CONTENTS

Article	
BASED ON FATTY ACIDS OF SYLVIC OIL SURFACTANTS: SYNTHESIS AND STUDY	
OF SURFACE ACTIVE CHARACTERISTICS	
Lutfullina G.G., Abdullin I.S.	3
Physical and Mathematical sciences	
Article	
ON EVOLUTION OF STATIONARY PROCESSES NEAR	
THE ORIGINS OF EXCITATION	5
Sergiyenko L.S., Nesmeyanov A.A.	3
Materials of Conferences	
CONTRADICTIONS IN MODERN CLIMATE THEORY AND THEIR SOLUTION	
Vorontsov A., Stepanenko S.	8
Technical sciences	
Article	
A METHOD FOR CALCULATING SHIP RESISTANCE COMPONENTS USING A THEORETICAL DRAWING	
Gotman A.S.	11
STUDYING BARITE EFFECT ON SOME PROPERTIES OF TYPE METALS	
Isagulov A.Z., Kvon S.S., Malashkevichute E.I., Tulegenova S.N.	16
ANALYSIS OF POLYMETAL ORES TREATMENT POSSIBILITY BY METALLIZATION METHOD	
Isagulov A.Z., Kvon S.S., Yesghanova D.T., Filippova T.S.	19
AN IMPACT OF SOME FACTORS UPON THE PROCESS OF CAKING OF IRON-ORE MATERIAL	
Isin D.K., Isagulov A.Z., Oryngozhina S.E., Isin B.D., Zholdubayeva Z.D.	22
THE GRAVIMETRIC AND DILATOMETRIC RESEARCH OF THE THREE –DIMENSIONAL FILTER ELEMENTS BEHAVIOUR AT HEATING	
Kimanov B.M., Ten A.B., Isagulov A.Z., Zholdubaeva Z.D.	25
THE INULIN AND OLIGOFRUCTOSE EFFECT ON QUALITY PARAMETERS OF BIG DARK AND WHEAT BREAD FUNCTIONAL PROPERTIES	
Koryachkina S.Y., Matveeva T.V., Akhmedova D.K.	28
TECHNOLOGY OF CORN BREAD	
KoryachkinA S.Y., Matveeva T.V., Kuznecova E.A., Cherepnina L.V.	31
THE INULIN AND OLIGOFRUCTOSE EFFECT ON QUALITY PARAMETERS OF BAKING PREMIUM WHEAT AND RYE FLOUR AND PRESSED BAKER'S YEAST	
KoryachkinA S.Y., Matveeva T.V., Akhmedova D.K.	34
Materials of Conferences	
THE BRITTLE MATERIALS DESTRUCTION GEOTECHNOLOGICAL PECULIARITIES WITH THE PLASTIC MATERIALS AND SUBSTANCES APPLICATION	
IN THE SHOCK REGIME	
Tzygankov D.A.	36
USING OPTIMIZATION METHODS SOME NONLINEAR MODEL	3.0
Znunussova L.K.	38

Ecological and conservancy Materials of Conferences	
MOBILE SOLUTIONS FOR ENVIRONMENTAL MONITORING OF WATER BODIES: HARDWARE, SOFTWARE AND COMPUTER MODELING	
Bobyrev S.V., Tikhomirova E.I., Podolsky A.L., Uglanov N.A., Markina T.A., Anokhina T.V.	40
Economic sciences Materials of Conferences	
PROBLEMS AND PROSPECTS FOR ECOTOURISM IN PRIMORYE	
Potekhina E.	41
Geological and Mineralogical sciences Materials of Conferences	
GEOECOLOGICAL MONITORING OF PETROLEUM REGIONS AND INFLUENCE OF GEODYNAMICS ON ENVIRONMENT	
Kopylov I.S.	43
Medical sciences Materials of Conferences	
LINEAR PARAMETERS OF ASYMMETRIC UPPER DENT-ALVEOLAR ARCHES CONDITIONAL BY UNILATERAL EXTRACTION OF THE FIRST PREMOLAR	
Dmitrienko S.V., Ivanova O.P., Vologina M.V., Kovalev M.O., Sevastyanov A.V., Berdin V.V. THE POSTEXTRACTIONAL SPACES ALVEOLAR CREST AUGMENTATION BEFORE THE ORTHODONTIC TREATMENT	44
Dmitrienko S.V., Vologina M.V., Kovalev M.O., Ivanova O.P., Sevastyanov A.V., Klimova N.N. GASTROENTEROLOGICAL PATHOLOGY OF CHILDREN WITH GOITER	44
Parakhonsky A.P.	45
PSYCHOSOMATIC DISORDERS OF CHILDREN WITH DUODENAL ULCER	
Parakhonsky A.P.	45
OF ILLNESSES AT WORKERS OF THE INDUSTRIAL ENTERPRISES OF THE NORTH	
Prokopyev M.N.	46
Philological sciences Materials of Conferences	
LINGUOPOETICS TODAY: ONTOLOGY AND METHODS	
Meshkova E.M.	47

BASED ON FATTY ACIDS OF SYLVIC OIL SURFACTANTS: SYNTHESIS AND STUDY OF SURFACE ACTIVE CHARACTERISTICS

Lutfullina G.G., Abdullin I.S.

The Kazan national research technological university, Kazan, e-mail: gulnaz777@bk.ru

Based on fatty acids of sylvic oil and ethanolamine based surfactants were synthesized, both non-ionic and cationic. Their characteristics were studied.

Keywords: non-ionic and cationic surface-active agents (surfactants), synthesis, characteristics

As of today surfactants has wide usage scope in many economic sectors: detergents, flotation reagents, emulsion and foam stabilizers, dispersants of minerals, antistatic agents, corrosion inhibitors, demulsification agents, etc.

The study objective is producing of surfactants from available and having the wide usage scope substances for organic synthesis:

 $\text{RCOOH} + \text{NH}(\text{C}_{2}\text{H}_{4}\text{OH})_{2} \rightarrow \text{RC}(\text{O})\text{N}(\text{CH}_{2}\text{CH}_{2}\text{OH})_{2} + \text{H}_{2}\text{O},$

scheme:

where R is the rest of fatty acid.

Sylvic acid diethanol amide (SADA) was produced. Trietanolamine was used for production of cationic surfactant.

$$RCOOH + N(C_2H_4OH)_3 \rightarrow R(O)COCH_2CH_2N(CH_2CH_2OH)_2 + H_2O_2$$

where R is the rest of fatty acid.

Sylvic acid trietanolamine (SAT) was produced. It is a cationic surfactant.

Reaction control was performed by changing the acid number. At the end of process it was equal to 5,0-5,2 mg KOH/g for SADA and 5,5-5,8 mg KOH/g for SAT.

The duration of production process for SADA and SAT is 4-5 hours. Time & temperature mode of synthesis of SADA is presented at the Figure. Parameters of synthesis for SAT are the same as presented at the Figure.

The synthesized products at indoor temperature are brown viscous aggregations. The With equimolar ratio of components the reaction is processed according to the following scheme:

from fatty acids of sylvic oil and from ethanolamines. Characteristics of synthesized sur-

Diethanol amine was used for production

With equimolar ratio of components the re-

action is processed according to the following

factants are also studying.

of non-ionic surfactant.

structure of produced surfactant is corroborated by the findings of IR-spectroscopy.

During this study IR-spectrums were created in liquid film between the KBr plates using the instrument SPECORD 75 IR in the range 3800-700 cm⁻¹. These spectrums were interpreted: see [1] for additional information.

Thereby the findings of IR-spectroscopy corroborate the presence of characteristic functional groups in synthesized surfactant. The produced non-ionic surfactant is characterized by first and second amide lanes. The synthesized cationic surfactant contains hydroxyl, carboxylic, ester groups.





Time & Temperature Mode of Synthesize for SADA

Colloid-chemical characteristics of SADA and SAT were studied. Emulsifying, foam-production and other characteristics were estimated. Temperature of turbid formation for water solutions of non-ionic surfactants having the concentration 1 g/dm³ was determined. Experimental and computed data relevant to study of characteristics of SADA and SAT solutions are presented in Table.

Characteristics of SADA and SAT water Solutions						
Characteristic	Va	lue				
Characteristic		SAT				
HLB	12,625	11,68				
CCMF, mole/dm ³	3,7-3,8.10-3	3,1-3,2.10-3				
Temperature of turbid formation for water solution with concentration 1,0 g/dm ³ , °C	82,0	-				
Foam's ratio	0,048	0,030				
Stability of emulsion pending 2 hours	Is st	able				
pH of 1% water solution	6,5-7,0	7-8				

Characteristics of CADA and CAT Water Colutions

Degree of adsorption on the surface for surfactants depends on structure of surfactants' molecules. Ratio between hydrophilic and hydrophobic shares (HLB) is the quantitative characteristic of surfactant's usage scope.

Turbid formation temperature (turbid point), HLB value and surfactant's usage scope are interrelated.

According to computed for SADA and SAT values of HLB the synthesized surfactants can be used as emulsifying agents «oil in water». These surfactants are easy soluble in water transparent dispersions. See [2] for additional information.

Reduce of surface tension is the basic estimation criterion of surfactant's action. See [3] for additional information. During this study the surface tension was measured according to tear of the ring procedure (for solutions). Construction of graphs for dependency between values of surface tension and values of concentration allowed determining the point of CCMF – the critical concentration of micelle formation. CCMF of SADA is equal to $3,7-3,8\cdot10^{-3}$ mole/dm³, CCMF of SAT – $3,1-3,2\cdot10^{-3}$ mole/dm³.

Turbid point has the practical meaning: stability of emulsion (containing surfactant as emulsifying agent) depends on temperature, at which emulsion was created. Temperature mode for creation of stable emulsion is determined by surfactant's turbid point. Temperature of creation for emulsion must not exceed the turbid point of surfactant's solution.

Average temperature of turbid point for synthesized SADA was equal to 82 °C.

Ability to create foam is characterized by foam's ratio – ratio between volume of foam and volume of surfactant's solution. The foam's ratio was equal to 0,048 for SADA and was equal to 0,030 for SAT. These values are small – this corroborates presence of non-ionic and cationic characteristics in synthesized products. These products are also characterized by relatively small foam producing ability.

The foam stabilizing ability is characterized by kinetic stability pending required period of time.

It is known, that stabilizing and emulsifying activities of surfactants are closely linked. They determine aggregative stability of emulsion – it is usually characterized by duration of existence (lifetime) for separate drops contacting each other or contacting with interfacial surface. This is also known as emulsion's delamination rate. The stability of produced emulsions was tested. The emulsions were diluted up to 0,5% of concentration and were shook energetically. No delamination was observed pending 2 + hours, so, the produced emulsions are stable.

Existence of various tensions between dispersed phase (oil) and dispersive medium (water) explains stabilizing activity of surfactant [4].

Presence of surface active characteristics (foam producing, wetting, emulsifying, stabilizing) for synthesized SADA and SAT is corroborated by the study findings.

References

1. Silverstein R. Spectrometric Identification of Organic Compounds / R. Silverstein, G. Bassler, T. Morril. – Moscow: «Mir» publishing house, 1977. – 592 p.

2. Lange K.R. Surface-Active Agents: Synthesis, Characteristics, Analysis and Usage / K.R. Lange; Edited by L.P. Zaichenko. – St. Petersburg: «Professia» publishing house, 2004. – 240 p.

3. Lutfullina G.G. Study of characteristics of synthesized non-ionic surfactants // Bulletin of Kazan State Technological University. – Kazan: KSTU, 2011 year – Vol. 6. – P. 44-47.

4. Sherman F. Emulsions. – Leningrad: «Chemistry» publishing house, 1927. – 448 p.

ON EVOLUTION OF STATIONARY PROCESSES NEAR THE ORIGINS OF EXCITATION

¹Sergiyenko L.S., ²Nesmeyanov A.A.

¹National research Irkutsk state technical university, Irkutsk;

²East-siberian institute of Ministry of Internal Affairs of Russia, Irkutsk, e-mail: lusia_ss@mail.ru

In three-dimensional Euclidean space we study elliptic system of four equations in quotient derivatives of the fourth order with four unknowns that parabolically degenerates on the coordinate axis. In certain classes of function smoothness an existence of the unique (with precision up to random constant) limited solution of the system that meet the fixed boundary terms in cylinder, symmetric to the line of degeneration, is proved. The proof is carried out through the reduction of the results of differentiation and integration of the system equations and dividing variables according to classic algorithm of Fourier. While calculating coefficients of the line that represent the solution of common linear differential equation of the second order with a special point in the centre of the results can be used while modeling stationary processes in asymmetric solenoid speed field.

Keywords: stationary processes, excitation

Let the stationary process be presented as a linear operator equation

$$I \operatorname{rot} T + B \operatorname{grad} s = 0, \quad \operatorname{div} T = 0, \quad (1)$$

where components u, v, w of the vector T, and scalar function s are dependent variables of arguments x, y, z, I and B are given matrixes

$$I = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}, \quad B = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & f \end{bmatrix},$$
$$f = \frac{(x^2 + y^2)^l}{r^2 + (x^2 + y^2)^k}.$$

With positive values of parameters l, k, r [1–3, 6].

As we approach the origin of the excitation, the studied fixed process starts to alter its structure – elliptic system (1) parabolically degenerates in the multiplicity $x^2 + y^2 = 0$, and for it common classic setting of problems of modern mathematical physics become incorrect [7].

The first boundary problem.

Let us study the behavior of the system (1)

$$u_x + v_y + w_z = 0, \ w_z - u_z - s_y = 0,$$

$$v_z - u_y + f(x, y)s_z = 0, \quad s_x - v_z + w_y = 0.$$

Near the degeneration line x = y = 0 that is contained in cylinder

$$D = \{(x, y): x^{2} + y^{2} < R^{2}, 0 < z < z_{0}\}$$
 we obtain a system:

$$\Delta w = 0, \quad s_{xx} + s_{yy} + f(x, y) s_{zz} = 0,$$

$$u(x, y, z) = \int_{0}^{z} \left[w_{x}(x, y, \xi) - s_{y}(x, y, \xi) \right] d\xi + J(y, z);$$

$$u(x, y, z) = \int_{0}^{z} \left[w_{y}(x, y, \xi) + s_{x}(x, y, \xi) \right] d\xi + Q(y, z).$$

with side surface Γ , upper Γ_1 and bottom Γ_0 bases. Let us define D_0 as a part of axis OZ, that lies in \overline{D} .

Problem 1.

Find all conditions of existence and uniqueness in area *D* of the limited on the multiplicity of degeneration D_0 solution of the system (1). While l > 0, k = r = 0, conditions of the

correctness of the problem are defined in [4].

In the presented work under terms

$$\begin{aligned} v|_{\partial\Gamma_0} &= h, \quad w|_{\partial D} = g, \\ s|_{\Gamma_0 \cup \Gamma_1} &= 0, \quad s|_{\Gamma} = q, \end{aligned}$$
(2)

where $h \in C_{0+\alpha}(\partial \Gamma_0)$; $g \in C_{1+\alpha}(\partial D)$;

 $q \in C^2(\overline{\Gamma}); \ q|_{\partial\Gamma_0} = 0.$

The following is proved.

Theorem 1. While l = k = 1 u r = R in classes of the function smoothness

$$(u,v) \in C^{1}(D/D_{0}) \cap C(\overline{D}/D_{0}),$$

$$w \in C^{2}(D) \cap C(\overline{D}),$$

$$s \in C^{2}(D/D_{0}) \cap C(\overline{D}/D_{0})$$

exists a limited near the degeneration axis solution (u, v, w, s) of the problem (1)–(2), where u and v are defined with a precision up to random constant summand, and a, w, and s – in a single way.

Through a reduction of the results of differentiation and integration of the equations (1) according to the corresponding variables we obtain a system:

Functions J(y, z) and Q(y, z) are defined precisely up to the random constant summand from the system

$$Q_y + J_x = -\lim_{z \to 0} w_z;$$

$$Q_x - J_y = f(x, y) \lim_{z \to 0} s_z.$$

The main point in the proof of the theorem is:

Lemma 1. Boundary problem

$$s_{xx} + s_{yy} + \frac{x^{2} + y^{2}}{R^{2} + x^{2} + y^{2}} s_{zz} = 0; \quad (3)$$
$$s|_{\Gamma_{0} \cup \Gamma_{1}} = 0, \quad s|_{\Gamma} = q,$$
$$q \in C^{2}(\overline{\Gamma}), \quad q|_{\partial \Gamma} = 0. \quad (4)$$

Has a unique solution in the cylinder *D*, that is limited while $(x^2 + y^2) \rightarrow 0$.

The proof is carried out according to the classic algorithm of Fourier where at first variables z and (x, y) are divided. The solution is built as line

$$s(x, y, z) = \sum_{n=0}^{\infty} b_n(z) a_n(x, y).$$
 (5)

We obtain

$$b_n'' + \lambda_n b_n = 0;$$

$$\Delta a_n - \frac{x^2 + y^2}{R^2 + x^2 + y^2} a_n = 0.$$
 (6)

Under boundary terms $b_n(0) = b_n(z_0) = 0$ M $\lambda_n = n\pi z/z_0$, n = 1, 2, 3, ..., from the first equation (6) we find

$$b_n(z) = \sin \frac{n\pi z}{z_0}.$$
 (7)

Then, from the second equation (6) in polar coordinates (ϕ , ρ) we define a solution of the view

$$a_n = \Phi_n(\varphi) \cdot \Psi_n(\rho).$$

We obtain the system

$$\Phi_n'' + \gamma_n \Phi_n = 0;$$

$$\rho^2 \Psi_n'' + \rho \Psi_n' - \left(\frac{\rho^4}{R^2 + \rho^2} + \gamma_n\right) \Psi_n = 0. (8)$$

From the first equation (8) while $\gamma_n = m^2$, $m = 0, 1, 2, \dots$ single periodic solution in shape of harmonic superpositions

$$\Phi_{nm}(\varphi) = A_{nm} \cos(m\varphi) + B_{nm} \sin(m\varphi).$$
(9)

With each focused *n* the second equation of the system (8) always has an integral as a line

$$\Psi_{mn}\left(\boldsymbol{\rho}\right) = \boldsymbol{\rho}^{m}\left(1 + \sum_{i=0}^{\infty} \gamma_{4+2i} \boldsymbol{\rho}^{4+2i}\right). \quad (10)$$

That is absolutely and equally met in circle $|\rho| < R$ under whole values of parameter *m*. To calculate coefficients of the degrees of the sedate line (10) let us build recurrent formulas

$$\gamma_{4+2i} = \left(-1\right)^{i} \frac{\mu^{2}}{4\left(i+2\right)\left(i+2+m\right)} \left[1 + \sum_{j=0}^{\frac{\alpha_{i}-2}{2}} \left(\frac{\mu}{2}\right)^{\alpha_{i}-2j} P_{ij}\right],\tag{11}$$

where

$$\mu = \frac{\pi n}{4}; \quad \alpha_i = \frac{2i+3+(-1)}{2}; \quad P_{00} = P_{10} = 0, \tag{12}$$

and while $i \ge 2$

$$P_{ij}(m) = \sum_{\tau_j=0}^{i-2-2j} \sum_{\tau_{j-1}=0}^{\tau_j} \dots \sum_{\tau_0=0}^{\tau_1} \prod_{\eta=0}^{j} \frac{1}{\left(2+2\eta+\tau_{j+1-\eta}\right)\left(2+2\eta+\tau_{j+1-\eta}\right)}.$$
 (13)

The solution of the equation (3) in cylindric coordinates will look as:

$$s(\rho, \varphi, z) = \sum_{m,n=0}^{\infty} \left\{ \frac{\Psi_{mn}(\rho)}{\Psi_{mn}(R)} \sin \frac{n\pi z}{z_0} \left[A_{mn} \cos(m\varphi) + B_{mn} \sin(m\varphi) \right] \right\}.$$
(14)

Degeneration into trigonometric line of the given function on the surface $\overline{\Gamma}$ function

$$q(\varphi, z) = \sum_{m,n=0}^{\infty} \sin \frac{m\pi z}{z_0} \Big[A_{mn} \cos(m\varphi) + B_{mn} \sin(m\varphi) \Big].$$
(15)

Let us define the values of Fourier coefficients:

$$A_{0m} = \frac{2}{\pi R z_0} \int_{\Gamma} q(\phi, z) \sin \frac{m \pi z}{z_0} d\Gamma, \quad m = 0, 1, 2, ...,$$

Physical and Mathematical sciences

$$A_{nm} = \frac{2}{\pi R z_0} \int_{\Gamma} q(\phi, z) \sin \frac{m \pi z}{z_0} \cos(m\phi) d\Gamma, \quad n = 1, 2, 3, ...,$$
$$B_{nm} = \frac{2}{\pi R z_0} \int_{\Gamma} f(\phi, z) \sin \frac{m \pi z}{z_0} \sin(m\phi) d\Gamma, \quad n, m = 0, 1, 2, 3, ...$$
(16)

The convergence of the line (15) is proved with a principle of maximum for elliptic equations.

