control the heating temperature, a chrome-alumel-alumel thermocouple installed in the furnace body with leads (4) to the potentiometer (5) was used to adjust the heating temperature in the required range. After assembling the driven shaft (2) with the furnace, a stand with a beam (6) was set up, in which a drive shaft (7) was installed on the rolling bearings, at the one end of which the test sample (8) was installed, and at the second end was the gear (9) receiving torque from the gear unit (10) and the drive gear (11).

When the torque changes, the carrier (12) deviates while bending an equally strong beam (13) with strain gauges fixed to it (14). The beam was pre-calibrated by loading with reference loads.

The change in current in the bridge circuit was amplified by the TA-5 strain gauge station and recorded by a sensitive galvanometer (15). The maximum load on the sample of 2450 N was transmitted through the beam (6) with a load screw (16). The diameters of the sample (8) and counterbody were 108 mm. Thus, it was possible to determine the torque at various loads on the sample, as well as the coefficient of friction between the test sample and the counterbody.

The speed range at which the tests were carried out was 0.07 - 12 m/s. As the drive, the gearbox of the milling machine was used. The control of the worn-out and initial surface was assessed by profilograms taken on a model 252 profilograph-profilometer. To reduce the influence of heat on the bearings of the driven shaft, aluminum flap radiators were installed on the shaft sections leaving the furnace (copper can be used).

For stable operation of the installation, the temperature of ball bearings did not exceed 180°C, above which their working hardness decreases.

### **Conclusions**

1. A hypothesis was confirmed in the most important aspect of achieving sustainable development of resource-producing regions - MRM processing in its production region using high technologies that ensure its comprehensive rational processing in environmentally friendly conditions due to the development of processing production, in particular, the production of electrode surfacing materials using MRM.

2. In the aspect of creating promising new materials, it is of considerable scientific and practical interest to obtain alloyed welding and surfacing materials that ensure high performance properties of product surfaces.

3. A diagram of the interaction of the components of the welding-surfacing process during the formation of the hardened surface in a gaseous medium on a base metal is shown.

4. These studies confirmed the hypothesis of the restoration of scheelite and baddeleyite concentrates with EAA and ESR. In this case, a complete or partial restoration of the elements occurs, depending on the use of electric modes and the interelectrode medium. When using graphite, the recovery process of scheelite and baddeleyite concentrates improves.

5. Experimental studies have proven the possibility of forming a surface by surfacing from a material obtained using the MRM FE region. The material of the deposited metal layer corresponded to steel 110G13L, and its wear resistance is 1.5 times higher than the wear resistance of the layer deposited with standard EA-395/9 electrodes.

6. To study the wear resistance under conditions of rolling friction with slippage, an installation was designed and manufactured that allows simulating the hot rolling process at temperatures in the range from 600 to 1000°C.

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热塑性塑料注射成型过程中收缩缺陷预测的计算机模型  
**THE COMPUTER MODEL FOR SHRINKAGE DEFECTS PREDICTING  
DURING INJECTION MOLDING OF THERMOPLASTICS**

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抽象。 在本文中，我们考虑了计算机模型，该模型用于研究在压力下成型，在钢模中冷却的热塑性材料制成的铸件中出现的收缩现象。 使用此模型，选择了用于生产没有收缩缺陷的注塑机铸件的最佳方法。

关键词：铸造 收缩缺陷 数学建模； 热塑性塑料，注塑

**Abstract.** *In this paper, we have considered the computer model for the study of shrinkage phenomena occurring in the castings made of thermoplastic material obtained by molding under pressure, which is cooled in a steel mold. Using this model, the best method was chosen for producing castings for injection molding machines without shrinkage defects.*