Multiple polynomials

To boost the process of calculating coefficients of $P_{ij}(m)$ line (10) let us introduce auxiliary functions [5]

$$Q_{i,l} = \sum_{\tau_1=0}^{i-2-2l} \sum_{\tau_2=0}^{\tau_1} \dots \sum_{\tau_{l+1}=0}^{\tau_l} \prod_{\eta=0}^{l} (2+2\eta+\tau_{l+1-\eta}).$$
(17)

That represent simplified modification of the multiple polynomials (13).

Then for whole nonnegative values $l \ge 1$, i > 2 + 2l, τ_i sequence of multipliers into summands of function Q_{il} with similar values of l can be written as block matrixes of triangle shape. For example, while l = 1, i = 5, 6, 7 μ l = 2, i = 6, 7, 8 we have summs

$$\begin{split} Q_{5,1} &= 2 \cdot 4 + 2 \cdot 5 + 3 \cdot 5, \ Q_{6,1} &= 2 \cdot 4 + 2 \cdot 5 + 3 \cdot 5 + 2 \cdot 6 + 3 \cdot 6 + 4 \cdot 6, \\ Q_{7,1} &= 2 \cdot 4 + 2 \cdot 5 + 3 \cdot 5 + 2 \cdot 6 + 3 \cdot 6 + 4 \cdot 6 + 2 \cdot 7 + 3 \cdot 7 + 4 \cdot 7 + 5 \cdot 7, \\ Q_{7,2} &= 2 \cdot 4 \cdot 6 + 2 \cdot 4 \cdot 7 + 2 \cdot 5 \cdot 7 + 3 \cdot 5 \cdot 7, \\ Q_{8,2} &= 2 \cdot 4 \cdot 6 + 2 \cdot 4 \cdot 7 + 2 \cdot 5 \cdot 7 + 3 \cdot 5 \cdot 7 + 2 \cdot 4 \cdot 8 + 2 \cdot 5 \cdot 8 + 3 \cdot 5 \cdot 8 + 2 \cdot 6 \cdot 8 + 3 \cdot 6 \cdot 8 + 4 \cdot 6 \cdot 8, \end{split}$$

to which will correspond the matrixes

$$\begin{aligned} \mathcal{Q}_{5,1} \rightarrow \begin{pmatrix} 2 \cdot 4 & 2 \cdot 5 \\ 0 & 3 \cdot 5 \end{pmatrix}; \quad \mathcal{Q}_{6,1} \rightarrow \begin{pmatrix} 2 \cdot 4 & 2 \cdot 5 & 2 \cdot 6 \\ 0 & 3 \cdot 5 & 3 \cdot 6 \\ 0 & 0 & 4 \cdot 6 \end{pmatrix}; \\ \mathcal{Q}_{7,1} \rightarrow \begin{pmatrix} 2 \cdot 4 & 2 \cdot 5 & 2 \cdot 6 & 2 \cdot 7 \\ 0 & 3 \cdot 5 & 3 \cdot 6 & 3 \cdot 7 \\ 0 & 0 & 4 \cdot 6 & 4 \cdot 7 \\ 0 & 0 & 0 & 4 \cdot 6 & 4 \cdot 7 \\ 0 & 2 \cdot 5 \cdot 7 & 0 \end{pmatrix}; \quad \mathcal{Q}_{7,2} \rightarrow \begin{pmatrix} 2 \cdot 4 \cdot 6 & 2 \cdot 4 \cdot 7 & 3 \cdot 5 \cdot 7 \\ 0 & 2 \cdot 5 \cdot 7 & 0 \end{pmatrix}; \\ \mathcal{Q}_{8,2} \rightarrow \begin{pmatrix} 2 \cdot 4 \cdot 6 & 2 \cdot 4 \cdot 7 & 2 \cdot 4 \cdot 8 & 3 \cdot 5 \cdot 7 & 3 \cdot 5 \cdot 8 & 4 \cdot 6 \cdot 8 \\ 0 & 2 \cdot 5 \cdot 7 & 2 \cdot 5 \cdot 8 & 0 & 3 \cdot 6 \cdot 8 & 0 \\ 0 & 0 & 2 \cdot 6 \cdot 8 & 0 & 0 & 0 \\ \end{pmatrix}. \end{aligned}$$

In connection with this characteristic functions $P_{i,l}(n)$ are called *multiple multinominals* of triangle form.

Resume

While modeling physical processes in extreme conditions the most basic and difficult stage is the correct setting of an objective. In this work we have obtained the terms that provide for existence and uniqueness of the solution of the first boundary for degenerating on the line elliptic equations. During the problem research a special function class has been built and called multiple polynomials of triangle form.

References

1. Nesmayanov A.A., Sigalov G.F. Diffraction of small-water waves on thin body under near-critical movement speed // Young scientists' messenger. / Series: applied maths and mechanics. –SPb: Ed. SPB state technical university, 2002, №1. – P. 72-77. 2. Sergiyenko L.S. On setting of correct objectives for degenerating models of stationary processes that take place in solenoid speed field // Non-classic equation of mathematic physics. – Novosibirsk: Ed. Institute of mathematics, 2002. – P. 226-230.

3. Sergiyenko L.S. Mathematic modeling of physical-technical processes. – Irkutsk: Ed. Irkutsk state technical university, 2006. – P. 58-91, 169-173.

4. Sergiyenko L.S. On problem of Dirichlet for one class of degenerating on axis elliptic equations // Modern methods of function theory and adjoining problems: materials of Voronezh winter mathematic school / Voronezh state university, Moscow state university of M.V. Lomonosov, Mathematic institute of V.A. Steklovof Russian science academy: Voronezh: Ed. centre of Voronezh state university. – 2011. – P. 311-312

5. Sergiyenko L.S., Byenchayeva A.V. The first boundary problem for stationary equation of Schrodinger class // Irkuts state technical university Messenger /scientific magazine – Irkutsk: Ed. Irkutsk state technical university, 2011. – N 10. – P. 275-280.

6. Tichonov A.N., Samarskiy A.A. Equations of mathematic physics: textbook. –M.: Science, 1977. – P. 484-495, 518-527, 615-655.

7. Janushauskas A.I. Analytic theory of elliptic equations. – Novosibirsk: Science, 1978. – P. 159-162.

Materials of Conferences

CONTRADICTIONS IN MODERN CLIMATE THEORY AND THEIR SOLUTION

Vorontsov A., Stepanenko S. RIHMI-WDC, Obninsk, e-mail: vorv@meteo.ru vorv10921@gmail.com

The modern climate modeling with general circulation models of the atmosphere and the ocean leads to two contradictions. If we consider the climate in terms of synergy, these contradictions can be eliminated. Shows one of the ways to resolve conflicts through the use of systemic approaches synthesis. Shows the solution for the two scales. Total system can contain about 50 equations (about hundreds of empirical parameters).

Modern theories of a climate we name modeling of a climate by means of models of the general circulation of atmosphere and ocean as now it is considered to be these models the main direction of development of a world science about a climate. We will consider two main contradictions and ways of their permission.

Contradiction 1. On the one hand the climate is understood as not observable fluctuation of a global condition of atmosphere, characteristic which time scale essentially more than characteristic time of synoptic fluctuations [3]. Hence, climatic fields should correspond with fields of synoptic scale as processes net and подсеточного scale. From here follows that at modeling of a climate entry conditions should characterize a climatic field, free (whenever possible) from fluctuations of synoptic scale. On the other hand, in practice initial fields are used the same, as at a weather forecast [1], therefore the decision of system of the equations of circulation of atmosphere and ocean gives only a field of synoptic fluctuations. Procedure of averaging which results in the second contradiction is applied to definition of climatic fields.

Contradiction 2. On the one hand for a long time already have come to a conclusion that the climate changes in time. On the other hand it agree эргодической to a hypothesis a climate it is defined as average value of results of integration (statistical ensemble) for 30 years, i.e. on this interval it is constants. As practice nevertheless demands to estimate climate change climate change is estimated on deviations from a climate that leads to the logic contradiction.

Climate forecasting can't be effective until both specified contradictions will be eliminated. That them to resolve, it is enough to refuse climate definition as statistical ensemble of conditions for 30 years, and to understand a climate as average values on some ensemble of inwardnesses of atmosphere under constant external conditions [3]. This definition leads to climate interpretation as to the usual equilibrium thermodynamic characteristic at which the specified contradictions can't simply arise. Can seem that such definition is not constructive as real atmosphere represents open nonlinear nonequilibrium system for which variable conditions to thermodynamic system in a sense are conditional.

However in many real systems thermodynamic balance is fair for elementary volumes (local balance) [9], i.e. variable conditions (pressure P and temperature T) are functions of spatial coordinates x and time t. If the elementary volume is much more than size of fluctuations values of variables of a condition can be defined by statistical averaging on elementary volume.

At the description of a climate fluctuations are fluctuations of synoptic scale. Their number isn't great, therefore as elementary volume it is necessary to consider atmosphere on all hemisphere that doesn't allow to predict a local climate.

Other way of definition of average values – smoothing of fields. However to solve a problem of smoothing by means of known formal methods of a filtration (for example, stated in [4]), it is impossible, since preconditions of formal methods don't correspond to properties of real atmospheric processes. Consideration of these preconditions is beyond the present article, therefore we will be limited to the remark that if they didn't contradict real processes the filtration problem has been already solved.

Let's consider a method of a filtration of fields from synergetrics positions in terms of the theory of casual processes. The basic concept of this theory is the concept about realization of casual process. Realizations, as it is known, are usual functions. Process name casual only because it is in advance impossible to specify, what will be following realization from set of potentially possible realizations.

Definition of casual process will well be coordinated with concepts of synergetrics, in particular, with concept of dynamic chaos [9]. In the beginning we will consider, in what this conformity on an example фрактальной Kokh's curve [9] consists. It is possible to present each level of a fractal as set of kusochno-linear functions

$$y_{kj}(t_i) = a_{kj}(t_i) + b_{kj} x_{kj}(t_i), \qquad (1)$$

$$x_{ij}(t_j) = f(t_j), \tag{2}$$

where x, y – horizontal coordinates; k – number of level of a fractal; j – conditional number of an element of a fractal at the given level, t_i – time. Set of parameters of a «correct» curve of Kokh is usual discrete function. However it is possible will present Kokh's constructed by means of casual une-

qualateral triangles «the wrong» function. Then we will receive family of linear functions with casual parameters c_{ki} , d_{ki} which with good reason can be considered as casual process. For preservation of linear dependence y from x function $f(t_i)$ shouldn't depend from k, j. Substituting (2) in (1) and summarizing for each k levels on realizations j at everyone t, we will receive

$$y_{kj}(t_i) = \alpha_{kj}(t_i) + \beta_{kj}(t) \overline{y}_k(t_i), \qquad (3)$$

where (t_i) – a population mean of casual process.

Thus, in фрактальной it is possible to express homogeneous non-stationary casual process to environment through its population mean if set of physically homogeneous realizations is correctly defined.

It is possible to consider atmosphere as фрактальную environment. The climate is level of a fractal of higher order, in comparison with fluctuations of synoptic scale. We will be limited to

$$u(t, x, \xi) = c(t) + d(t) \varphi(\xi) + p(t)f(x, \xi) + q(t) \psi(\xi) f(x, \xi) + e(t, x, \xi), t = 1, 2, ..., m,$$

Where c(t), d(t), p(t), q(t) – the global parameters characterizing change of climatic fields, $e(t, x, \xi)$ – the internal fluctuations reflecting distribution of weather conditions on a hemisphere in each concrete day of year.

It is easy to be convinced that function $E(t, x, \xi) = e^{2}(t, x, \xi)$ has well expressed annual course

$$E(t, x, \xi) = \eta(t) + \mu(t) \psi(x) + \lambda(t) \chi(x, \xi) + \theta(t) \psi(x) + \lambda(t) \psi(x) + \lambda(t) \chi(x, \xi) + \theta(t) \psi(x) + \lambda(t) \psi(x) + \theta(t) \psi(x) + \lambda(t) \psi(x) + \lambda($$

According to classical thermodynamics, macroscopical characteristics of system and its internal

$$\Phi[c(t), d(t), p(t), q(t), \eta(t), \mu(t), \lambda(t), \theta(t)] = 0.$$
(12)

Let's write down (11) in the form of

$$E(t,\mathbf{x},\boldsymbol{\xi}) = E(t,\mathbf{x},\boldsymbol{\xi}) + e(t,\mathbf{x},\boldsymbol{\xi}),$$

where

$$\hat{E}(t,\mathbf{x},\xi) = \eta(t) + \mu(t)\psi(\mathbf{x}) + \lambda(t)\chi(\mathbf{x},\xi) + \theta(t)\upsilon(\mathbf{x})\chi(\mathbf{x},\xi)$$

Values $e(t, \mathbf{x}, \boldsymbol{\xi})$ is a stationary random process, as all non-stationarity $E(t, x, \xi)$ on time and on space is considered in $\hat{E}(t, \mathbf{x}, \boldsymbol{\xi})$ (record $(t, x, \boldsymbol{\xi})$ means only that this three-dimensional set). Hence, it is possible to consider that $e(t, \mathbf{x}, \xi)$ represents required ensemble of inwardnesses of atmosphere under constant external conditions. Changes of this ensemble (climate fluctuation) are defined by expressions (7), (11).

Knowing Φ on the set horizon of the forecast, it is possible to define a non-stationary component $E(t, \mathbf{x}, \boldsymbol{\xi})$. Summarizing with casually chosen steady state $e(t, \mathbf{x}, \xi)$, we will receive $E(t, x, \xi)$. For the decision of the primary goal of climatology - the prediction of statistical characteristics of a mode of weather conditions is enough to establish connection between weather conditions and values $E(t, x, \xi)$.

The analysis of the empirical data (air temperature [5, 6], atmospheric pressure [8], fields of consideration of these levels (substructures) and we will express their interrelation in the mathematical form

Let $u(t, x, \xi)$ – a variable field u in *t*-ty*j* year, $t = 1, 2, ..., m, \xi$ day of year, x – horizontal coordinates, f(x) – the function which is not dependent from *t*, ξ . It is easy to show that if

$$u(t, x, \xi) = a(t, \xi) + b(t, \xi) f(x) + \varepsilon(t, x, \xi), (4)$$

That the invariant $f(x) = \bar{u}(x, \xi)$ is an average long-term field for *a* day ξ .

In turn *a*, *b* it is possible to present parameters in a kind

$$a(t, \xi) = c(t) + d(t) \varphi(\xi) + ea(t, \xi),$$
 (5)

$$b(t,\xi) = p(t) + q(t) \psi(\xi) + eb(t,\xi), \quad (6)$$

Where $\varphi(\xi)$, $\psi(\xi) - a$ long-term annual course of parameters $a(t, \xi)$, $b(t, \xi)$, accordingly. Summarizing (4)–(6), we will receive

$$(\xi) + p(t)f(x,\xi) + q(t)\psi(\xi)f(x,\xi) + e(t,x,\xi), t = 1, 2, ..., m,$$
(7)

and a natural component on space. Hence, for E(t, x) ξ), by analogy, it is possible to write down parities

$$E(t,\mathbf{x},\boldsymbol{\xi}) = \omega(t,\mathbf{x}) + h(t,\mathbf{x})\chi(\mathbf{x},\boldsymbol{\xi}) + e(t,\mathbf{x},\boldsymbol{\xi}), \quad (8)$$

$$\omega(t,\mathbf{x}) = \eta(t) + \mu(t)\psi(\mathbf{x}) + e_{\omega}(t,\mathbf{x}), \qquad (9)$$

 $h(t,\mathbf{x}) = \lambda(t) + \theta(t)\upsilon(\mathbf{x}) + e_{h}(t,\mathbf{x}),$ (10)whence

$$\theta + \theta(t) v(x) \chi(x, \xi) + (t, x, \xi), t = 1, 2, ..., m.$$
 (11)

fluctuations change is interconnected. Hence, it is possible to write down

$$(12, d(t), p(t), q(t), \eta(t), \mu(t), \lambda(t), \theta(t)] = 0.$$

shows that communication between climatic parameters (12) is nonlinear and has high statistical characteristics (factor of determination more than 90% at all significant factors). From this it is possible to make two conclusions. First, the climate can't be reduced to simple averaging of weather conditions. The climate not is «average» weather, and represents some structure which, on the one hand, is generated by the internal fluctuations resulting nonequilibrium character of movements in atmosphere. On the other hand, the climate «operates» weather conditions. In other words, the climate and weather are connected among themselves by circular causality.

radioactive pollution after Chernobyl failure [6]),

Important feature of a fractal consists that selfsimilar structures of different scale represent a single whole in which substructures of the lowest order form substructures of higher order. It is impossible to separate or withdraw one of substructures from

the general structure, without destroying thus all structure. From this it follows that for the climate description it is necessary to find empirically interrelation for the greatest possible number of levels of a fractal (this purpose has been formulated still in 1980 [10]). As a matter of fact, it leads to a restoration problem arrparropa on time numbers of supervision. The decision of this problem name also system synthesis [2]. In [7] main principles of system synthesis on an example of modeling of a climate are stated.

Summing up, we can conclude that the method of synthesis system developed thermodynamic approach to equilibrium and no equilibrium processes. Invariants in (7), (11) implicitly characterize the direction and magnitude of flows generated by the potential fields. Parameters of equations (5), (6) are relative indicators of fluxes in the atmosphere – thermodynamic characteristics. When flows of climate fluctuations remains constant, and only their scalar, and with climate change – and change the direction of flows and their inner characteristics.

We examined two related fluctuations of the atmosphere. Full empirical model can contain 40-50 of equations (80-100 empirical parameters). It is incomparably smaller than the hydrodynamic theory of climate change. Therefore, technology forecasting climate can be developed in the near future. The main problem is getting to an array of qualitative data for the hemisphere in increments not exceeding 12 hours.

References

1. Dymnikov V.P. et al Climate and climate change: mathematical theory and numerical modeling // Siberian Journal of Numerical Mathematics. – 2003. – Vol. 6, №4. – P. 347-379.

2. Kurdyumov S.P. et al Nonlinear dynamics and problems of prediction. // Safety of Eurasia. – 2001. – N_{2} 2. – P. 481-517.

3. Leyts S.E. Construction of a statistical-dynamical climate models and statistical limitations of its predictability // In: Physical basis of climate and its modeling. – 1977. – P. 142-146.

4. Polyak I.I. Methods of analysis of random processes and fields in climatology. – L.: Gidrometeoizdat. – 1979. – 255 p.

5. Stepanenko S.P. Climatic changes in air temperature and surface height H500 of the Northern Hemisphere. – Obninsk: RIHMI-WDC, 2001. – 36 p.

6. Stepanenko S.P., Yahryushin V.N. The use of models of nonstationary random processes for monitoring and prediction of complex systems // Security problems and emergencies. – $2006. - N_{\rm D}1 - P. 91-104.$

7. Stepanenko S.R., Vorontsov A.A. Principles of systematic synthesis of empirical laws of complex systems on the example of climate modeling // Security problems and emergencies. $-2009. - N_04. - P. 65-74.$

8. Vorontsov A.A., Stepanenko S.R. System synthesis as the thermodynamic method of predicting climate // Modern high technologies. $-2011. - N_{\rm e} 1. - P. 56-59.$

9. Haken H. Erfolgsgeneimnissi der Natur. Synergetik: Die Lehre vom Zusammenwirken. – Rororo Sachbuch bei Hamburg, 1995. – 254 pp.

10. Hasselmann K. Klimamodelle. – Annalen Meteorologi (Neu Folge). – 1980. – №15. – P. 81-82.

The work is submitted to the Scientific International Conference «Modern science technology», Spain (Tenerife), 18-25 November, 2011, came to the editorial office on 01.12.2011. Gotman A.S.

Novosibirsk, e-mail: Agotman@yandex.ru

The method of calculating the wave and friction resistance of different ship hull forms by using analytical hull grid surface have been described in this paper. The analytical grid is a set of frames and waterlines of the ship hull, which are described by the equation of ship versiera. The comparisons of calculated wave resistance with experimental data have been made for Todd's series 60 model and for the river vessels «Sevan» and «Rodina». The calculated friction resistance has been compared with the calculated friction resistance obtained by using a friction extrapolator for all these vessels and also for the analytical Weinblum – 1100 model. The comparisons of the calculations with experimental data has confirmed the possibility of using these worked out methods in the practice of designing displacement vessels.

Keywords: ship resistance components, theoretical drawing

The wave and friction resistance calculations methods, which are the main part of the total resistance of a moving ship, have been developed. The wave resistance is defined by using Michell's integral and the friction resistance is calculated by using the integral relation for curved surfaces. All these calculations give the possibility to take into account the hull form influence upon its resistance. The vortex resistance, having connected with the bow, shock, and breaking waves, also with the boundary layer separation, still can not be calculated.

So, the carried out research has shown that on those Froude numbers, on which the wave resistance is the main part of the residual resistance, it is possible to use the main part of Michell's integral for its definition [1]. It is necessary to take into account that Michell's integral defines only the resistance, which is tied to the bow and stern Kelvin waves systems, because Michell found his solution to ideal fluid.

For the practical calculation of wave resistance a special form of Michell's integral [2] on an analytical grid theoretical drawing is used. What we have called the analytical grid, are ship lines, the equations of which have been described by the ship versiera equation. To calculate the friction resistance of the given hull shape the integral relation is used, specially obtained for curved surfaces [3] and the analytical grid too.

Analytical grid

In the general case, it is quite impossible to obtain the equation of the given ship hull surface, however it is quite necessary to have not only the ordinates of each point of the hull surface, but the derivatives in them for the computing of wave resistance and friction resistance. To solve such tasks it is necessary to describe the frames and waterlines by equations, in order to use an analytical grid instead of the surface equation

So, we use the graphic representations in the EXCEL program and the calculations in the FORTRAN program for obtaining the analytical grid of the theoretical drawing. The waterlines and the frames are built by the offset in the EXCEL program, as it has been shown in Fig. 1. They are obtained coordinated, because the frames and the waterlines are intersected at the same points of the surface. So, by using the FORTRAN program, we have each frame and each waterline approximated by the ship versiera equation.

$$y^{3} + y^{2}(a_{1}x + a_{2}) + y(a_{3}x^{2} + a_{4}x + a_{5}) + a_{6}x^{3} + a_{7}x^{2} + a_{8}x + a_{9} = 0.$$
(1)

The approximation and, consequently, the coordinating can be obtained with the desired and the given accuracy. The accuracy is defined by the ordinates and by the drawing, as all, even the insignificant irregularities are seen on the drawings in the EXCEL program.

The ship versiera (1) are calculated by the least squares method. The analytical grid, which is built by the approximated frames and the waterlines is shown in Fig. 1 (here the true proportions are not practically observed). Thus, the approximation process is the most laborious part of the computations. The initial and the approximated frames of the vessel «Rodina» are shown in Fig. 2. As the presented lines are being merged together, the calculated curves are marked by the dots.

Calculation of the wave resistance of ships The special form of Michell's integral with the separation of the main (nonoscillatory) part and the part, which reflects the bow and stern Kelvin waves systems interaction, has been described in the paper [2]. The calculations by using this form can be easily carried out, when the hull surface equation is given analytically in the form of $y = f_1(x) \cdot f_2(z)$, but for a ship's hull theoretical drawing given by offsets it is required to work out a special algorithm.

It is possible to carry out only if we know the higher-order derivatives in the waterlines'

Technical sciences

ends. However we had to carry out a number of the preliminary researches. We had to find out the minimum number of frames and waterlines, for which the necessary accuracy can be reached. In addition, it was quite necessary to decide the question on the derivatives' highest order, having being entered into the Michell's integral computation.





Bow



Fig. 1. Bony plans under the main waterline of Todd's model is EXCEL



Fig. 2. Comparison of the calculated and original frames

The fact is that the waterlines' equation is given in implicit form (1). In this case, it is possible to obtain any order's derivatives up to infinity. To find the sufficient order of derivatives for accurate calculation we have carried out the calculation taking into account the derivatives from the 8th to the 16th order. So, has been found, that it is quite sufficient to perform the calculations with derivatives up to the 16th order.

The second challenge is connected to integration with respect to z, as the calculation is

carried out by using the analytical grid instead the equation.

In this case, we had to perform the integration over the whole hull's surface by the special formula, received after its integration by the parts.

To check the precision of the calculation the experimental curves of three different models have been used: Todd's models of the 60th series and the two models of the river vessels «Sevan» and «Rodina». The experimental curves of the wave and the residual resistance of Todd's model have been obtained in different years and in different towing tanks of the world [4]. The experimental data of the river vessels has been obtained in the GIEWT tank [5]. Thus, the calculated and experimental curves are shown in Fig. 3, 4 and 5.



Fig. 3. Calculated and experimental coefficients of the wave and the residual resistance of Todd's model



Fig. 4. Calculated and experimental coefficients of the wave resistance of model «Sevan»



Fig. 5. Calculated and experimental of the wave resistance coefficients of model «Rodina»

One can see in Fig. 3 that the calculated and experimental wave resistance curves coincide up to the 0,22 Froude number, but at the higher Froude numbers – it approaches residual resistance curves. This is due to the fact that the wave resistance is low at the small Froude numbers, but it is the main part of the residual resistance at the higher Froude numbers.

It is seen from these curves that this method of wave resistance calculation can be used in the designing process of a theoretical drawing of any displacement ships.

Calculation of friction resistance

The friction drag design of the vessels' displacement tons is usually defined by the friction extrapolators with sufficient accuracy. But in this case, the calculations are fulfilled only on the wetted surface area, the hull shape is not taken into consideration.

If the friction resistance is defined by the integral relation, then the hull form is taken into account, and there is the possibility to trace the tangential stresses distribution on the wetted surface, and we can even define the location of the

boundary layer separation. The development of the integral relation for the ship hull shape is given in the book [3], therefore here is not shown.

The needed velocity field is fulfilled by using the Hess – Smith program. In this case the velocity field is computed on the whole underwater part with the exception of the flat bottom. Therefore the calculated resistance of Todd's and «Rodina» models is equal to the sum of the resistance of curvilinear hull sides and the resistance of a flat bottom, which is defined with help of a friction extrapolator. The Weinblum 1100 model's hull form is symmetrical about the midsection, and is slenderer to the aft and stern ends. This model does not have a flat bottom. The Weinblum model's hull surface has been described by an equation, therefore one has a possibility to check the validity of this suggested method for the calculation of friction resistance by the integral relation using this model. The comparison of the results of the calculations obtained by the integral relation and by the friction extrapolator are given in Fig. 6 and 7.



Fig. 6. Friction resistance curves obtained by extrapolator and by the integral relation of Todd's model and of river vessel «Rodina»



Fig. 7. Friction resistance curves obtained by extrapolator and by the integral relation of Weinblum's 1100 model

Conclusions

The methods of the calculation of wave and friction resistance for the displacement ships, the theoretical drawing of which is given by the offset sheets, have been developed. Such calculations permit to evaluate the ship hull resistance at all the designing stages without labour-consuming and expensive towing tests. So, this method distinguished that all the design stages are quite available for performing them in the design process of the theoretical drawing in the ship-designing department. To fulfill the calculations of resistance the method of the analytical grid of hull shapes practically substituting the equation of surface hull, which cannot be obtained for any ship hull form has been developed.

The analytical grid allows us to receive ordinates of a theoretical drawing and derivatives of any order in each point of its surface, that opens possibilities not only for given calculations, but also for various research in the field of ship hydrodynamics.

It should be noted that the used ship's versiera's significance for the approximation of

the thoretical drawing cross section. There is no other curve, which can allow with such accuracy to approximate the lines of hull surface. The approximation could not be carried out with the required and the given accuracy without this curve, and, consequently, the present calculations could not be performed.

It is necessary to mark also the large possibilities of EXCEL, permitting us to receive the table of ordinates of sections of a theoretical drawing. The possibility to transpose in EXCEL a matrix of data and approximated data considerably facilitates labour-consuming work of approximation and coordination of a lines drawing. These possibilities considerably reduce the colossal work of deriving an analytical grid with a great many frames and waterlines.

References

1. Gotman A.Sh. Definition of wave resistance and optimisation of contours of courts. – Novosibirsk: NGAVT, 1995.

2. Gotman A.Sh. Study of Michell's Integral and Influence of Viscosity and Ship Hull Form on Wave Resistance. // «Ocean Engineering International», 2002, 8, No 2, 74 – 115;

3. Gotman A.Sh. Designing of contours of courts with a developed covering. – Leningrad (St.-Petersburg): «Shipbuild-ing», 1979.

4. Proc. of the Workshop on Ship Wave Resistance Computations – David W. Taylor, «Naval Research and Development Center, Bethesda, Maryland». The Overview of Results by Kwang June Bai, Part of Series 60 Block Coefficient 0.60. 1979, vol. 1.

5. Gotman A.Sh. The report Experience of designing of well streamline ship contours with a developed covering – Chair of the theory of ship MRF GIIVT. № TK-97. Bitter (Nizhni Novgorod), 1967.

STUDYING BARITE EFFECT ON SOME PROPERTIES OF TYPE METALS

Isagulov A.Z., Kvon S.S., Malashkevichute E.I., Tulegenova S.N.

The Karaganda state technical university, Karaganda, e-mail: erkezhan 2301@bk.ru, mamuzic@simet.hr

Type metals are used for casting type matters (prints, spacing, rules, etc.). Type elements are mainly produced by casting under pressure of melted type metals into matrixes located in casting boxes.

Keywords: barite effect, type metals, the fused metals, a matrix

Type metals are manufactured based on the system antimony-lead-tin. Antimony (8-23%) enters the composition of type metals increasing their hardness and decreasing their shrinkage in cooling. Tin (2-7%) improves their casting characteristics and eliminates extraordinary fragility of the metal, and lead is the base of any type metal.

There are used several grades of type metals, depending on the composition the metals differ by their melting temperature, hardness and other properties.

However all the type metals must satisfy the following technical requirements:

- to melt at a possible low temperature;

- to have good casting properties, i.e. to be liquid at the casting temperature;

- to have low shrinkage at solidifying;

 not to damage matrixes and parts of the casting mechanism as a result of melted metal chemical effect;

- to have high mechanical strength in solid state;

 the metal losses in repeated castings must be minimal;

- not to be toxic;

 not to contain in its composition scarce and expensive metals, i.e. to be economically acceptable;

- prints cast from a type metal mustn't damage under the action of water, atmospheric conditions, washing matters and in warehousing.

Of all the requirements listed the most important properties defining the type metal quality are casting properties and hardness.

The type metal hardness is one of the most significant operation properties, as the harder is the type metal, the higher is its wear resistance, the higher is the impression resistance of the plate made of this metal.

During the last years the printing industry with mass numbers of copies uses a computer text input or photo-polymer plates, however in printing specific production (reproductions, engravings, etc.) there is still used a type matter, that's why the problem of improving the type metal quality is still urgent.

In some studies [1, 2] there was noted that barium-containing additives effect positively the type metals hardness. A natural barium,containing matter is barite. It is a mineral presenting barium sulfate (BaS0₄), it is rather widely spread in nature and is the main barium source in chemistry. In many cases barium in barite is partly substituted by strontium, lead or calcium. Barite possesses high density – 4,3-4,7 g/cm³, its hardness by Moos scale is from 3,0 till 3,5.

Kazakhstan possesses about 23% of all the world barite resources. In the world practice the main part of barite (about 75%) is used for drilling oil and gas bore-holes. However during the last years barite is more widely used in other industries. Prospective lines of barite use is cement branch, heavy concretes and ferroalloys producing, etc.

In this work there is studied barite additives effect on the type metals hardness. For studies there were used samples prepared from the existing used type metal (its composition is shown in Table 1). The type metal used after washing was milled and mixed with bariumcontai8ning matter which was usually a barite concentrate of the Zhairem deposit, containing about 95% of pure barite. Barite additives were made over 100% by mass.

To carry out experiments the barite concentrate was milled till the size 400 mkm (90%) and combined with the system metal part. As barite tends to burn out, in loading barite was placed in the middle of the crucible, and the melting was carried out in the closed graphite crucible at the temperature 350 °C. In the system melting there took place a melt natural homogenization, and there was no chemical liquation on the ingot body. After the melting the samples were cooled and subjected to studying for hardness and wear resistance.

Their hardness was determined by Brinnel method in accordance with State standard 9012-59 for lead and other alloys. Wear resistance of the alloys obtained was determined with the help of measuring the sample mass changing (SS 23.224-86) by the formula:

$$U = \frac{g_e \rho_i}{g_i \rho_e},$$

where g_{ei} ; g_{ii} is mass loss for individual tested reference and studied samples, g.

As a reference there was used an analog type metal without barite additives.

To obtain valid results all the measuring was carried out no less than on three doubles, the discrepancy didn't exceed 5%. The confidential assessment of the results was carried out by the way of comparing to the empiric standard with the significance level P = 0.98. The assessment of the discrepancy significance

between the parameters compared was carried out with the help of Student criterion P = 0.98.

The results of the studies carried out are shown in Table, on the base of which there were built the dependences of hardness and wear resistance factor on barite content in the alloy.

Samula Ma		Alloy compos	sition,%	Alloy properties		
Sample No	Sn	Sb	Pb	barite	HB, kg/mm ²	Wear resistance factor
Reference	5	14,5	80, 5	-	19	1
1	5	14,5	80, 5	1	20	1,05
2	5	14,5	80, 5	2	22	1,05
3	5	14,5	80, 5	3	23	1,15
4	5	14,5	80, 5	4	25	1,2
5	5	14,5	80, 5	5	25	1,2

Barite content effect on the alloy properties

As we can see from the Table and Figure, barite additives increase the alloy hardness and wear resistance about 20% on the average.

The mechanism of positive effect on the alloy hardness and, consequently, on wear resistance is not still quite clear. However, taking into consideration the diagram antimonylead-tin, there can be supposed the forming of the triple solid solution alloyed with barium. Partial barium substitution with lead atoms in the solution leads to increasing the friction-induced stress in the lattice, and hardening takes place by the mechanism which is analogous to hardening of alloyed ferrite [4].



Type metal hardness and wear resistance dependence on barite content

In this work there was not analyzed in details barite effect on other important properties of type metals, such as liquidity and tendency to shrinkage. However in visual observation these properties didn't change. All the mold details were not filled completely, shrinkage extent was 0,8% on the average. This value somewhat exceeds the one indicated in SS 5235-72 (0,7%). In this connection the further increasing barite additives seems to be inexpedient.

The studies carried out showed the possibility of increasing type metals wear resistance by means of introducing small quantities (1-5%) of barite additives. This trend seems to be prospective as barite concentrate is rather inexpensive raw material.

Conclusions

1. There has been experimentally proved the possibility to use barite for increasing some properties of type metals.

2. Introducing small quantities (1-5%) of barite permits to increase 15-20% type metals hardness and wear resistance.

References

1. Berezin B.I. Printing production material study. - 2-d edition. - M.: Materialovedeniye, 1972. - 420 p.

2. Tyan V.D., Kubarev A.D., Zhangarayev A.Zh., Kakenov N.K., Dzhasupov A.T. Complex use of barite ores of Zhairem deposit // J. Complex use of mineral raw materials. – $1982. - N_{2}6. - P. 39.$

3. Pankov V.A., Kozhevnikov G.N., Zhauchkov V.I., Lukin S.V., Parfenov A.A. Obtaining barium-containing alloys from barite ores // J. Complex use of mineral raw materials. – $1981. - N_{\rm D}11. - P. 63.$

4. Goldstein M.N., Grachyov S.V., Veksler Yu.G. Special steels. – M.: Mtallurgy, 1989.

5. Lokshin E.P., Voskoboinikov N.B. Barium. Barium and its properties. – M.: Nedra, 1996. – 350 p.

ANALYSIS OF POLYMETAL ORES TREATMENT POSSIBILITY BY METALLIZATION METHOD

Isagulov A.Z., Kvon S.S., Yesghanova D.T., Filippova T.S.

The Karaganda state technical university, Karaganda, e-mail: erkezhan_2301@bk.ru

Iron-ore raw materials porous structure (pellets, agglomerates, briquettes) formed as a result of sintering, is a universal indication of their quality, as it defines such important metallurgical properties, as «cold» and «hot» strength, restorability, and metallization extent. That's why the questions of forming and analyzing the final porous structure are dealt with in a lot of works.

Keywords: metallization method, Iron-ore, a result of sintering

Most researchers describe the structure effect on strength by an empiric formula:

$$P = a \exp(-B), \tag{1}$$

where P is strength; a is a factor taking into account sintering mode parameters; B is the structure parameter.

As an example of *B* there is used either the general porosity value or the pore average radius value. Such an approach in studying strength characteristics is adequate because these parameters are the indication of the sintering process completeness. However, studying the porous structure as an object of studying mass-exchange processes, require a completely different approach both in the methodological and in experimental relation. Such mass exchange processes are the process of oxidation during sintering, restoration during sintering and metallization. It's evident, that these processes completeness defines finally the quality of the product obtained.

In work [1] there was shown that the intensity of mass exchange processes is mainly defined by the character of the porous structure and, particularly, by such parameters, as general volumetric porosity, pores distribution by their sizes, and pores surface accessible for reacting.

In the present work there is studied the process of pore formation, their distribution by the size in the sintering process depending on different factors. Besides, the approach to studying the porous structure was formed from the point of view of mass exchange processes possibility.

For studies there were used briquettes of iron-ore concentrate of different density. The value of density in damp briquettes varied by the value of compacting pressure from 130 till 1200 kg/cmm². The damp briquettes porous structure was studied with the help of mercury porometry [2]. Then the briquettes were sintered in the air at the temperature 1250 °C, the time of sintering varied from 3 till 40 minutes. The samples obtained by such a way, were studied with the help of mercury porometry. The results of studying are shown in Table 1.

Table 1

Number one	Sintering time, min		0		3		8		20		40
after another	Compacting pressure, kg/cm ²	L	V S	L	V S	L	V S	L	V S	L	V S
1	130	42	0,0879 1,5048	37	0,0551 0,8874	28	0,0453 0,548	25	0,0359 0,328	23	0,0301 0,214
2	380	35	0, 063 1,202	31	0,0429 0,612	24	0,0319 0,404	21	0,0236 0,0261	18	0,025 0,198
3	1200	28	0,051 0,908	24	0,0309 0,384	20	0,0231 0,204	17	0,0198 0,146	15	0,0136 0,106

Parameters of porous structure depending on compacting pressure and sintering time

N o t e . L is open porosity, %; V is pores specific volume, cm^3/g ; S is pores specific surface, m^2/g .

According to the pores classification suggested in [3], all the pores can be divided into four groups by their size:

I group: macropores, size over 2 mkm;

II group: mesopores, size 2-0,5 mkm;

III group: micropores, size 0,5-0,02 mkm; IV group: inner-particle pores, size less than 0,02 mkm.

Besides, it's necessary to note that there was considered only open porosity, i.e. accessible for mass exchange processes and chemical reacting.