**Keywords:** *casting; shrinkage defect; mathematical modeling; thermoplastics, injection molding*

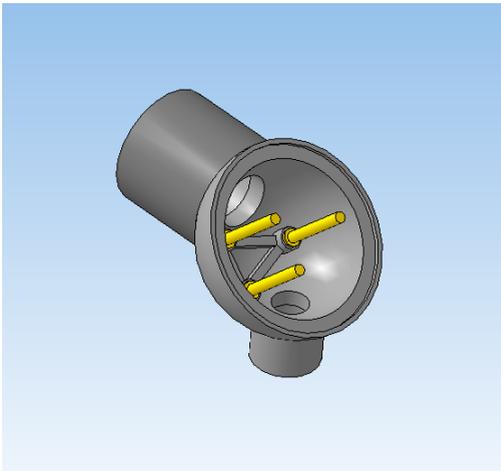
The process of forming a thermoplastic casting obtained by injection molding is difficult to describe mathematically. This is due to the large number of parameters that determine the functioning of the system, as well as the complexity of modeling the behavior of the system.

Currently, the problem of the formation of casting defects that arise as a result of shrinkage phenomena is urgent. Foundries often have large losses from casting defects. The main reasons leading to castings marriage, most often, include the following: 1) deviations of technological parameters from the calculated ones; 2) insufficient qualification of technologists, which contributes to poor-quality development of technological projects; 3) insufficient organization of labor in production; 4) the lack of a systematic approach to the search and elimination of defects. All these reasons create the conditions for the occurrence of defects in castings.

Currently, of the systemic approaches, engineering analysis is the most common. It creates the basis for a logical and consistent study of the problem of decision making. Engineering analysis involves the use of basic physical equations in order to obtain the optimal technological solution. Engineering analysis, most often, relies on a mathematical model of the process in question.

It should be noted that today there are a sufficient number of developed methods for predicting shrinkage defects. In [1], the most accurate methods for predicting shrinkage phenomena are presented, one of which is the adjusted residual stress method, which consists in calculating the stresses acting in a casting in a mold, followed by modeling the strains of the casting when it is removed from the mold.

To create a new model, the method of adjusted residual stresses was used as the main calculations of the study. This article presents a computer model for predicting shrinkage phenomena, as well as testing the model on a specific cast (Fig. 1) from the "Sensor Head" thermoplastic obtained by injection molding.



**Fig. 1.** Casting "Sensor Head"

In the process of the study, a computer model of the formation of shrinkage pores was developed, which solves the following problems: 1) allows to most accurately determine the shrinkage phenomena occurring in the casting; 2) determines the most effective way to eliminate defects, taking into account the characteristics of a particular foundry.

To create a computer model, it should be noted that the formation of shrinkage pores is considered [2], as a melt flow process, under the influence of the pressure difference arising in

the two-phase casting zone during crystallization. The formation of a closed shrink pore occurs as a process of creating new interfaces, that is, due to violation of the material continuity under tensile stresses exceeding its tensile strength.

The formation of a shrink shell occurs in the presence of a forming framework of thermoplastic crystals. The dimensions of the shell determine the capillary forces acting in the crystallization phase. Since the magnitude of these forces is much greater than the static pressure of the plastic, as well as the environmental pressure, it is assumed that capillary forces play a rather important role in the formation of internal shrink shells. Taking capillary forces into account allows us to create a more adequate model [3].

Consider the crystallization process of a melt poured into a mold, the cooling of which occurs as a result of heat removal to the environment, both through the mold walls and directly from the free surface of the melt (gate). The casting, which is represented by a grid model, is divided into elementary volumes, such a model is used to solve the heat problem.

We assume that the temperature in elementary volumes associated with the grid node  $i$  is known from the solution corresponding to the heat equation. The phase composition of the melt in the elementary volume is characterized by the equilibrium fractions of the amorphous and crystallization phases.

In general terms, the process of crystallization of a casting goes through two stages [4]:

1) the formation of shrinkage pores, during crystallization of an open thermal node;

2) the formation of a closed thermal node or internal shrink pores.

If the melt is in contact with the environment, then such a node is considered open, but if there is no direct contact with the environment, then such a node is considered closed.

In an open thermal node, crystallization does not lead to a pressure drop if the shrinkage is compensated by a decrease in the level of the free surface (melt mirror). The surface of the melt is free and able to move if it does not have a fixed frame of the crystallization phase of the thermoplastic.