The analysis of Table 1 data showed that a damp briquette density effects significantly the character of distribution by the size. The briquette density increase leads to macropores number decreasing and, respectively, to mesoand macropores number increasing. However similar studies of sintered briquettes showed that the difference in pores distribution in damp briquettes of different density is practically leveled after sintering. F All the sintered briquettes are characterized by the tendency to decrease macro- and micropores number and to increase mesopores number. In other words, the character of pores distribution by their size in sintered briquettes is almost the same and doesn't depend on the starting distribution. This is connected with developing the processes of diffusion and pores coalescence during sintering.

Alongside with the starting density effect on the pores distribution character, there was also studied time and sintering temperature effect. The sintering time varied from 3 till 40 minutes, the sintering temperature varied from 1000 till 1300 °C. The analysis of the data obtained showed that the general tendency of pores distribution character changing consists in the following.

At the first stages of sintering there goes on an active healing of all the pore groups, the speed of the briquette shrinkage is great. At the next stages of sintering the process of pores healing is accompanied by forming closed pores, coalescences and smoothing the relief of pores surface. At the final stages of sintering the process of closed pores forming becomes predominating and is accompanied by a sharp decreasing of open porosity. Based on this it can be said that to obtain a product with good gas-permeability the sintering process is to be carried out no longer than 8 minutes.

Pores surface changing in the sintering time is described by the following equation:

$$S_t = S_0 \cdot \exp(-k\tau), \qquad (2)$$

where S_{i} is pores surface in the starting briquette; k^{0} is a coefficient depending on the nature of the material sintered and sintering time; τ is the sintering time.

Equation (2) reflects rather completely the physical sense of the process of pores surface changing during sintering: at $\tau = 0$ $S_t = S_o$; at $\tau \to \infty$, $S \to 0$. Indeed, at an indefinitely great time of sintering there develops the process of pores coalescence, and in ideal all the pores merge in a single pore located in the poreless matrix and having an extremely small surface.

Thus, knowing the pores starting surface in a damp sample and taking into consideration equation (2), there can be predicted the value of pores surface S_t at any moment of the sintering process.

As it was noted in work [4], the pores surface value can be controlled with the help of the sintering mode: the temperature and the time of isothermal exposure. To check this statement there were carried out the following tests. Iron-ore briquettes were sintered in the air at the temperatures 1200 and 1000 °C till the shrinkage value 5% with various sintering time. Then the samples were studied with the help of mercury porometry, the results are presented in Table 2.

Table 2

Parameter controlled	Sh	rinkage extent 5	· %	Sintering time 40 min.			
Sintering tempera- ture, °C	Sintering time, min	Pores sp.volume, cm ³ /g	Pores sp.surface, m ² /g	Shrinkage, %	Pores sp.volume, cm ³ /g	Pores sp.surface, m ² /g	
1200 1000	8 18	0,0473 0,0443	0,5516 0,3314	8,9 6,4	0,0401 0.0301	0,203 0,211	

Porous structure parameters depending on sintering temperature

As it's clear from Table 2, at the same shrinkage the sintering temperature decreasing leads to the pores surface decrease. It's easily explained if it's taken into consideration that at decreased sintering temperatures the surface migration process prevails over the matter volumetric flowing. At the same tine the sintering temperature increasing with the same activity of isothermal exposure leads to the logical volume and pores surface decrease due to the more completeness of the sintering process.

Thus, at other equal conditions the pores surface value changing in the sintering process is effected by: the pores starting surface, sintering temperature and the time of isothermal exposure. The data of these factors effect are shown in Table 3.

Mode	Balling time, min	Sintering time, min	Sintering temp. °C	Pores	Pores volume, cm ³ /g	Pores surface, $m^{2/g}$
1	2	9	1240	37	0,0453	0,328
2	14	3	1240	26	0,0309	0,256
3	2	3	1300	22	0,0296	0,198
4	14	9	1300	19	0,0203	0,119
The main level	8	6	1270	22	0,0300	0,293
Varying interval	6	3	30	-	-	-

Porous structure parameters depending on the sintering mode

By the data of Table 3 there was carried out the quantitative analysis of the balling time effect (starting pores surface), sintering temperature and time. As a result there was obtained the following equation of regression:

$$S_t = 0.221 - 0.037\tau_{ok} - 0.06t - 0.0017\tau_{ok}$$
.(3)

Starting from the values of coefficients in equation (3), all the factors effecting pores surface decreasing can be placed in the following order: sintering temperature, balling time (pores starting surface), and the time of isothermal exposure of sintering.

Conclusions

1. In studying the porous structure as an object of mass exchange processes the greatest role is played not by the absolute porosity but the pores surface and pores distribution by their size.

2. At the existing temperatures of iron ore raw material burning the sintering process is to be carried out no longer than 8 minutes, otherwise there develops the process of pores coalescence that leads to the product gas permeability decrease.

3. By the effect on the pores surface decreasing in the sintering process the factors can be placed in the following order: sintering temperature, balling time (pores starting surface), and the time of isothermal exposure of sintering. Consequently, when controlling these factors, we can regulate the pores surface and, thus, the strength properties and gas-permeability of the product.

References

2. Plachenov T.G. Mercury porometry and its use for describing porous structures. Adsorption and porosity. – $M_{\rm .:}$ Nauka, 1986.

3. Belov S.V. Porous permeable bodies. – M.: Metallurgy, 1997. – 335 p.

4. Ivensen V.A. Kinetics of metal powders packing. – M.: Nauka, 1987. – 272 p. $\,$

Table 3

AN IMPACT OF SOME FACTORS UPON THE PROCESS OF CAKING OF IRON-ORE MATERIAL

Isin D.K., Isagulov A.Z., Oryngozhina S.E., Isin B.D., Zholdubayeva Z.D. Karaganda state technical university, Karaganda, e-mail: zhuma-77@mail.ru

One of the main reserves of an increase in efficiency of blast furnaces and improvement of technic-economic characteristics of their work is the further development of the existing and search for new technologies of preparing raw materials. An urgency of this matter will grow higher along with a significant increase in volume of blast furnaces. Work is devoted to study of technical peculiarities of this process, investigating of the main characteristics of the process agglomerate, and improvement its quality.

Keywords: of caking material, iron-ore, blast furnace, process agglomerate

For the closest future an agglomeration remains one of the main methods of preparing iron-ore material for blast melting. Therefore, efforts of many scientists both in our country and abroad are nowadays aimed for the search of new means of carrying out the agglomeration process. To these means we can refer the agglomeration of iron-ore materials with usage of high-pressure air.

The following problems are studied in the work:

– an impact of separate parameters of caking regime – the pressure of the supercharged air, temperature of its heating, amount of fuel in furnace charge upon the efficiency of the agglomeration facility and quality of the final product;

- comparing the received data with indexes of agglomeration process under vacuum regime of caking.

The research has been carried out on the facility consisting of cylindrical caking bowl and electric air supercharger. Along the pitch of the bowl were placed connecting pipes for thermopair installment, measurement of air pressure above the layer and pressure of the discharged gas above the fire grate.

The furnace charge of the fixed composition was mixed and balled on a plate granulator, the duration of mixing dry and moist charge equaled approximately three minutes. Before the load of furnace charge into the bowl layers of bed with height of 10–15 mm and fineness of 5–10 mm were paced upon the fire grate. The height of furnace charge layer equaled 300 mm. An ignition of furnace charge was carried out under vacuum during 1 minute with coke breeze and wood shaving.

Within the initial period optimal fuel consumption and furnace charge wetness was defined, and as an optimal criterion the vertical caking speed and cold solidity of agglomerate was taken.

Under vacuum agglomeration an optimal content of cox breeze in furnace charge and its moist equaled 3,8 and 6,2% correspondingly, and under caking with pressed cold air these

values were lowered to 3,3 and 4,2%. The consumption of cox breeze during caking with hot air was altered from 1 to 5%. The basic capacity of CaO/SiO₂ for all agglomerates equaled 0,95.

The prepared cake after its cooling on air was exposed to double dropping from the height of 2 m upon a steel plate. A fraction of +10 mm was considered as a proper agglomerate, fractions 0f 10–5 mm were used as a bed, and fraction of 0–5 mm was returned. The solidity of agglomerate was defined according to the output of fraction of 5–0 mm after its 4-time dropping and according to the barrel of Rubin.

The results of the experiments are provided in Table 1. The analysis of the data testifies for a significant impact of fuel consumption during the caking process upon the indexes of agglomeration process. Thus, under the caking with cold air with pressure of 0,2 MPa the best indexes of efficiency and quality of agglomerate were achieved with fuel consumption of 3,3%.

With an increase of carbon consumption over the optimal value the output of the valid decreased as a result of the macroporous agglomerate that possessed lower solidity. The specific efficiency of the facility under the cox breeze consumption for caking of 3,3% equaled 4,46 t/m² per hour that is 3 times higher than that under vacuum caking. The cold solidity of the agglomerate, caked under pressure was imes higher than that of agglomerate, caked under vacuum. The higher solidity was achieved due to a significant consolidation of the furnace charge layer during the process of caking and receiving of finely porous normally-melted agglomerate. Obviously, during caking under pressure, as well as under vacuum agglomeration, it is necessary to set an optimal carbon consumption for the process.

Fig. 1 provides the impact of air temperature and fuel consumption under caking upon the cold solidity of agglomerates. According to the picture data we can see that under the fuel consumption of 1,8% the solidity of agglomerates, caked under the heated up to 950°C air is higher than that of agglomerate, caked with cold air. Barrel index of agglomerate decreases correspondingly by 7,0 and 12,0% (absolute values) compared to agglomeration under pressure of cold air and vacuum caking (barrel index -30%). With an increase of air temperature from 500 to 950 °C with fuel consumption of 1,8–2,5% the agglomerates' solidity styed practically the same.

Cox breeze for mass of dry fyr- nace charge, %	Vertical cak- ing speed, mm/min	Caked output, %	Valid output for the caked mass, %	Specific efficiency, t/m ³ , hour	Fraction output (0-5) mm after dropping,%	Agglor conte	merate ent, % FeO	
1	2	3	4	5	6	7	8	
Agglo	merate, receive	ed under the	temperature ar	nd air pressure	(20 °C and 0,2 M	(Pa)		
2,8	55,6	91,2	81,2	4,37	4,2	58,3	9,8	
3,3	56,1	92,3	82,0	4,46	3,8	58,2	12,9	
4,0	54,5	92,0	81,0	4,29	3,7	59,0	16,3	
5,0	57,1	92,4	79,1	4,38	3,9	59,2	19,8	
6,0	54,5	93,7	78,6	4,16	4,0	60,1	26,6	
Agglon	Agglomerate, received under the temperature and air pressure (600 °C and 0,2 MPa)							
1,5	47,4	90,3	88,1	3,74	3,5	58,0	5,7	
2,0	25,6	91,1	91,6	4,68	2,8	57,9	6,2	
2,5	54,5	89,5	92,3	4,87	2,6	58,6	8,6	
3,0	54,5	90,0	91,6	4,85	2,2	58,3	10,8	
5,0	58,1	95,5	87,3	4,93	2,8	60,3	23,2	
Agglom	erate, receivea	l under the t	emperature and	d air pressure ((950 °C and 0,25	MPa)		
1,5	65,2	89,8	91,8	5,82	3,0	57,6	3,4	
1,8	63,3	89,5	91,4	5,75	2,8	58,0	4,2	
2,0	62,5	91,3	92,0	5,53	2,8	57,5	6,4	
2,5	63,8	90,2	92,2	5,72	2,7	57,8	8,8	
3,0	61,2	91,7	91,0	5,42	2,4	57,8	12,2	
A	gglomerate, re	ceived unde	r the temperati	<i>ure and air pre</i>	ssure (1100 mm)			
3,8	20,0	84,6	73,2	1,42	11,7	57,8	13,7	

The results of test cakings with different cox consumption

The results of test cakings under different pressures

Cox breeze for mass of	Vertical	fertical Caked Output for Caked Output for		Specific	Fraction output $(0-5)$ mm after	Agglor	merate ent, %
dry fyrnace charge, %	mm/min	output,%	the caked mass, %	t/m ³ , hour	dropping,%	Fe _{gen}	FeO
1	2	3	4	5	6	7	8
Agglomerate	, received under	r the temper	ature of $20^{\circ}C$	and fuel conten	t in furnace charg	ge of 3,.	3%
0,2	30,	76,1	2,21	9,8	30	58,5	6,5
0,5	40,5	81,5	3,21	4,3	28	58,4	8,9
1,0	56,1	82,0	4,46	3,8	25	58,2	12,9
1,5	64,5	82,0	5,13	4,0	26	58,7	12,5
2,0	85,7	82,5	6,87	3,6	25	58,5	13,3
Agglomerate,	received under	the tempera	ature of 600 °C	and fuel content	nt in furnace char	ge of 2,	2%
0,5	40,0	85,2	87,8	3,49	3,2	58,5	5,2
1,0	54,5	91,2	88,6	4,70	3,3	59,0	7,1
1,5	62,5	88,7	90,5	5,49	2,7	58,1	8,3
2,0	80,0	87,9	91,6	7,12	2,9	58,3	8,4
2,0	80,0	92,6	88,3	6,86	3,5	58,0	9,3



Fig. 1. The dependence of barrel index of an agglomerate solidity upon the air temperature with different fuel content: Fuel content under temperatures: 20°C - 3,3; 500°C - 2,5; 600°C - 2,2; 700°C - 2,2; 850°C - 2,0; 950°C - 1,8

The greatest impact upon the cold solidity of agglomerates carried the fuel consumption for caking. Fig. 2 provides the dependence of fraction output (-5) mm after 4-time dropping depending on fuel consumption under air temperatures for caking of 500-950 °C. With an alteration of fuel consumption for caking from 1,5 to 3% an increase in agglomerate solidity was observed, while the further increase in fuel consumption up to 5% led to a decrease in agglomerate solidity. A characteristic of agglomerate solidity is also the fraction output -5 mm and the output of the valid after caking. As shows the picture, an optimal fuel consumption for the valid output equals 2,5% for all air temperatures, besides, for low fuel consumptions (lower than 2,5% along with an increase in air temperature an output of valid agglomerate increases). With fuel consumptions over 2,5% an impact of temperature weakens.



Fig. 2. Dependence of an agglomerate solidity upon the air temperature with different fuel content: Digits by curves – fuel consumption under caking,%

According to the provided data we can suppose that the best agglomerate according to cold solidity with caking with air, heated up to 500–700 °C was received with fuel consumption of 2,5%. An increase in pressure under caking

with hot (600 °C) air allowed us not only to increase efficiency, but also to improve the quality of the received agglomerate. With pressure increase from 0,05 to 0,2 MPa the output of valid agglomerate increased from 87,5 to 91,6%.

THE GRAVIMETRIC AND DILATOMETRIC RESEARCH OF THE THREE – DIMENSIONAL FILTER ELEMENTS BEHAVIOUR AT HEATING

¹Kimanov B.M., ²Ten A.B., ³Isagulov A.Z., ³Zholdubaeva Z.D.

¹The Chemical and Metallurgical Institute after Zh. Abishev, L.R.S., Karaganda; ²The National Research Technological University «MIS&A», Moscow; ³The Karaganda State Technical University, Karaganda, e-mail: zhuma-77@mail.ru

The quite different and the various filters' modes (e.g. the two- and the three-dimensional ones), having distinguished by constructively and having their own advantages and disadvantages, are used for the metal melts refining. So, the used filter must hold the large variety number of the non – metal inclusions in their size, particularly the fine – dispersed ones, during the liquid steel filtration. Therefore, the two-dimensional filters (e.g. the leaf, the screen ones) are not quite suitable for this, so far as the pores' diameter such inclusions detention in them would be chosen such a small one, that the filtration process itself would be quite challengeable. So, the three – dimensional filters are the most suitable and appropriate for the steel filtering, to which are related to the ceramic foam filters (CFF) and the granular filters.

Keywords: two-dimensional and volume filters, a liquid steel, the ceramic foam filters, granular filters

The granular filters are distinguished from the following:

 by the highly complex refining capacity, not inferior to the CFF;

- by the filter elements production technology simplicity, in the form of the granules from the available and the inexpensive materials;

- by the unique and the unprecedented possibility to be varied by the filter composition, depending on the filter melt and the removed impurities nature; - by the refining degree and the filter's capacity regulation controlling ability, at the expense of the bulked elements and the filter bed height size change, and the others.

The filter elements from the magnesite, in the form of the granules, with the 14–20 mm diameter, having received with the bonding materials and the agents quality application have been the research object: the sodium silicate aqueous solution and the hydrolyzed ethyl silicate ETHS – 40 (Table 1).

Table 1

The Materials' Characteristic, Having Used for the Filter Elements Preparation, in the Form of the Granules

	The Filter Elem	ient		
Num- ber	The Granule Base	The Outer Layer Material	Bonding	The Note
1	Magnesite	MgO	Sodium Silicate, $\rho = 1,24 \text{ g/cm}^3$	MgO melted
2	Magnesite	Y ₂ O ₃	Hydrolyzed ethyl silicate ETHS-40	The Y_2O_3 layer on the magnesite granules has been obtained by the cladding method
3	Magnesite with the aluminum powder	$MgO + Al_{dose}$	Sodium Silicate, $\rho = 1,24 \text{ g/cm}^3$	The initial mixture composition 70% MgO and 30% Al power [138]
4	The fused alumina	Al ₂ O ₃	SAG sulfite – alcohol grains	The ceramic granules

For the comparison, the ceramic granules from the fused alumina have been studied, having received by the solid – phase sintering (e.g. at 1,900 °C) under the industrial conditions, with the usage, as the SAG sulfite – alcohol grains bonding (e.g. option 4). So, the magnesite filter elements (e.g. option 1, 3) have been received by the roll briquetting method. The magnesite elements from Y_2O_3 (e.g. option 2) have been received, by means of the rolling (e.g. the cladding) of the deficient rare – earth oxide on the magnesite granules' surface. All these granules have not been exposed to the subsequent sintering just in these both cases (e.g. options 1-3).

Originally, the damp and the moist granules had been dried out in the air, after which they were placed into the drying cabinet, and immediately before filtering – they have been tempered and annealed at the ~900 °C temperature. In connection with above – mentioned material, the gravimetrical research on the weight change study of the filter elements have been carried out at the heating, originally, up to

200, and after that up to 900 °C. So, the studied granules in amount of 5 pieces from each option have preliminarily been weighed on the electronic balance, after that they have been laid on the special trays into the muffle furnace. So, the filter elements had been stood during an hour at this temperature, after the desired temperature reaching, after which the furnace was turned off. All these granules have been weighed again, having cooled down to the room temperature. Thus, the averaged data on the filter elements' mass change have already been presented in the Table 2. As it is seen from this Table, the granules' mass loss on the sodium silicate is in 5–6 times more, than at the ETHS-40 (e.g. options 1 and 2, correspondingly). This has been conditioned by the fact, that the sodium silicate is used, in the form of the aqueous solution, but the hydrolyzed ethyl silicate (ETHS) – is used with the organic solvent. So, the version 3 peculiarity and its special feature is the aluminum powder presence in the filter material. The high level dispersion of the last one is required the bonding solution increased consumption at the granulation. Therefore, all these filter granules mass losses at 200 °C almost in 2–3 times are exceeded the similar indicator for the options 1-2.

Table 2

The Filter Elements Mass Change at Their Heating

The Filter	The Mass Change, % mass				
element	at the granules heating temperature				
(option №)	200 °C	900°C			
1	-1,40	-2,40			
2	-0,33	-0,49			
3	-2,63	+6,57			
4	-0,85	-0,85			

N o t e – the «+» and «-» signs are meant correspondingly the filter elements' mass «increase» or «decrease» at their heating.

But, at the 900 °C temperature, these granules mass, on the contrary, is being increased for 7–9% relative to the initial one that is conditioned by the aluminum powder oxidation. So, the share of the last one, in the filter material structure, can be made up 10–30%, so long as the Al₂O₃ mass approximately in 2 times more the consumed mass for the aluminum its formation, than the mass increase, due to the aluminum powder oxidation, in the limit, is quite able to be equal to the mass share of the last one in the filter material. The ceramic granules (e.g. option 4) at their heating up to $200 \,^{\circ}$ C are being lost their absorbed moisture, so their weight is left without any change at the subsequent heating.

Thus, the dilatometric measurements have been carried out at the installation, the diagram of which is given in the Fig. 1.

The installation had been mounted on the basis of the Tammann furnace 1 with the graphite heater. So, the studied filter granules 3 were laid on the bottom of the graphite shell 2, which was installed in the furnace on the support 4. The graphite rod 7 was lowered on the granule's top with the tip, in the form of the piston. Then, the weight 8, having had its mass 2 kg, was fixed on the rod. Then, the granules' heating was carried out in the inert atmosphere, for what the argon was laid up from below. The thermocouple 6 and the potentiometer 5 were used for the tests' temperature measurement. So, the BP5/20 thermocouple junction was placed in the special hole in the bottom of the graphite shell 2. The tests' maximum temperature was made up 1,580 – 1,590 °C. The granules layer initial height was made up 45 mm. The granules layer height change was fixed, by means of the registering device 9, having transformed the rod 7 linear motions into the electrical signals, on the device 10. The measurements were carried out accurate to ± 1 mm. The filter height change at the heating in the graphic form has been shown in the Fig. 2.

So, the linear dimensions increase is quite characterized for all the filter elements versions in the initial stages of the heating, due to the thermal expansion. The elements, having manufactured with using, as the bonding sodium silicate (e.g. the curve 1), have the extreme dependence of the linear dimensions change from the temperature; so, it is obvious, that the granules expansion is being stopped, and their shrink is being started at the 1,370 °C temperature. So, the sodium silicate change for the hydrolyzed ethyl silicate (ETHS-40) is prevented the granules softening and their shrinkage (e.g. the curve 2). The most linear dimensions change is characterized for the filter element from the sintered fused alumina (e.g. the curve 4). The filter element from the magnesite with the aluminum powder mixture has the characteristics, which are quite close to it (e.g. the curve 3). That is why, the last presence is prevented the filter element softening, in spite of the use, as the sodium silicate bonding.



Fig. 1. The installation diagram for the filter elements dilatometric measurements at the heating: 1 - furnace; 2 - shell; 3 - filter elements (e.g. granules); 4 - support; 5 - thermocouple; 6, 10 - potentiometers; 7 - rod; 8 - weight; 9 - transformer



Fig. 2. The filter height change at the heating:

3 = MgO + Ai poi. (on the solution sincate), $4 = \text{Ai}_2\text{O}_3$ (certainie)

Thus, the gravimetric and the dilatometric already performed researches and the studies have been shown, that the studied bonding materials use is allowed to be received the filter elements just without the high – temperature solid – phase sintering. So, it is quite necessary to be entered not less 5% aluminum powder into the fireproof and the refractory material, at the melt large masses filtration, for the purpose of the filter elements softening prevention, having manufactured with the use, as the sodium silicate bonding material.

^{1 -} MgO (on the sodium silicate); 2 - MgO (on the ethyl silicate); 3 - MgO + Al por. (on the sodium silicate); $4 - Al_2O_3$ (ceramic)

THE INULIN AND OLIGOFRUCTOSE EFFECT ON QUALITY PARAMETERS OF BIG DARK AND WHEAT BREAD FUNCTIONAL PROPERTIES

Koryachkina S.Y., Matveeva T.V., Akhmedova D.K.

FGBOU VPO «The State university is an uchebno-nauchno-proizvodstvennyy complex», Orel, e-mail: hleb@ostu.ru

To determine the expediency of inulin and oligofructose use as an additive giving the bread functional properties, the effect of inulin and oligofructose on quality parameters of big dark and wheat bread.

Keywords: inulin, oligofructose, additive, dark and wheat bread

The development of functional purpose bakery products using food fibers, obtained from readily available raw materials, that could have a positive effect on the human organism, improve the quality of the products under development, output, and thereby increase the competitiveness of products is an important task for today.

In this regard, it is expedient to use inulin and oligofructose, which are products of the processing of chicory and Jerusalem artichoke growing in the most of European regions.

The purpose of research is to develop technologies for production of wheat and rye-wheat bread of functional purpose using inulin brands Beneo HP, Beneo GR and oligofructose brand Beneo P 95.

Rye-wheat dough is prepared with a thick rye sourdough, three-phase method of the brew injection being used, wheat dough is prepared on a big thick brew. During the research, inulin and oligofructose are introduced in the powder form and in the restored form in the amount of 2,0; 3,0; 4,0% of the flour weight. To restore the powder of the inulin brand Beneo HP, one mixes it with water under the temperature of 30°C with a ratio of 1:3 to obtain a gel consistency for 5 minutes at least and one proofs the mixture obtained for 1 hour at least. The powder of the inulin brand Beneo HP being used, one mixes it with water under the temperature of 30°C with a ratio of 1:3 for 5 minutes at least and one proofs the mixture obtained for 1 hour at least. The oligofryctose brand Beneo P 95 is mixed with water under the temperature of 30°C with a ratio of 1:3 and the mixture obtained is proofed for 1 hour at least.

When preparing big dark bread, inulin (oligofructose) is injected into the brew immediately after brewing in the restored or powder form. When preparing wheat dough, inulin (oligofructose) is introduced in the restored or powder form while the brew or the dough are mixed.

Inulin and oligofructose affect on quality parameters of final products

On the grounds of laboratory test baking the conclusion was made that the best way

to introduce inulin and oligofructose for baking rye-wheat bread is to introduce these fibers in the restored form into the brew, right after brewing in the amount of 3% by weight of flour. To bake wheat bread, it is expedient to inject inulin and oligofretose in the restored form in the amount of 3% by weight of flour when kneading the dough.

These ways to add the fibers in question provide the best organoleptic and physicochemical quality of bread, much higher than in control samples. For the rye-wheat bread oven loss is reduced by 0,3% when injecting brand inulin Beneo HP, by 2,0% when you inject Beneo GR and by 1,3% when oligofructose Beneo P 95 is used. When baking wheat bread with the introduction of inulin mark Beneo HP oven loss decreases by 0,9%, when you use Beneo GR – by 1,3%, as to the use of oligofructose Beneo P 95 oven loss decreases by 2,6%.

The drying up during the preparation of ryewheat bread decreases by 1,0% when Beneo HP is used, it remains the same when you add Beneo GR, and decreases by 0,7% when Beneo P 95 being used. When preparing wheat bread with the injection of inulin brands Beneo GR and Beneo HP the drying up does not change, compared with the control sample, and the use of oligofructose Beneo P 95 makes the drying up decrease by 1,1%.

When baking rye-wheat bread with the use of brands Beneo GR, Beneo HP and Beneo P 95, one can find the bread output rising by 5,1; 5,3 and 4,7% in comparison with the control sample. When baking wheat bread, this increase is respectively 2,4; 6,6 and 11,3%.

When baking rye-wheat bread, the specific volume of bread increases by 9,0% when Beneo HP is used, by 14,1% with the injection of inulin Beneo GR and by 15,3% when using oligofructose Beneo P 95. As to wheat bread, specific volume increases by 12,8% with the injection of inulin Beneo HP, by 0,8% with the injection of inulin Beneo GR and by 7,2% with the injection of oligofructose Beneo P 95.

The samples of rye-wheat bread were subjected to further analysis samples when dietary fiber was added in the quantity of 3 % by weight of flour in the restored form into the brew just after brewing. To prepare wheat bread, one uses 3% of fiber in the restored form, the fiber being put into when mixing the dough.

On the grounds of the analysis of structural and mechanical properties of packed big dark bread crumb it was found that the addition of inulin brand GR increases the shelf life in 14 hours, the use of oligofructose Beneo P 95 – by 42 hours, and inulin brand HP – by 46 hours compared with the control sample. Injecting inulin brand GR increases the shelf life in 14 hours, the addition of oligofructose brand P 95 – in 48 hours, and inulin brand HP - in 42 hours compared with the control sample for unpacked rye-wheat bread. Using inulin brand Beneo HP and GR in the production of wheat bread leads to a reduction in the shelf life in 16 and 8 hours respectively, and as to oligofructose P 95 used, the shelf life increases in 18 hours compared with the control sample for unpacked bread. When analyzing the data obtained about packed wheat bread, the conclusion was made, that the addition of inulin brands Beneo HP and GR reduces the shelf life in 16 hours, and oligofuctose Beneo P 95 being used, the shelf life increases in 12 hours compared with the control sample.

Studying digestibility of bread, the fact that the introduction of inulin and oligofructose does not influence the digestibility of proteins was proved and, in all cases, the change in optical density (y) depending on the duration of hydrolysis (x) of extract of rye-wheat bread crumb was described with the equation:

$$y = 0,002x + 0,061,$$

when R = 0.947.

For wheat bread similar equation has the form:

$$y = 0,004x + 0,057,$$

when R = 0,994.

To characterize the aroma of bread the contents of bisulfite binding compounds in the finished bread was examined. It is clear that the content of aroma compounds increases compared with control samples, and the lower the degree of polymerization of the molecules of inulin and oligofructose is, the higher is the content of bisulfite binding compounds.

On the grounds of data obtained from determining of aerogenous ability of flour and aroma compounds in the bread, the conclusion can be made that inulin and oligofructose are partially hydrolyzed in the bread production. To state the expediency to use inulin and oligofructose as an additive that increases the content of dietary fibers in bread, the degree of hydrolisis of inulin and oligofructose molecules in the final products is determined. The results are presented on the Table.

	The residual maintenance inulin (oligofructose),%			
I he indicator name	In 100 g bread	In recalculation to 100 g flour		
The sample with using of 3 % HP:				
The big dark	1,96	2,8		
The wheaten	2,07	2,7		
The sample with using of 3 % GR:				
The big dark	1,74	2,5		
The wheaten	1,81	2,5		
The sample with using of 3 % P 95:				
The big dark	1,45	2,1		
The wheaten	1,49	2,1		

The maintenance raftiline and raftilose in bread

Despite the significantly difference in the acidity of the rye-wheat and wheat bread and different duration of the period during which the inulin (oligofructose) is under aggressive environmental conditions, their degree of hydrolysis is the same and depends on the degree of polymerization of molecule. This proves the assumption that only mono-and disaccharides are fermented in the process of mixing the dough and glucose residues at the ends of inulin and oligofructose molecules are split off, with β (2 \rightarrow 1) relationship between the molecules of anhydrofructofuranose being unaf-

fected by acid or enzymatic hydrolysis in the dough.

In determining the content of soluble and insoluble fiber in bread, the fact was found, that the use of the inulin brand Beneo HP, possessing the solubility which is less than 20 g/l, increases mainly the content of insoluble dietary fibers, and when you add the oligofructose Beneo P 95, possessing the solubility which is more than 750 g/l, the content of soluble dietary fibers increases mainly.

If you use 100 grams of rye-wheat bread daily, the need of food fibers is satisfied by

more than 30%, and using white bread, the need of soluble dietary fibers is satisfied. Consequently, the use of inulin and oligofructose is expedient for bread to be given its functional properties.

The calculation of complex quality parameter shows that despite the slight decrease in the content of some dietary factors in the test samples, when adding the inulin brands Beneo HP and Beneo GR and the oligofructose brand Beneo P 95, the complex parameter of the quality of rye-wheat bread increases in 7.3;11.2 and 12.5%, respectively, and when making wheat bread, the growth is 5.5, 3.1 and 5.5, respectively.

Reference

1. Puchkova L.I. Laboratory a practical work on technology of baking production / L.I. Puchkova. – SPb.: GIORD, 2004. – 264 p.

2. Strepiheev A.A. Bases of chemistry of high-molecular substances: the Manual for chemistry – technological specialities of HIGH SCHOOLS / A.A. Strepiheev, V.A. Derevitskaya. – M: Chemistry, 1976. – 437 p.

TECHNOLOGY OF CORN BREAD

KoryachkinA S.Y., Matveeva T.V., Kuznecova E.A., Cherepnina L.V.

FGBOU VPO «The State university is an uchebno-nauchno-proizvodstvennyy complex», Orel, e-mail: lvcherepnina@rambler.ru

The possibility of making bread from a cracked grains with triticale rich kefir starter without baking yeast cake. Experiments were carried out using varieties of triticale breeding Moscow Nemchinovsky 56, the most satisfying requirements for grain in bread making. To improve the quality of the finished product was carried out soaking the grain in the extract of coriander with cellulolytic enzyme preparation of celloviridine G20h under conditions optimal for the action of the enzyme complex of the drug. In the process of making bread using kefir starter thick, prepared with flour from whole grain triticale. The finished products were evaluated by organoleptic, physico-chemical, structural and mechanical characteristics of quality.

Keywords: grain, grain triticale, enzymes, kefir starter

Proper nutrition is one of the major factors affecting human health. It is estimated that if people rationally fed, the average life expectancy would increase by 50-70 years. Deaths from chronic diseases that is largely due to the nutritional factor in Russia is significantly higher than in most European countries and the power of the majority of the adult population does not conform to the principles of healthy eating.

In this regard, one of the objectives of State policy in the field of nutrition for the period to 2020 (the Order of the Government of the Russian Federation of October 25, 2010 № 1873-p) is to develop a package of measures aimed at reducing the incidence of diseases related to nutrition. So one of the expected outcomes of state policy in healthy nutrition is to increase the production of consumer products, fortified with vitamins and minerals, including the massive variety of bakery products, up to 40-50% of total production

Analysis of the structure of the diet of Russian population has revealed that the bread and bakery products occupy the leading place in the human diet because of the large advantages compared to all other foods. Bread has a constant, not decreasing with daily use of digestibility. Good taste and smell of fresh bread stimulates the appetite and stimulates the activity of the digestive organs. Thus, bread plays an important role in the overall physiology of nutrition.

The fact that the modern baking industry is highly developed food production, no one is beyond doubt. Indeed, currently offered to the consumer a wide range of bread, corresponding tastes of many people. Nevertheless, the world's leading manufacturers today do not just take care of the uniqueness of flavor of bread, and in the first place – the preservation of its natural components, which were originally laid in the grain.

From the standpoint of common sense, get wasted, first remove and then add. The question is: do not logical to expand the production of corn bread, obtained from a cracked corn? In addition, the grain is always cheaper than flour, since it does not include the cost of the process of grinding mills, which raises the cost of the final product. Big importance has and that grain to keep much easier, than flour.

Therefore natural that in the world becoming more common work on the creation of grain baked goods, other than a high content of dietary fiber, are a source of B vitamins, niacin, minerals, full of proteins and lipids. It is known that eating whole-grain bread helps cleanse of toxins, carcinogens and toxic substances, the normalization of metabolism, reduce cholesterol, improve bowel motility, reducing the risk of cardiovascular diseases [1].

However, statistical data release of the product groups at the present time does not exceed 15,6%. In this regard, the development of technologies of corn bread is relevant and has important theoretical and practical importance.

However, the shell and aleurone grains have high strength, which makes use of cracked corn in food technology. The strength of shells of grain β -glucan is determined, xylans and other hemicelluloses, which form cross-links in the structure of the matrix of the cell wall. To soften the grain instead of peeling the covers appropriate use of biocatalysts (enzymes) on the basis of cellulases on stage soaking grains [4].

Promising crop for expanding raw material base of the baking industry in technology grain bread is triticale. Triticale – a hybrid that combines the usefulness of the proteins from rye bread-baking properties of wheat. This cereal has a high frost resistance, resistance to fungal and viral diseases, low soil fertility for demanding, high content of valuable protein and mineral content [2].

Currently, there is used in bread making in the production of rye and rye-wheat bread technology using kefir starter, which improves the organoleptic, physico-chemical, structural and mechanical properties of the quality of the finished product, as well as to exclude the use of compressed baker's yeast [6]. The aim of this study was to investigate the possibility of making bread from a cracked grains with triticale rich kefir starter. We used a variety of triticale breeding Moscow Nemchinovsky 56, which satisfies most requirements for grain in bread [5].

Preparation of grain bread involves soaking the grain triticale prior to its swelling. To soften the shells used cellulolytic enzyme preparation of celloviridine G20h, the dosage of which the optimal parameters of triticale grain soaking in his presence have been identified experimentally. Dry grain triticale significantly Dissemination microorganisms, so in order to reduce the number of microflora of grain after soaking, wetting of lead in the presence of a preservative of natural origin – extract of coriander. The extract was prepared according to recommendations of the pharmacopoeia.

The aqueous extract of coriander is used in bread to improve the taste and aroma products, and also contains phenolic compounds, which have antiseptic and antioxidant properties [3]. It is established that the aqueous extract of coriander, used for steeping grains of triticale, contains substances that have antibacterial properties, as evidenced in Figure driven chromatogram.



Chromatogram of an aqueous extract of coriander

Chromatogram of extract of coriander contains peaks corresponding to the retention time of 2 to 5 minutes, which is characterized by the presence of organic acids. Small peaks in the chromatogram, corresponding to the retention time of 8 to 15 minutes, typical for the presence of anthocyanins in the extract [7]. These substances have antibacterial properties.

The area of peaks corresponding to the output of organic acids, is high enough, indicating that their contribution to the reduction of microbiological contamination of grain.

Analysis of experimental data (Table 1) showed the feasibility of using extract of coriander as an antiseptic on the stage of soaking the grain triticale, as the number of colonies mesophyllic aerobic and facultative anaerobic microorganisms (KMAFAnM) decreased by 55,26%, spore-forming bacteria – 91,11%, the number of fungi and yeasts decreased by 71,05%, respectively. Table 1

Effect of extract of coriander on the microbiological quality of the grain

	Number colony, sht.			
Mikrobiologicheskie	Grain	Grain,		
factors	soaked	soaked in extract		
	in water	fruit coriander		
KMAFAnM	380	170		
Sporoobrazuyuschie bacterias	45	4		
Plesnevye mush- rooms and yeast	8/30	1/10		

The dosage of the enzyme preparation celloviridine G20h was 0,11% by weight of dry matter of grain. The process of soaking

the grain triticale performed under conditions optimal for the action of the enzyme complex preparation: temperature -50 °C (in a thermostat), pH 5,0 (using citrate buffer), the duration of soaking -10 hours. After soaking the grain was ground on disperser Homogenizer 1094.

Triticale grain is characterized by increased amylolytic activity, which increases during soaking of grain. Under the action of α -amylase splits the starch with the formation of low molecular weight dextrins basically, that results in bread with sticky crumb jams. In addition, increased activity of proteolytic enzymes, whose action is in the process of preparation of the test leads to its thinning and relaxation. In this case, the most effective means of improving the quality of bread from whole-grain triticale – increasing the acidity of the test. This can be achieved using starter cultures, the addition of which reduces the activity of proteases in the test, but also reduces the temperature of inactivation of α -amylase in baking corn bread.

In this paper we propose to use in the production of corn bread from whole-grain triticale thick kefir starter. The microflora of kefir fungi starter is strong symbiosis, consisting of homo-and heterofermentative lactic acid bacteria, yeast, and fermenting lactose nesbrazhivayuschih, atsetobaktery etc. Literature data indicate the lability of the microflora of kefir starter from the influence of external factors. This unique ability, as well as the composition of the microflora of kefir starter predetermined our choice on the application of symbiotic yeast for the production of corn bread from triticale.

For the preparation of thick kefir starter used dairy kefir fungi. In razvodochnom cycle activation of yeast produced using grain concentrate from whole-grain triticale. Mass accumulation was carried out in two phases at a temperature of 32 °C by the resumption of the activated yeast nutrient mixture consisting of water and whole-grain triticale. The final acidity of the starter in razvodochnom cycle was 16 degrees. Resumption of yeast in the production cycle was carried out using the same formula, as in razvodochnom.

The resulting yeast was used for preparation of the test. It is known that the amount of yeast, made when dough has a significant impact on the performance of the process and the quality of bread. Therefore, the dosage was determined experimentally introduced starter. In the analysis of the finished corn bread was found that the best quality of different breads, made with the introduction of 50% of triticale grain with yeast. For the control sample was taken bread, made without yeast.