Lowering the melt mirror should compensate for the shrinkage of the plastic melt at this time step. The movement of the mirror is determined by the expression:

$$\Delta Y = \frac{V_{\Omega}}{S_M}, \quad (1)$$

where  $V_{\Omega}$  – shrink volume,  $S_M$  – area of the melt mirror.

The volume of shrinkage can be described as a function  $V_{sh}(t)$ , and it will be equal to:

$$V_{sh}(t) = \sum_j^N \vartheta_{nj}t, \quad (2)$$

where  $\vartheta_{nj}$  – volume of shrinkage in the node of the finite elementary mesh;  $N$  – the number of nodes within the thermal node (or within the zone).

According to the accepted conditions, there should not be a melt in the grid nodes located above the mirror in which there is no fixed frame; therefore, the actual fractions of the amorphous phase and crystallization phase should be equal to 0, and 1 for the shrink pore.

The volume of the casting attributed to each node of the grid is 1/4 of the sum of the volumes of the elements to which this node belongs. Thus, lowering the mirror below this casting unit leads to the exclusion from the calculation of the melt, the volume of which may be greater than the shrinkage.

But with an increase in the estimated grid, the model may have an error. To eliminate it, it is necessary to take a proportional decrease in the volume of material in the nodes above the melt mirror in accordance with the expression:

$$\Phi V = V_{sh}(t), \quad (3)$$

where  $\Phi$  – proportionality coefficient.

The fraction of the amorphous and crystalline phases in the nodes located above the melt mirror decreases in accordance with the expression:

$$q' = (1 - \Phi)q, \quad (4)$$

where  $q, q'$  – phase fraction at the beginning and end of the time step, respectively.

The formation of a continuous crystalline frame around the melt makes it difficult to contact it with the environment. The free surface of the melt, once in the crystalline frame, loses its ability to move freely. Under the influence of capillary forces acting in the crystalline framework, the shrinkage of the metal during crystallization is only partially compensated by a change in the level of the melt, which leads to a decrease in pressure in the thermal node.

The pressure distribution is determined by the following expression:

$$P = P_{atm} + \rho_{mc}gh - E(V_{\Omega} - V_{\rho})/V_L, \quad (5)$$

where  $P_{atm}$  – external pressure at the time of the formation of the thermal node;

$h$  – the height of the melt column from the highest point in the thermal node;

$E$  – melt compressibility modulus;

$V_{\Omega}$  – volume of shrinkage that occurred in the thermal node at a given time step.

Due to rarefaction, the melt is drawn into the center of the thermal node, as a result of which a void appears in the intercrystalline spaces on its periphery, which leads to the formation of pores. The pressure drop in the thermal node and the volume of pores formed depend on the capillary forces acting in the crystalline framework. Conventionally, the expression that determines the equilibrium between the forces drawing the melt from the periphery to the center of the thermal node and the capillary forces that impede this process can be written as follows:

$$\frac{2\sigma}{r} = E(V_{\Omega} - V_{\rho})/V_L, \quad (6)$$

where  $r$  – meniscus curvature radius in intercrystalline space;

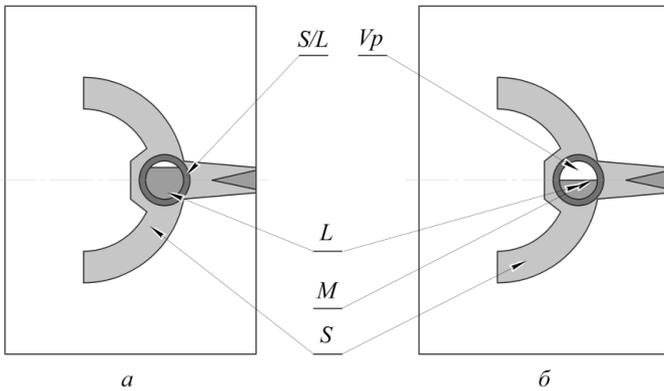
$V_L$  – determined by pressure drop due to shrinkage.