The fermentation test was carried out in a thermostat at 30 °C. After fermentation, the finished dough was divided into pieces weighing 350 g, which gave the elongated-oval shape with a smooth surface. Proofing the dough pieces were performed at a temperature of 38-40 °C and relative humidity of 75-80%. Endproofing was determined organoleptically as a test piece. Bake bread at 200 °C for 40-50 min.

The quality of bread were studied after 12-14 h after baking. The results of studies of the effect introduced by the starter on the quality of corn bread from whole-grain triticale on the physico-chemical quality of the finished product are shown in Table 2.

Table 2

33

	The test samples			
Characteristic	Control	Sample		
	Control	experienced		
Moisture, %	46,42	44,39		
Acidity, hail	6,0	8,2		
Specific volume, sm ³ /g	1,42	1,53		
Porosity,%	45,13	51,49		

Quality of corn bread

Analysis of experimental data showed that the use of kefir starter shortened the duration of the fermentation test, increase, compared with controls, the specific volume (to 7,75%) and porosity (at 14,09%) of bread. The specific strain of crumb compression using kefir starter is reduced to a lesser degree, compared with controls. Thus, studies have shown the possibility of using thick kefir starter for the production of corn bread from triticale with high physical and chemical indicators of quality and longer shelf life without the use of compressed baker's yeast.

Work is executed within the framework of realization of the federal having a special purpose program «The Scientific and scientific-pedagogical shots of innovative Russia on 2009-2013».

References

1. Grain bread – the bread of the future // Hleboprodukty. – 2000. – N
95. – P. 22.

2. The use of triticale in bread / L.P. Pashchenko [and others] // Proceedings of the universities. Food technology. – $2001. - N_{\odot} 2$ -3. – P. 26-29.

3. Klimov R.V. Development and evaluation of the consumer properties of syrups prophylactic purpose: abstract. ... candidate. tech. sciences: 05.18.15. – Orel, 2003. – P. 11-12.

4. Koryachkina S.Ya., Kuznecova E.A. The use of enzymes in the production of cytolytic action of whole-grain bread // Proceedings of the universities. Food technology. -2003. $-N_{\rm P}$ 4. -P 25-27.

5. Koryachkina S.Y., Kuznecova E.A., Cherepnina L.V. The use of triticale grain in the technology of corn bread // Hleboprodukty. $-2007. - N_{\odot} 5. - P. 38-39.$

6. Halaphanova L.V. Development of a symbiotic yeast – based kefir fungi for baking : dis. ... Candidate. tech. Sciences: 05.18.04. – Ulan-Ude, 2000. – 112 s.

7. Wangensteen Helle, Berit Samuelsen Anne, Malsterud Karl Edil. Antioxidant activity in exstracts from coriander // Food Chem. – 2004. – Vol. 88, №2 – P. 293–297.

s

THE INULIN AND OLIGOFRUCTOSE EFFECT ON QUALITY PARAMETERS OF BAKING PREMIUM WHEAT AND RYE FLOUR AND PRESSED BAKER'S YEAST

KoryachkinA S.Y., Matveeva T.V., Akhmedova D.K.

FGBOU VPO «The State university is an uchebno-nauchno-proizvodstvennyy complex», Orel, e-mail: lvcherepnina@rambler.ru

To determine the expediency of inulin and oligofructose use as an additive giving the bread functional properties, the effect of inulin and oligofructose on quality parameters of baking premium wheat and rye flour and pressed baker's yeast was investigated.

Keywords: inulin, oligofructose, premium wheat and rye flour, pressed baker's yeast

The development of functional purpose bakery products using food fibers, obtained from readily available raw materials, that could have a positive effect on the human organism, improve the quality of the products under development, output, and thereby increase the competitiveness of products is an important task for today.

In this regard, it is expedient to use inulin and oligofructose, which are products of the processing of chicory and Jerusalem artichoke growing in the most of European regions.

The purpose of research is to develop technologies for production of wheat and ryewheat bread of functional purpose using inulin brands Beneo HP, Beneo GR and oligofructose brand Beneo P 95 their quality parameters are resulted in the Table 1.

Table 1

The indicator name	Beneo HP	Beneo GR	Beneo P 95	
Mass fraction of solids, %	$97 \pm 1,5$	$97 \pm 1,5$	$97 \pm 1,5$	
Average degree of polymerization, g.u	> 23	от 10 до 14	от 2 до 8	
The raftiline maintenance (raftilose), % on solid	> 99,5	≥ 93,2	> 90	
The maintenance mono- and дисахаридов, % on solid	< 0,5	< 4	≤ 12	
Solubility, g/l	20 – at 25 °C 300 – at 90 °C	120 – at 25 °C 350 – at 90 °C	> 750	
Features at mixing with water	Formation of gels	Formation of suspensions	Formation of solutions	

Quality parameters of food fibers

During the study, the fact that the injection of inulin and oligofructose does not influence the quantity and quality of wheat flour gluten was established, and the content of raw gluten was 33%, readings DCO – 100.

In the investigation of the autolytic activity of wheat and rye flour in terms of «falling numbers», an increase in this indicator by 19,3–45,3% compared with the control sample was pointed out, due to the ability of inulin and oligofructose to bind up to quintuple amount of water, the viscosity of the suspension increasing.

Since the definition of «falling number» can not fully assess the the inulin and oligofructose effect on the state of amylase and carbohydrate complex of flour the nature of changes in the autolytic activity of flour and flour starch gelatinization temperature is defined.

In determining the amount of water-soluble substances formed during the heating of the water-flour suspension an increase in the number of water-soluble substances by 0–11,9% was found, which is the result of the partial solubility of inulin and oligofructose, the number of water-soluble substances increasing with higher solubility of the component injected.

To study the effect of inulin and oligofructose on the properties of flour starch, the gelatinization temperature of starch grains is defined and it is found that the addition of inulin and oligofructose does not influence the temperature of starch gelatinization, as, anyway, the swelling of starch grains starts at 75 °C, and the maximum effort with which the stock (rod) is mixing water and flour suspension is always observed at the temperature of 91,5 °C for rye flour, and at a temperature of 97 °C for wheat flour.

While examining the aerogenous ability of wheat flour it was estab-lished that the maximum aerogenesis in all samples was observed after 120 minutes of fermentation, with the samples with the introduction of 3% inulin

34

brands Beneo HP and Beneo GR to the mass of flour and 5% oligofructose Beneo P 95 having the greatest aerogenous ability. Beneo HP having been injected, the aerogenous ability of flour increased by 17,4% compared with the control sample, with Beneo GR it grew by 19,7%, while introducing oligofructose Beneo P 95 it increased by 35,6%.

The results obtained in the study of water absorption capacity of flour (Table 2) (WAC) let us say that, when injecting oligofructose with a degree of polymerization (DP) 2 to 8 m.u., rye flour WAC remained the same, and wheat flour WAC decreased by 2,3%, when using inulin brand Beneo GR with DP from 10 to 14 m.u. rye and wheat flour WAC didn't change. Inulin brand Beneo HP with a degree of polymerization above 23 m.u. being injected, rye flour WAC increases by 2,7% and wheat flour WAC grows by 2,6%.

Table 2

The indicator name	WAC, (ml)	Dough formation time, (mines)	Dough stability, (mines)	Dough resist- ibility (firmness), (B+C, mines)	Dough elasticity (D, mm)
Rye flour	86,5	5,5	13,0	18,5	2,0
Rye flour with the introduction of 3% Beneo HP		5,5	14,0	19,5	1,5
Rye flour with the introduction of 3% Beneo GR		6,0	12,0	18,0	1,5
Rye flour with the introduction of 3 % Beneo P 95		6,5	11,0	17,5	2,0
Baking premium wheat flour		1,0	31,0	32,0	52,0
Baking premium wheat flour with the introduction of 3% Beneo HP		1,0	29,0	30,0	40,0
Baking premium wheat flour with the introduction of 3% Beneo GR		1,0	33,0	34,0	52,0
Baking premium wheat flour with the introduction of 3% Beneo P 95	59,3	1,0	31,0	33,0	56,0

The results obtained in the study of farinograms

It is established that the addition of inulin and oligofructose does not influence the quantity and the physiological state of yeast cells, as in all the samples of activated yeast the quantity of the yeast cells varied from $3450 \cdot 10^6$ to $5650 \cdot 10^6$ while the quantity of dead cells with glycogen being within the limits of $68 \cdot 10^3 - 135 \cdot 10^3$ in 1 g of yeast.

Based on the data obtained, one could find that the addition of inulin and oligofructose affects only the rate of aerogenous ability and water absorption capacity of flour, while the other indicators of the main raw materials remain the same.

Reference

1. Koryachkin V.P. Physicomechanical properties of raw materials and finished goods: a laboratory practical work. – Oryol: OryolSTU, 2001. – 74 p.

2. Maximov A.S. Laboratory a practical work on a rheology of raw materials, semifinished products and finished articles of baking, confectionery and macaroni manufactures / A.S. Maximov, V.J. Chernyh. – M.: Publishing complex MSUFT, 2004. – 163 p.

3. Puchkova L.I. Laboratory a practical work on technology of baking production. – SPb.: GIORD, 2004. – 264 p.

Materials of Conferences

THE BRITTLE MATERIALS DESTRUCTION GEOTECHNOLOGICAL PECULIARITIES WITH THE PLASTIC MATERIALS AND SUBSTANCES APPLICATION IN THE SHOCK REGIME

Tzygankov D.A. Novosibirsk, e-mail: dmtsygankov@fastmail.fm

Thus, the conducted researches complex on the natural stone destruction technology development with the plastic materials and the substances application in their shock impact displacement regime from the blast holes into the generated and the formed cracks has been permitted to be set the following scientific position: «The blast holes dimensions, the orientation, the location, and their quantity in the splitting plane are being defined by the cracks shock loading parameters, by the rocks mechanical – physically properties and characteristics, and the applied plastic materials and the substances rheological properties».

For all this, it has been determined, that the applied instrument impact energy, the generated and the formed crack dimensions, the distance between the filled and the empty blast holes, and also their quantity in the line of the splitting in the crack formation along the blast hole's axis are defined by the blast hole diameter and its length. So, the same indices are defined at the crack generation and its formation in the brittle materials and the substances perpendicular to the blast hole's axis to its diameter, in combination with the length, with the exception, that the empty blast holes are not applied.

So, it is necessary to be used the natural stone impact fracture technology with the plastic materials and the substances application, together with the well – known technologies, with regard to the specific and the particular monolith (e.g. the block). This is quite true for the rocks of any strength. For all this, the planes, in which the breaking is performed with the plastic materials and the substances application, are coincided with those, in which the quite other breaking blast hole's methods are applied.

So, the natural stone impact fracture technology use with the plastic materials and the substances application, due to the empty blast holes use, will be connected with the labor productivity increase, with the production activities labor intensity decrease, and with the solid wastes output, and also with the lower cost units and the blocks rescued, at the expense of the cheap materials and the equipment application with the low maintenance costs. So, the natural stone impact fracture technology use, with the plastic materials and the substances application, will be resulted in the security general increase, and in the works conducting hazards reduction.

As a result of the theoretical and the experimental researches cycle completion on the validation the natural stone impact fracture technology application planes with the plastic materials and the substances use at their displacement along and across the blast holes axes, the following scientific position has been set: «The natural stone destruction with the with the plastic materials and the substances application at their displacement along the blast hole axis is practically applied in the vertical plane of the splitting with the crack size, having defined by the volume embedded the plastic material and the substance into it, across it - in the horizontal one with the crack size, which is additionally defined by the destruction pressure transmission distance, having depended on the batter block height».

So, the conducted works examples have been shown the natural stone impact fracture technology application possibility with the plastic materials and the substances use in the different fields and the various areas – as in the mining, as well in the construction and the building, when in the second case, the conditions and the requirements to the final result are less complex.

For all this, it has been proved, for example, the marbled limestone blocks breaking, that the natural stone impact fracture technology with the plastic materials and the substances application under conditions of the large natural fracturing or the artificial cracking is able to be provided the rocks breaking sawing methods alternative in the presence of the hard rocks inclusions in them.

So, the crack configuration formation laws and regularities determination challenges, the plastic material and the substance propagation in it, as well as the relationships with the impact energy with them have been solved in the works complex, having conducted by the author's report. For all this, the natural stone breaking technology has been developed with the plastic materials and the substances application in their shock impact displacement regime from the blast holes into the generated and the formed cracks, as well as its application planes at the blocks breaking have experimentally and theoretically been proved. So, the work and the report have been directed at the mineral resources deposits development efficiency improvement challenge solving, at the expense of the technology development, having based on the rocks massif destruction and the fracture geomechanical characteristics, the peculiarities, and the special features knowledge with the plastic materials and the substances application. For all this, the following basic scientific

and the practical results have already been received and obtained:

1. It has been found and established, that the distance between the crack boundary and the zone boundary of its filling by the plastic material and the substance is depended on its delivery, on the flow rate regime, and the rheological properties, as well as on the destructible rocks mechanical – physically properties.

2. It has been proved, that the brittle materials destruction the perspective diagrams and the promising circuits are quite needed to be considered their further displacement along and across blast holes axes in the dynamical or in the quasi – static regime. For all this, for the long cracks of the required sizes creation with the plastic materials and the substances application, because of the forces absence, having resulted in the crack surface curvature with the increase its sizes, instead of the single blast hole, is quite be able to be applied their combination of them just in the one line.

3. It has been established, as a result of the laboratory experiments conducting, that for the correct form cracks generation and their formation with the smooth surfaces, it is necessary the plastic materials and the substances fixed flow rates provision at its displacement from the blast hole into the generated and the formed crack in the small (e.g. up to 150 mm³/sec.) value.

4. It has been clarified at the laboratory experiments on the blocks from the organic glass, that the plastic material and the substance, having found in the crack, and having caught into it, as a result of the dynamical injection, it is accumulated the pressure. So, this pressure is able to be kept in it during several days and nights, and it is the samples and the specimens further spontaneous fracture and the destruction reason.

5. It has been established, that the crack preferential growth is observed in the direction of this load application, in the case of the external load application to the destructive pattern and the specimen (e.g. the rock pressure presence), and the distance between the crack boundary and its zone edge of the plastic filling material and the substance is constantly increased, regardless this load application direction or its availability.

6. This calculation is quite able to be carried out, as the quasi – static one, under condition of the low flow rates (e.g. up to 150 mm³/sec.) of the plastic material and the substance in their destruction, due to the brittle materials and the substances fracture dynamical calculations absence by the plastic materials and the substances with the sufficient degree of the accuracy. For all this, it is able to be destroyed any well – known rocks strength (e.g. $\sigma_p = 80$ MPa) with the plastic materials and the substances use.

7. Due to the fact, that the pressure distribution in the plastic material and the substance is taken its place by the decreasing dependence, the process starting and the continuation possibility of the cross crack further development, having generated and formed at the level of the blast hole bottom, will be connected with the instrument use need, with bigger impact energy, in comparison with the longitudinal crack and the fissure, consistently, having generated and formed along the blast hole entire length, having started from its mouth.

8. The preference should be given to the instruments, having had at the same impact energy, the lower frequency, due to the fact, that the pressure, having generated and accumulated in the plastic material and the substance, and, having underachieved to be redistributed (e.g. to be decreased), is resisted physically the re-entering pressure transfer, and, thus, it is prevented the fragile material and the brittle substance further destruction.

9. It has been established, that the blast hole's diameter and its length is determined by the applied instrument impact energy, the crack generated and the formed size, the distance between the filled and the empty blast holes, as well as their number in the splitting line at the crack generation and the further formation along the blast hole axis. So, the same parameters and the indices are determined at the crack formation in the brittle material and the substance across the blast hole's axis to its diameter in the combination with the length, except to the fact, that the empty blast holes are not practically applied.

10. The natural stone impact fracture technology use with the plastic materials and the substances application, due to the empty blast holes use, will be connected with the labor productivity increase, with the production activities labor intensity decrease, and with the solid wastes output, and also with the lower cost units and the blocks rescued, at the expense of the cheap materials and the equipment application with the low maintenance costs. So, the natural stone impact fracture technology use, with the plastic materials and the substances application, will be resulted in the security general increase, and in the works conducting hazards reduction.

11. In comparison with the same bore wedge drilling method, the brittle materials and the substances directed fracture method advantages with the plastic materials and the substances application are concluded in the following ability: the blast holes length and the number reduction in the proposed splits planes; the solid wastes output reduction of the main production, at the expense of the splitting surfaces curvature reduction in the dorsal planes; the blast holes mouth parts shape maintaining; the commercially produced percussion instrument of another major destination application with its insignificant adaptation. In comparison with the similar method of the powdery destruction NEDM (e.g. the non - explosive destructive means), its advantages are concluded in the fact, that: it does not require the sealing of the horizontal blast holes mouths; it practically permits the plastic materials and the substances are able to be got into the cracks, and to be transferred the efforts on their walls; it allows the plastic substances and the materials to be introduced in any volume; it can regulate the application temperature regime, being used in combination with the different and the various additives; it provides the best technical and the sanitary conditions of the works performance.

The work is submitted to the International Scientific Conference «Problems of international integration of national educational standards», France (Paris), 15-22 March, 2012, came to the editorial office on 13.01.2012.

USING OPTIMIZATION METHODS SOME NONLINEAR MODEL

Zhunussova L.K.

Kazakh National Pedagogical University named after Abai, Almaty, e-mail: khafizovna 66@mail.ru

The World of the mathematical models of the phenomena's of the a live world inexhaustible, either as world of the living beings itself. However as in biologics as united theory emerges the theories to molecular biology and evolutions, revealing unity to generalities of the biological phenomena's, so and in biomathematics gradually drawn the general approaches, which will reveal essence main mechanism biological processes, acta a sing powerful ally to experimental biology.

To persisting moment mathematical methods got into most area miscellaneous theoretical and applied ecology: analysis of the relations type in community, study of the processes to migration, territorial behavior, analysis flow material and energy in ecosystems, problems to difficulties and stability community, estimations of the influence different anthropogenous factor on natural systems, problems optimum exploration populations.

At modeling ecological and other natural systems we face with the following circumstance: than for big period necessary to predict importance a parameter conditions surrounding ambiences under fixed accuracy of their description and upper frequency of the smoothing, that greater number interacting processes to us necessary to take into consideration at study of the operations.

The principle optimality pertains to biological process, which is formulated as follows: biological structure or process must be optimum to the extent that that alive organisms, staying it is enough longlasting time in determined condition, as a result of actions of the natural selection must gain the signs optimum for these conditions.

The processes, occurring in nervous system animal under that or other its action, possible research with different standpoint. Possible consider functioning the concrete structures of the brain, distribution agitated and dullard neuron in them. Possible, however, expect that all this only facility for realization of the certain procedures, providing as a result that or other behavior animal.

The processes in nervous system can have different physical, biochemical or the other nature. Each of they are realized certain physical controlling system.

Three types distinguish at study behavior:

1) instincts;

- 2) reflexes;
- 3) elementary rational activity.

Here the most typical characteristic to elementary rational activity animal is their ability to catch protozoa laws surrounding ambiences and handle these law at building of the algorithm of the behavior in new situation.

Greatly herewith that behaviour, founded on elementary rational activity, is seen already under the first meeting the organism with extraordinary situation, created in ambience its dwelling.

The problem speakers to number to populations occupies the special place in mathematical modeling of the biology.

Any ecosystem consists of population of one type, chosen in space that or other insulating barrier, which interact between itself, as well as surrounding their ambience. Most idle time description to populations – a description speakers to its number or biomasses forming its organism.

When we move to level экосистемы, that we produce the simplifying operation: we describe the speaker a community through speaker of the number or biomasses forming its populations. In spite of the fact that these values discrete, we their consider unceasing and describe their speaker unceasing value available continuously at time and in space. Certainly, such description there is abstraction, and we risk to lose some real existing characteristic of the system.

The Analytical models do qualitative information on behavior, about nature of the operation biological community and ecological systems. But these models in a complicated way to require that they gave the quantitative forecast of the behavior real ecosystem.

Correlation is shown In work between physical controlling system and their mathematical model, so named controlling system – one controlling system can be described whole class different physical controlling systems [1].

Herewith, important importance for ecology and practical problems to usages and governing the population has a study speakers age composition to populations [1].

The quantitative nature struggle for existence reveals itself in given ambience in the manner of change the number individual, forming population miscellaneous. Under one condition of these change consist of fluctuation around average importances, under the other condition it is reduced to disappearance or progressing increase some type. Of course, exists periodic changing condition of the ambience, hanging from time of the year, which generate the compelled fluctuations to number individual different type [2].

In persisting work is researched track record of the models ecosystem. by means of optimum management with provision for factor delay. In this instance functional Bolts' special type is formed with participation first integral unadjusted part of system with delay:

$$\frac{dx}{dt} = f(x(t-h), t) + B(x, t)u, \ t \in [t_0, T].$$
(1)

The initial condition of the system is given:

$$\frac{dx}{dt} = f(x(t-h), t),$$

где x - n – measured vector of a condition; u - m – measured vector of management; f(x(t - h), t) - n – measured vector function; h – delay factor; $B(x, t) - n \cdot m$ – маtrix. On management u(t), $t \in [t_0, T]$ following restriction is imposed:

$$|u_j(t)| \le M_j, M_j = \text{const} > 0.$$
 (2)

Necessary to find such operated u(t), $t \in [t_0, T]$ vector-function, satisfying restrictions (2) which minimized functional Bolts'.

The decision given problems is concluded in determination importance functions of management in analytical type. For this use the method, offered in work [3, 4, 5].

Historically application of the mathematical methods in ecologies contained basically dynamic

theory population, which, having begun with use the device of the common differential equations, handles presently all facility to modern theory of the dynamic systems.

References

1. Kolesov A.J. Relaksacionnye fluctuations in mathematical model ekologii // Trudy MIRAN. – M.: Nauka, 1993. – P. 6-72.

2. Volterrra V. Mathematical theory fight for existence. – M.: Nauka, 1976. – 288 p.

3. Bajgelov K.Z., Biarov T.H., Zhumagulov B.T. Optimization of the biological system at presence restriction on management. – Almaty: the Prepnint of news RK 1993. – №4. – 23 p.

4. Biarov T.N., Zhunussova L.K. Reports national academy of sciences Kazakhstan. – 2005. – №2. – P. 54-59.

5. Zhunussova L.K. Mathematical journal. – 2010. – Vol. 10, №1(35). – P. 47-51.

6. Mathematical theories of optimal processes / L.S. Pontryagin, V.G. Boltyansky, Z.V. Golikrelidze, E.F. Mischenko. – M.: Science, 1976. – 392 p.

7. Smagulov S.S., Biyarov T.N., Baigelov K.Z. Synthesis of optimal systems of management with the limited resource // Vestnik AS KazUSR. – 1991. – №2. – P. 63-69.

8. Bellman R., Glinsberg I., Grosse O. Sone problems of the mathematical theory of processes of board. – M.: IL, 1962. – 336 p.

9. Karmanov B.G. Mathematical programming. – M.: Nauka, 1975.

The work is submitted to the International Scientific Conference «Computer simulations in science and technology», Andorra, 9-16 March, 2012, came to the editorial office on 07.02.2012.

MOBILE SOLUTIONS FOR ENVIRONMENTAL MONITORING OF WATER BODIES: HARDWARE, SOFTWARE AND COMPUTER MODELING

Bobyrev S.V., Tikhomirova E.I., Podolsky A.L., Uglanov N.A., Markina T.A., Anokhina T.V. Saratov State Technical University, Saratov, e-mail: tichomirova ei@mail.ru

Ecological monitoring is an integral part of the system of decision-making related to ecosystem management [1]. Therefore, it is necessary to measure the environmental variables of interest to ensure the effectiveness of the natural resource management.

We chose mobile solutions based on the principle of remote sensing [2] as a main feature for the newly developed system of environmental monitoring of water bodies. In this system, the database is distributed between the mobile computer and stationary server. Incoming information is generated through a system of sensors that have an interface to connect to the computer. For sensors that do not have such interface, we developed the paring devices and relevant device drivers for the transmission of information. Using highly integrated elements for developing the hardware system made the system small and easily configurable. Sensors are connected to the computer by means of USB-2 or wireless interface. Functioning of the described system allows accomplishing the following tasks:

1. Creating a vector map of the region representing all water bodies in the region with high accuracy, using the ArcGIS-type software to address geographic information tasks and to present the solutions of these tasks in common formats.

2. Compiling the databases containing all important variable on the basis of the vector map along with the data obtained from other specialized organizations and in our own research.

3. Creating a knowledge base reflecting the patterns and relationships among the processes affecting the performance of water bodies on the basis of the hydrological regime dynamics studies.

4. Establishing an expert system producing practical recommendations on business solutions concerning rational water resource management in the region on the basis of the above knowledge base.

The goal of our computer modeling approach was to define the influence of water levels on the configuration of the shallow parts in the Volgograd Reservoir. Background information used to build the model was a vector map of the Volgograd Reservoir with isobaths. The main type of such maps is a navigation map. However, navigation maps deal primarily with fairway tracks. We were mainly interested in coastal swamps and meadows along with shallow waterways and floodplain forests. That is why, prior to building a model, we supplemented the navigation map with depth measurements at the points of interest. These areas are located mainly in the upper part of the reservoir, in the Saratov region. Measurements were made from a recreational craft equipped with an echo sounder, GPS Navigator and a Locarus device. All digital and analog gauges were connected to Locarus, and measurement data were transmitted via Internet to the server with the software converting the monitoring results into data formats compatible with a computing mathematical model.

We selected a function of two variables of the second order as a mathematical model of the riverbed topography:

$$Z = a_{20}x^{2} + a_{02}y^{2} + a_{11}xy + a_{10}x + a_{01}y + a_{00}.$$

Where Z is depth, x and y are the coordinates of sampling points, and $a_{i,j}$ are the coefficients determined by the simulation.

Second order in the equation allows eliminating the extremes and also generates sufficiently smooth function describing configuration of the water reservoir bottom, which in its shallow parts is smoothed out by years of sedimentation. Configuration of water surfaces of the modeled areas of the reservoir was represented by the horizontal crosssection of the function describing the topography of the riverbed. The model describes how water surface configuration depends on water levels and specifies the critical values corresponding to the beginning of flooding. Also, the modeling results can be used for calculation of thermo-clines and computing the concentrations of dissolved gases in water (e.g. oxygen).

References

1. Burden F.R. Environmental Monitoring Handbook. – McGraw-Hill Professional, 2002. – 1100 p.

2. Ustin S. Manual of Remote Sensing, Remote Sensing for Natural Resource Management and Environmental Monitoring. – New York: John Wiley & Sons, 2004. – 768 p.

The work is submitted to the International Scientific Conference «Current problems of environmental pollution», Canary Islands (island of Tenerife), 9-16 March 2012, came to the editorial office on 07.02.2012.

PROBLEMS AND PROSPECTS FOR ECOTOURISM IN PRIMORYE

Potekhina E.

Vladivostok State University of Economics and Service, Vladivostok, e-mail: pes.66@mail.ru

Today the term «ecotourism» is often used by travel agencies and experts for defining activity connected with the use of natural landscapes and objects. It is possible to name some large-scale projects in this field: development of rural tourism, ecotourism in natural reserves, excursions of scientific conferences etc. The word combination «ecological tourism» began to apply widely in the world in the early eighties.

Ecotourism differs from traditional tourism in the following ways (by Petrasov I.N.):

• use of natural objects for tourism;

• smaller resource and power intensity;

• direct influence on social and economic development of territories;

• an essential role of ecological education and enlightenment of tourists;

• aiming at steady nature management.

In the conditions of development of the modern world ecotourism can and should become serious business. Tendencies toward it have already been observed. Experts on ecotourism counted that in 1988 there were from 157 to 236 million ecotourists in the world of which 79–157 million were ready for travel in the wild reserves and to national parks.

However in our country tourism development in Nature Reserves contravenes the legislation of the Russian Federation. Such tourism is possible only in natural and national parks. At the same time the quantity of reserves in Russia and their vast area make it quite possible to visit by curious tourists.

Nature Reserves have great financial difficulties; so ecotourism development could solve a number of problems, providing the salaries of employees, the purchasing of materials and equipment, and finally, protection from poachers. For inhabitants of regions where reserves are located, ecotourism would create conditions for additional earnings, the selling of souvenirs, foodstuff etc. to tourists.

Travel agencies of the Far East consider that the ecotourism is an unprofitable field of activity. Having compared these estimations with the WTO (World Trade Organization) data, we see that in 1988 ecotourism in the national income of the various member states brought in from 93 to 233 billion dollars.

Demand for ecotourism is quickly growing. In the next years territories in which virgin nature remains where the quality of the environment is guaranteed by its «wildness», the primitiveness of the natural landscapes become the centers of development of ecotourism. Primorsky Kray has many such landscapes.

Developing the ecology economically depends on authorities at every level. Only this can stop the uncivilized plunder of natural resources in the region which we observe today. Developing ecotourism it is incorrect to focus on the foreign tourist first of all. For a sustainable development of this kind of activity it is necessary to work actively on the domestic market and the market of the Commonwealth of Independent States (CIS)

Usually especially protected territories are noncompetitive, and therefore have a modest budget. In agricultural areas there is inefficient economic activity in agricultural areas. For example, in Lazovsky region of Primorye 30% of land transferred to the possession of peasant farmers turned out to be abandoned because of the unprofitability of working it, – there is nobody to buy its production.

Today ecotourism has fallen to 10% of world GDP (Gross Domestic Product). Meanwhile Russia is on one of the last places for this kind of activity. The priority in programs of many regions of our country including Primorsky Kray, should be ecotourism development. The main thing is to create a positive image of our region in the mass media, to publicize information about the sights of our region. All these will promote an increase of tourism. A similar strategy has allowed the Botanical Garden in Vladivostok to increase visitors for the last three years by five times, and increase receipt in the offbudget fund by ten times.

Ecotourism can become an alternative to logging and poaching. With ecotourism the rate of deforestation should decrease and forests will revive. Now progress in the field of ecological tourism in Primorsky Territory is taking place. However this progress is still too slow to begin to solve this problem.

Ecotourism development can go in two ways:

• development of protected territories as objects of ecotourism;

• development of a network of ecological routes on the landscapes which have been not disturbed by economical activities.

Now ecotourism is developing in specially protected natural territories of Primorsky Kray.

Nature Reserves appeal specially attention to foreign tourists. In this case they can be objects of a special kind of ecotourism – so-called scientific tourism for scientists.

Today travel agencies in Primorsky Kray offer more than 100 diverse routes using natural landscapes to some extent. However, it is impossible to call such tourism «wild» for the following reasons:

• There is no established way to get tourists or scientists to the territory where the routes are.

• There is no accurate planning of tourism; formation of groups occurs casually; they aren't yet organized very well by anybody.

• There is no exact calculation the costs involved in ecotourism, or the planned profit expected. Hereupon tour tariffs are either too low. And therefore are unprofitable, or overpriced, and therefore aren't in demand.

• There are no capital investments in ecotourism development, financial recourses aren't remitted either for the restoration of ecosystems, nor for infrastructure development.

Thereon it is possible to assert that ecological tourism in Primorye isn't a technologically advanced business; there is no efficient organization or economical management.

The general economic crisis of these years has essentially affected the structure and dynamics of tourism in Primorsky Kray: the demand for travelling in the country has gone down and the demand for foreign trips, mainly, to China and Korea has increased. Small private tourist firms have actively joined in the marketing and management of shopping tours both in big cities, and in provinces. Ecotourism stopped at the beginning of its formation, having been reduced to a small stream of foreign tourists in Primorsky Kray.

Thus, socioeconomic factors of the last years didn't promote development of ecological tourism.

But today Primorsky Kray has a complex of natural conditions helping out the region as a potential leader of ecotourism activity. Tourism resources of Primorsky Kray are distinguished by the high variety and aesthetic attractiveness of natural landscapes; various recreation resources and unique ecosystems.

The nature of Primorye is a unique contrast of relief and biodiversity. Primorsky Kray has 186 caves (this compares to Japan where there are only 79 caves), and more than 70 bays, which are good for diving and walks. There are a lot of sandy beaches and water areas for walks, sea crafts, the savage taiga, lakes and medicinal mineral spas here.

The global value of ecotourism has in its favour the protection of rare and disappearing ecosystems. This makes it possible for local communities to define ways of development and to receive benefit from tourism activity in the sphere of ecotourism. Tourism business is one of the most winning kinds of business. Primorye is a region of prospective tourism whose ecological potential isn't used.

Thus, today it is extremely necessary to work out an effective regional policy to develop and publicize tourism individually in each region. It is necessary to create special state and regional programs for the development of ecotourism and to finance its development. For our region with its unique natural and cultural tourism resources it is necessary to implement special government and regional programs of ecotourism development and at the initial stage to finance its development from the government budget.

The work is submitted to the International Conference on Electronic, came to the editorial office on 05.03.2012.

Materials of Conferences

GEOECOLOGICAL MONITORING OF PETROLEUM REGIONS AND INFLUENCE OF GEODYNAMICS ON ENVIRONMENT

Kopylov I.S.

Perm state national research university, Perm, e-mail: georif@yandex.ru

Monitoring of an ecological condition of environment petroleum regions is one of the major problems at their development, for the purpose of safe development and carrying out of a policy of environmental management. Oil and gas bearing areas of Eastern Siberia throughout 40 years are studied by methods of geochemical and geoecological researches and mappings. In Krasnovarsk region within 20 years the regional ecological monitoring which monitoring system includes waterways, springs, soils, vegetation, air, snow, geodynamic processes, Boreholes is carried out. At development of oil and gas deposits the basic technogenic influence on environment, especially on soils, surface and underground waters render geological prospecting, geological exploration and oilgas-field objects. Environment undergoes the strongest influence as a result of development of the Urubcheno-Tokhomskoe field - the largest in Eastern Siberia. In soils technogenic anomalies, especially are revealed on: Pb, Cu, Cr, Ti, Ba, Mn, Co, and also Ni, Zr, V, P, Ga, Sr. In waters of the rivers on drilling areas steady hydrogeochemical anomalies were generated, average values of a mineralization and the basic components are increased in 1,5-4 times. Large anomalies

are established on: Co, Be, Br, In, Pb, Ni, Ba, Li, Cd, Sr, Ti, Mn. Concentration Br in some springs and the rivers exceeds maximum concentration limit in hundreds times.

Except anthropogenous influence on environment, a considerable role play the geological factors caused by geodynamic, structurally-tectonic, neotectonic processes. Last years geoecological, ecological and geodynamical, engineering and geological conditions are studied by space geological methods on the basis of modern digital space pictures and computer technologies of interpretation. The numerous geodynamic active zones caused by intensity of tectonic cracks and high density of lineaments are allocated ten thousand tectonic lineaments, and also. The complex lineamentno-geodynamic and geochemical analysis shows on dependence of formation of many geochemical anomalies on tectonic infringements and geodynamic active zones. This law, characteristic and for others oil and gas bearing regions - Western Siberia, the Volga- Ural basin, the Timano-Pechora basin, shows for geodynamics leading part along with oil-field tehnogenesis in processes of pollution of environment. Therefore methods of studying of modern geodynamics should be obligatory at carrying out of ecological monitoring for any petroleum regions.

The work is submitted to the International Scientific Conference «Problems of ecological monitoring», Italy (Rome-Florence), 10-17 April 2012, came to the editorial office on 28.02.2012.

Materials of Conferences

LINEAR PARAMETERS OF ASYMMETRIC UPPER DENT-ALVEOLAR ARCHES CONDITIONAL BY UNILATERAL EXTRACTION OF THE FIRST PREMOLAR

Dmitrienko S.V., Ivanova O.P., Vologina M.V., Kovalev M.O., Sevastyanov A.V., Berdin V.V. Volgograd State Medical University, Volgograd, e-mail: svdmitrienko@volgmed.ru

For asymmetry of teeth arc that is defined by single-side removal of the first premolar non-symmetric placement of anti-measures is character, that is reflected in the main linear parameters of the complete and incomplete side of arc.

The objective of the research is to define linear parameters of asymmetric dent-alveolar arcs, defined by the lack of anti-measure for one of premolars on the upper jaw under normadentism of constant teeth and mesognatic shape of dent-alveolar arcs.

We have carried out a biometric study of 17 jaw models, obtained from patients of both sexes of the fist maturity period after orthodontic treatment with single-side removal of the first premolar of the upper jaw. Measures of the both arc sides we taken, one of them was named complete, and another – incomplete (with lack of one of premolars) without signs of laterality.

To define main parameters of the main frontal point, located in contact place of medial cutting teeth of the upper jaw near the cutting edge, we have placed a perpendicular to the line that links distal surfaces of the second molars. This line was called as «sagittal arc line». From the centre of the distal surface of each tooth we have placed a perpendicular to the sagittal arc line, it allowed us to measure transversal (W) and sagittal (D) parameters of arcs. Frontal-distal diagonal of dent-alveolar arc (FD) was measured from the frontal point to the point, located at the centre of distal surface of a certain tooth.

The results have shown that in the front arc department the size of frontal-distal diagonal didn't have any signs of laterality and, in general, equaled $22,7 \pm 1,94$ mm. At the same time, arc depth up to the fang level at the complete side was shorter by about $4,2 \pm 1,21$ mm, and arc width was bigger by $2,8 \pm 0,93$ mm.

The most evident alterations took place in the area of chewing teeth. Frontal-distal diagonal at the complete arc side was bigger by $4,6 \pm 0,82$ mm, up to the level of constant molars – by $4,3 \pm 0,95$ mm, and up to the second molars – by $3,1 \pm 0,79$ mm, it was conditioned by mesial shift of chewing teeth to the defect.

The width of dent-alveolar arc at the complete side up to second premolars equaled $22,3 \pm 2,4$ mm, to first constant molars $-24,8 \pm 2,6$ mm, to second molars $-28,75 \pm 2,5$ mm the width of dent-alveolr arc of the incomplete side to second premolars

equaled $18,35 \pm 1,9$ mm, to fist constant premolars – $19,6 \pm 2,3$ mm, to second molars – $21,8 \pm 2,4$ mm. Besides, the depth of dent-alveolar arc at the complete side was smaller than it was at the incomplete side, that was conditioned by an asymmetric shape of dent-alveolar arc.

Thus, we have outlined reliable differences of the main parameters of dent-alveolar arcs on both complete and incomplete sides.

The work is submitted to the Scientific International Conference «Innovative Medical Technologies», France (Paris), 15-22 March 2012, came to the editorial office on 14.02.2012.

THE POSTEXTRACTIONAL SPACES ALVEOLAR CREST AUGMENTATION BEFORE THE ORTHODONTIC TREATMENT

Dmitrienko S.V., Vologina M.V., Kovalev M.O., Ivanova O.P., Sevastyanov A.V., Klimova N.N.

The Volgograd State Medical University, Volgograd, e-mail: svdmitrienko@volgmed.ru

At present, the osteoplastic materials application field is quite the different and diverse one – from the bone defects filling just after the teeth extraction before the implantation, up to the osteo – replacing operations, for the purpose of the bone tissue regeneration accelerating. However, we have not yet met the necessary information on the alveolar process augmentation at the stage of the orthodontic treatment with the following permanent teeth removal in the modern literature.

In this connection, we have offered to be formed the postextractional spaces, simultaneously, with the tooth extraction by the orthodontic indications. So, to do this, we have performed the alveolus gentle curettage after the tooth removal, then we have filled the alveolus with the dense biomaterial (e.g. the osteomatrix, the biomatrix, the bioimplant, the kolapol-kp, the blood plasma), we have put in the stitches and have inserted the sutures upon the mucous membrane and the periosteum. We have distributed the biomaterial by the vestibular, the lingual or the palatal bone surface for the further alveolar arch widening, the bone contour correction, besides the dense biomaterial filling, then we closed and repaired the wound, and, after that, we have mobilized the mucous membrane. Moreover, we have created the orthodontic load a month (e.g. 30 days and nights) just after the augmentation conducting.