From some point on, due to a decrease in the fraction of the liquid phase, the boundaries of the thermal node become impermeable, melt shrinkage during crystallization is not compensated by a change in the level of the melt in the dendritic framework, and the thermal node becomes closed (Fig. 2). This leads to an intensive decrease in pressure in the thermal node, which is determined by expression (6), and when the pressure at the point of the thermal node drops to a critical value, it becomes energetically favorable to form a new mirror in the free melt zone. It should also be borne in mind that some additional work is required to form a new interface.

The emergence of a new plane of the interface completely compensates for the shrinkage accumulated in the thermal node since its isolation. Therefore, the location of the melt mirror can be determined from the condition that the formed shell is equal to the shrink volume  $V_{\Omega} = V_p$ .

With the advent of the melt mirror, the heat assembly will be reopened, in the notion that crystallization shrinkage will continue to be compensated by its lowering. A shrink shell will be formed in the node according to the above algorithm.

During an experimental study, it was found that the formation of a shrink shell occurs when the pressure in the melt drops to a critical value. As a result, a compressibility module was introduced into the proposed model, which characterizes the process of pressure drop in the thermal node.



**Fig. 2.** Scheme of the formation of shrinkage shell in a closed node

*L* – melt;

*S* – thermoplastic crystallization phase;

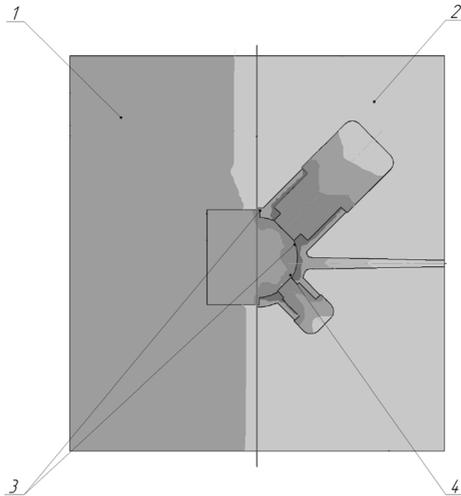
*F* – mold;

*M* – material mirror

*V<sub>p</sub>* – shrinkage volume

Under ideal conditions, the rate of pressure drop in a closed thermal node is proportional to the compressibility modulus of the melt  $E$ . During crystallization of a real cast, the crystallizing melt crust surrounding the thermal node may be leaky, which leads to a pressure drop in the unit.

Fig. 3 presents the simulation results of the crystallization process of the "Sensor head" casting from the Technomid thermoplastic material. Overall dimensions of the casting, 60x45x35 mm. When modeling, the following initial data were used:  $T_{\phi} = 20$  °C;  $T_{nl} = 310$  °C,  $T_{kp} = 230$  °C,  $H_{nl} = 8,4$  kJ/mol,  $b = 0,1$  W/(cm<sup>2</sup>/K).



**Fig. 3.** Screen shot of the simulation:  
 1 – mold, area  $\Phi$ ,  
 2 – mold, area  $\Phi_p$ ;  
 3 – casting, area  $M$ ,  
 4 – crystallization area.

The presented computer model also allows to select the pressure for certain cycles of the injection molding machine. The table shows the data obtained as a result of modeling and the experimental values of pressure during prepressing in four main zones.

**Table 1** – the results of the study of the pressure regime during prepress (kg)

Parameter	Zone №1	Zone №2	Zone №3	Zone №4
Estimation	30,23	39,74	49,62	55,18
Experiment	30	40	50	55

As can be seen from table 1, when solving the problem, namely the elimination of shrinkage pores, a solution is obtained that is consistent with the experimental data.

Thus, we can draw the following conclusions:

1. The developed computer model allows us to solve the problem of optimizing the design of the casting, as well as choosing the optimal temperature for the injection molding machine.

2. For practical use of the program, you must use an interface that allows you to describe the design of castings of complex shape.

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