Thus, the patients had been divided into the 2 groups: the patients, for whom the postextractional spaces have been formed just after the tooth extraction by the different and the various methods, entered into the *first* (e.g. *or the basic*) group. So, the patients of *the second* group refused from the offered surgical correction methods, and then, the orthodontic treatment by the generally accepted methods has been conducted for them.

So, the bone tissue loss has been evaluated, as in the vertical, well as in the vestibular – lingual directions.

So, the obtained research results had been shown, that the postextractional spaces alveolar crest defect size in the *first* group was made up $0,19 \pm 0,11$ mm in the vertical direction; it was made up $0,9 \pm 0,12$ mm in the vestibular one, and it was made up $0,78 \pm 0,11$ mm in the lingual one. At the time, as all these indices had been made up in the *comparison* group: $2,95 \pm 0,5$; $1,9 \pm 0,23$ and $2,05 \pm 0,26$ mm, correspondingly. Thus, the defect size at the patients of the *basis* group was quite less, than in the *comparison* group.

The work is submitted to the Scientific International Conference «Innovative Medical Technologies», France (Paris), 15-22 March 2012, came to the editorial office on 14.02.2012.

GASTROENTEROLOGICAL PATHOLOGY OF CHILDREN WITH GOITER

Parakhonsky A.P.

Kuban medical institute, Krasnodar, e-mail: para.path@mail.ru

In clinical practice plenty enough of information is accumulated that deficit of thyroidin hormones be what degree negatively influences on child's organism, is the factor of high risk of violation of growth and development for children, forming of chronic pathology and growth of socially meaningful illnesses. Consequently high-frequency of endemic goiter among child's population and decline of function of thyroid gland subject to the condition iodine deficit show by itself a serious threat to the somatic (specifically gastrointestinal tracts) and psychical health. As Kuban behaves to territories with the deficit of iodine, remonitoring of deficiency iodine diseases for children that development of modern approaches to their prophylaxis is both social and medical the issue of the day. To examine prevalence and structure of gastroenterological pathology of children with goiter. The program of inspection foresaw the statistical analysis of school age children's case report with pathology of gastrointestinal tract, with the selection of clinically instrumental and laboratory researches. Determination of concentration of iodine in urine of children from the different climate-geographical areas of Kuban showed that in most children excretion of iodine with urine is reduced. General frequency of goiter for the children of Kuban from data of palpation research is 53,3% of degree prevails for girls, for certain high-frequency of goiter and predominance of his heavy degrees it is registered for

the children of mountain area of dwelling. 34,6% children of basic group (with the different degrees of goiter) were characterized the changes of indexes of thyroid type of, which go out outside age-old parameters, 18,8% have signs of subclinical hypothyroidism. Children from the mountain area of dwelling had the most wide vibrations of maintenance of hormones of the hypophysial-thyroid system. In the structure of gastroenterological pathology among children with the goiter of 1-2 degrees first place has chronic gastroduodenitis - 86,6%. Characteristic of this pathology is a decline of amount of hypertrophic gastroduodenitis with the displays of lymphofollicular hyperplasia, increase of erosive destructive affection of gullet, stomach and duodenum. Classical basic therapy does not give a positive clinical result and prolonged effect. Pays attention on itself increase of frequency of gastric and duodenum ulcers. In 88,7% of sick children with pathology that is associated with Helicobacterium that it is confirmed with express method and cytological research. Among concomitant pathology of this contingent of children the pathological changes of liver (67,7%) of different level of affection prevailed often in combination with affection of the bile-excreting system, kidneys and intestine. More than half of children had allergic affection: allergic dermatitis and food allergy. At the same time ultrasonic research of sign of dyspancreatism was registered in 90% of children with gastroenteritis pathology. We consider such state as reactive involvement of pancreas to the pathological process in connection with the uneven arcade of bile in duodenum because 87% of children were found with various deformations of gallbladder. Thus, there is considerable growth of gastroenterological pathology among school age children that live in the zone of endemic goiter.

The work is submitted to the Scientific International Conference «Topical issues of pediatrics and pediatric surgery», Mauritius, 18-25 February 2012, came to the editorial office on 13.01.2012.

PSYCHOSOMATIC DISORDERS OF CHILDREN WITH DUODENAL ULCER

Parakhonsky A.P.

Kuban medical institute, Krasnodar, e-mail: para.path@mail.ru

The main factor of pathogenesis of disease at emotional stress is an accumulation in fabrics of free radicals, those results in lipid peroxidation of membranes of different cages, especially neurons of cerebrum. Thus in central nervous system especially in the structures of limbic-reticular complex, there are changes of sensitiveness of neurons to neuromediator and oligopeptidis. It, in the turn, leads to forming of stagnant emotional excitation in central nervous system, which results in proof violation of mechanisms of self-regulation of arte-

rial pressure, update of shells of mucous tunic gastrointestinal tracts and increase of penetrating of connective tissue membranes in different organs. Emotional stress results in generalized distribution of sympathetic and parasympathetic excitations of, which shows up in one the violation of activity of the cardiac-vascular system, in other - gastrointestinal tracts. In the conducted researches it is shown that a those organ or system, which, after imagination of patient, is most impressionable and most essential for vital functions, suffers under act of the protracted stress. Opinion is expressed also that the choice of organ-target depends on the structures of crusts, which determine an optimum efferent way for the output of emotions, caused stress, on periphery. To research psychological features of children's personality with duodenal ulcer. 36 children 10-18 years of age are inspected. The program of medical inspection included: interview with specially developed questionnaires, genealogy research, research of psychological type of personality by the test of Ayzenko and inspection of character using A.E. Lychko pathological characteristic questionnaire. With the purpose of determination of endoskopic and functional changes from the side of overhead departments of digestive fiberscope was executed by fiberscope with determination of endoskopics criteria of presence of gelikobakter infection and shield biopsy of mucus shell of stomach and duodenum by generally accepted rules of taking with next preparation of impression smear, staining and bacterioscopy. Simultaneously conducted intragastric acidity analysis with the study of secretory and alkalescence functions of stomach after the difference of values of acidity in a body and antrum. By the help of questionnaire data was established that family's psycho-traumatic situations had 65% of children. A genealogical analysis revealed that 75% of children are burdened with inherited inclination. Emotional deprivation is aftereffect of child alienation from emotionally meaningful people in a responsible personality formation period that predetermines the deficit of intercourse skills. The broken emotional connection in babyhood leads to developing of duodenal ulcer before time, burdened with inherited anamnesis and differs with heavier, frequently relapsing clinical course, complications and severe pain syndrome. When emotional copulas were broken before pubertal period than clinical course of duodenal ulcer was sparer. In a severe period of illnesses prevailed psychasthenia and labile accentuation of character, introvertive mode of behavior, emotional instability. Discovered psychosomatic features of duodenal ulcer clinical course dictate the necessity in development of differentiated treatment programs and prophylaxis of this pathology.

TO THE QUESTION ON THE REGIONAL APPROACH OF PREVENTIVE MAINTENANCE OF ILLNESSES AT WORKERS OF THE INDUSTRIAL ENTERPRISES OF THE NORTH

Prokopyev M.N.

Medical institute SurGU, Surgut, e-mail: mik-prokopev@yandex.ru

Severe environment of northern territories of the Tyumen region, including Yamal-Nenets (ЯНАО) and Hunts-Mansijsky (XMAO) autonomous regions, strengthens an adverse effect on a human body of the harmful factors accompanying technological processes at the industrial enterprises. Simultaneous influence of climatic and industrialecological factors leads to reduction of functionality of a human body to homeostasis restoration.

The analysis of annual reports on disease for 2000-2003 on the one-profile enterprises of oil and gas branch of the Tyumen region has shown that level and structure varies it depending on a geographical place of a disposition of structural divisions. So, at workers of the enterprises located in territory of the south of the Tyumen region, the disease indicator was the highest in comparison with other regions and has made 333,8 in 2001, 213,0 in 2002 and 432,6 in 2003, thus illnesses of system of blood circulation came to the forefront in structure of the general disease. Among workers of the enterprises in territory ЯНАО the given indicator has made in 2001 -68.7, in 2002 - 42.0 and in 2003 - 146.6 where on the first place there were diseases of a gastroenteric path. Among workers of the enterprises in territory XMAO the disease indicator in 2001 has made 93,2, in 2002 - 105,0 and in 2003 - 68,2, and diseases of nervous system always prevailed.

It is possible to explain a similar situation only influence on a human body of a complex of adverse klimato-ecological and geoecological factors, the characteristic enterprises for a concrete geographical address point against unhealthy working conditions of work. It demands working out of special methodology and a complex of methodical approaches for an estimation of complex influence cpedobux factors on quality of individual and population health, studying of mechanisms of infringements of processes of ability to live at anthropogenous pollution of biosphere in concrete prirodno-environmental conditions.

The offered scientific approach will allow to develop a complex from the most effective organizational-technical and mediko-preventive actions for maintenance of constant monitoring of a condition of inhabitancy of the person and population health, for early revealing and elimination of influence of risk factors of environment and productions that, undoubtedly, will lay down in a basis of creation of regional programs on decrease in level of disease.

The work is submitted to the Scientific International Conference «Priorities in science, technology and engineering», Egypt (Sharm el-Sheikh), 20-27 November 2011, came to the editorial office on 01.12.2011.

The work is submitted to the Scientific International Conference «Topical issues of pediatrics and pediatric surgery», Mauritius, 18-25 February 2012, came to the editorial office on 13.01.2012.

LINGUOPOETICS TODAY: ONTOLOGY AND METHODS

Meshkova E.M.

Moscow State University of M.V. Lomonosova, the transfer Higher school, Moscow, e-mail: yemeshkova@mail.ru

The article discusses the ontology of linguopoetics and its methods, emphasizing the idea that linguopoetics today is not merely a combination of linguostylistics and literary criticism but a philological discipline in its own right. It also shows the advantages of using the methods elaborated by A.A. Lipgart and his disciples.

«Linguopoetics is a branch of philology that studies stylistically marked linguistic units used in a text of verbal art in terms of their functions and relative value in rendering the artistic content and creating aesthetic effect» (Lipgart 1996: 23). Stylistically marked linguistic units are linguistic units that fulfill the function of impact, or the aesthetic function – one of the three main functions of language according to V.V. Vinogradov's classification (Vinogradov 1968: 6). V.V. Vinogradov's theory has been elaborated further by A.A. Lipgart who explains in one of his articles the distinction between these functions in the following way. The communicative function is «observed in the situations of the «non-specialized» and «non-artistic» communication and is associated with the notion of linguistic norm. /.../the intellective function is performed in situations of «specialized» communication and is characterized by a more restricted use of linguistic elements, while the aesthetic function/.../ is connected with «artistic» communication and with linguistic units displaying their metaphorical potential to the utmost, one way or another violating or playing upon the norm» (Lipgart 1997: 6).

The theory of linguopoetics developed by A.A. Lipgart and his disciples is in fact a consistent evolution of the ideas of outstanding Russian philologists: V.V. Vinogradov, G.O. Vinokur, V.P. Grigorjev, R.A. Budagov, O.S. Akhmanova and V.J. Zadornova. It has as well incorporated some of the ideas of the Prague Linguistic Circle. A.A. Lipgart defines linguopoetics as a full-fledged philological discipline that has its own aims and object of study. This implies that it also has its own methods of research. These methods have been elaborated and effectively applied by A.A. Lipgart and his disciples (Lipgart 1994, Lipgart 1996, Lipgart 1997, Lipgart, Garkavenko 2001, Kirtaeva 2001, Shmul 2001, Murashkina 2004, Karpova 2009) and include the linguopoetics of an artistic device, linguopoetic confrontation, linguopoetic stratification, and the linguopoetics of narrative types.

The linguopoetics of an artistic device is a typological study which discovers invariant linguopoetic properties of this or that artistic, or poetic, device. For this kind of linguopoetic research to be carried out, the device should be a linguistic unit fulfilling the function of impact and it should be used regularly in a fairly large number of texts. The linguopoetic study of connotative attributive word-combinations in Shakespeare's dramas conducted by A.A. Lipgart (Lipgart 1996: 179-263) established the categories of linguopoetic function and linguopoetic value – the two basic categories of linguopoetics which help to assess the contribution of this or that artistic device to creating aesthetic effect.

Linguopoetic value is the extent to which the semantic and metasemiotic potential of a stylistically marked linguistic unit is realized in the given context. The category of linguopoetic value is constituted by three categorial forms - automatization, linguopoetically valid use, and foregrounding. The linguopoetic function is the role that the given stylistically marked element plays in creating the aesthetic effect that the text produces upon the reader. The category of linguopoetic function is also constituted by the opposition of three categorial forms the expressive, the gnomic and the associative linguopoetic functions. The linguopoetic function of a stylistically marked linguistic unit depends on its linguopoetic value and on the type of context (narrative or non-narrative) in which it is used (Lipgart 2006: 23-24). The categories of linguopoetic value and linguopoetic function being established, the role of stylistically marked linguistic units in creating the aesthetic effect can be assessed more objectively and not in a form of subjective impressions.

Linguopoetic confrontation is carried out for the purpose of determining the relative value of stylistically marked linguistic elements used in the texts under analysis. The method is based on comparing two or more literary texts which are similar in terms of their content and formal, functional-stylistic characteristics (Lipgart 1996: 273-274).

Linguopoetic stratification aims at singling out different thematic-stylistic strata in a literary text and thereby reveals linguopoetic complexity of the text as a whole. The given method can be applied only to those texts which are characterized by both thematic and stylistic heterogeneity (Lipgart 1996: 421-489).

The linguopoetics of narrative types combines the principles of confrontational and typological research and is based on the theory of narrative types (Karpova 2009: 7). Narrative types can be understood as means of rendering this or that artistic content. They differ in terms of their notional characteristics, and this difference is reflected in their linguistic properties: namely, in the choice of stylistically marked linguistic units and in the extent to which their linguopoetic potential is realized (Murashkina 2004: 68).

A.A. Lipgart has also established correlation between linguopoetics and linguostylistics on the one hand and between linguopoetics and literary criticism on the other as different (though closely related) branches of philology (Lipgart 2006: 35-109). A linguostylistic analysis aims at differentiating between stylistically marked and stylistically unmarked elements in a text (not necessarily a literary one). Linguopoetic analysis can be applied to literary texts only, and to those literary texts which contain stylistically marked linguistic elements. Literary criticism largely discusses the content of a literary text. A linguopoetic analysis presupposes the study of a literary text as a unity of artistic content and its formal linguistic expression. It is based on the results of the linguostylistic analysis and may take into consideration achievements in the field of literary criticism. However, these three should not be confused. Nor should linguopoetics be approached as a mere «combination» of linguostylistics and literary criticism, for such an approach does not seem to contribute much to the development of linguopoetics and most regrettably affects the results of investigation.

Thus, for example, research conducted by E.B. Borisova (Borisova 2010), though claiming to be linguopoetic, in fact, lacks even a proper linguostylistic, let alone linguopoetic, analysis. Thus, talking about the image of nature in «Death of a Hero» by R. Aldington, Y.B. Borisova discusses the content of Aldington's descriptions of nature and comes to the conclusion that the image of nature in the novel is presented mainly in the form of lyrical digressions which aim at highlighting the contrast between a fragile beauty of nature and the devastating impact of war. However, from a truly linguopoetic point of view, those «lyrical digressions» are actually comprised of passages belonging to different narrative types - description and volition - the choice and functioning of stylistically marked linguistic units being different in these two types of context:

«The lilacs had just unfolded their pale hearts, showing the slim stalk of closed buds which would break open later in a foam of white and blue blossoms. Underfoot was the stouter green of wild plants, spread out like an evening sky of verdure for the thick-clustered constellation of flowers/.../

English spring flowers! What an answer to our ridiculous «cosmic woe», how salutary, what a soft reproach to bitterness and avarice and despair, what balm to hurt minds! When the inevitable 'fuit Ilium' resounds mournfully over London among the appalling crash of huge bombs and foul reek of deadly gases while the planes roar overhead, will the conqueror think regretfully and tenderly of flowers and poets?» (Aldington 1985: 135-136)

The first passage belongs to the narrative type of description. It contains stylistically marked longish postpositional attributes expressed by participial constructions, a comparison («like an evening sky of verdure») and metaphors («the thick-clustered constellation of flowers», «an evening sky of verdure»). Postpositional attributes are linguopoetically valid and fulfill the expressive linguopoetic function in the context of description (i.e. they add to the expressivity of the text). The stylistically marked linguistic units within the comparison and metaphors appear to be interconnected: the noun «sky» develops associations with «constellation», thus these stylistically marked elements are foregrounded and perform the gnomic linguopoetic function in the context of description creating an image of flowers against the background of green plants which look like a constellation of stars in the sky.

The second passage belongs to the narrative type of volition and does not contain longish postpositional attributes. However, it abounds in stylistically marked syntactic units: exclamations, the uses of anaphora, synonymic condensation, syntactic parallelism, and it contains a rhetorical question. Here we can also find automatically used connotative attributive word-combinations. All these stylistically marked elements perform the expressive linguopoetic function, adding a certain rhetorical colouring and enhancing the author's idea of the cruelty of war.

Thus, by applying the categories of linguopoetics we manage to reveal the contribution of stylistically marked linguistic units to creating the particular aesthetic effect: the alternation of narrative types differing in the type of content and in the choice and use of stylistically marked linguistic units helps to draw the reader's attention to a sharp contrast between the enchanting beauty of nature and the horrible effects of war.

It was the understanding of the categorial nature of linguopoetic value and linguopoetic function, the precise definition of these notions, the introduction of the relevant terminology and the elaboration of the methods of linguopoetic research carried out by A.A. Lipgart that contributed greatly to the development of linguopoetics as a scholarly discipline - in fact, its foundation as a scholarly discipline - which has its own object of study, methods of research adequate to its nature, its own notional apparatus and terminology. A scholarly (or scientific) discipline in any sphere of knowledge differs from purely practical understanding and everyday speculations on this or that subject in that it has its own object of study, methods of research, notional apparatus and terminology. Applying the adequate methods of research with the use of the appropriate notional apparatus and terminology ensures the objective character of the achieved results.

Philological sciences

References

1. Borisova E.B. Artistic Image in the English Literature of the 20th Century: typology – linguopoetics – translation. – Abstract of the candidate thesis. – Samara, 2010. – URL: http://www.ceninauki.ru/info/page_18437.htm.

2. Vinogradov V.V. Stylistics. Theory of Poetic Speech. Poetics. – $M_{\cdot,\gamma}$ 1968.

3. Karpova L.S. The Linguopoetic Study of Narrative Types in English Elizabethan Sonnets. – Abstract of the candidate thesis. – M., 2009.

4. Kirtaeva A.V. The Linguopoetics of Multicomponential Attributive Word-Combinations in the English Drama of the $16-18^{th}$ Centuries. – Candidate thesis. – M., 2001.

5. Lipgart A.A. The Bases of Linguopoetics. - M., 2006.

6. Lipgart A.A. Methods of Linguopoetic Research. – M., 1997.

7. Lipgart A.A. Functional Stylistics: A Thing of the Living Present (Editorial) // Folia Anglistica. – 1997. – №1. – P. 5-10. 8. Lipgart A.A. The Linguopoetic Study of a Literary Text: theory and practice. – Doctoral thesis. – M., 1996.

9. Lipgart A.A. Linguopoetic Confrontation: theory and method. – M., 1994.

10. Lipgart A., Garkavenko N. «Irish Melodies» by Thomas Moore: The Linguopoetic Typology of Artistic Terms // Language philosophy. Functional Stylistics. Linguopoetics. – M., 2001. – Vol. 1. – P. 161-224.

11. Murashkina A.A. On the Linguopoetic Study of Narrative Types // Language philosophy. Functional Stylistics. Linguopoetics. – M., 2004. –Vol. 2. – P. 65-75.

12. Shmul I.A. Linguopoetic Stratification of Literary Texts and the Study of the Author's Individual Style. – Candidate thesis. – M., 2001.

13. Aldington R. Death of a Hero. - M., 1985.

The work was Submitted the International Scientific Conference «Basic Research», Dominican Republic, 13-22 April, 2012, came to the editorial office 27.03.2012.