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The Methods of Assessment and Management of Mining Processes Near-Contact Portions of the Ore Bodies.

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ABSTRACT

In connection with the market economy and the development of production of geological and engineering models practiced as methods of reducing losses ores used in development environments largest ore basins of Kazakhstan: Dzhezkazgan copper, Mirgalimsai, Zhairemsky and Zyryanovsky polymetallic, Krasnooktyabr'skaya bauxite and South Kempirsai chromite deposits developed open and underground methods exclusively directed to the regulation quality of the forming indicators in order to improve the quality of the ore production in the conditions of the existing technology of mining operations.

Keywords: ore bodies, economy, stocks, marginal strip, system

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INTRODUCTION

Near the contact area is a very complicated section of the ore body and the quantitative and qualitative composition which is formed from a mixture of varieties of the rock mass agitated as the development of reserve minerals in the form of individual excavation technology layers of different capacities. In this case, near the contact zone is inherent in the dynamic and complex natural and technological formation, which makes it the most difficult quality in production areas for the mine.

The economic and geologotechnological importance of excavation sites which are accompanied ores contacts and rocks derived from their distinctive features. Exactly the near-contact zone is a source of geological and technological outputs qualitatively and quantitatively lost from ores and metal impoverishing rocks and man-made waste mined of ore masses.

Thereby, leads directly to the quantitative and qualitative reduction of ore producers and their market value. In connection with this problem of assessment and management processes the mining near-contact deposits zones are studied for a long time, and becomes problematic nature in the mineral resources at the moment.

The notable works can be grouped into information estimates near-contact zones of deposits.

Mountanious geometrical estimates are based on the complexity of the design characteristics geologogeometrical complexity basically only the geometry of bedding deposits, and distribution of ore and intraore capacity. The main line of work was formed on the basis of the principle of geometric evaluation of traits variability, methods of geometry bowels, in which the spatial distribution of features is reflected in its content and topofunction gornogeometrical schedules.

The estimate of the prevalence of carried out on the basis of geometric, displaying the character trait variability geometrically and intensity with a number.

The diversity of geologogeometrical elements, and on the occurrence of near-contact zones of ore deposits within the recessed unit (shoulder, cameras, etc.) that is inherent in almost all the of ore deposits, determines the degree of complexity of the near-contact areas of the deposit. To account for the influence of the contour complexity of the ore bodies in the exploration and exploitation of the deposit suggested various measures of complexity.

P.P. Bastan and E.R. Osnegovski [1] the model of loss and dilution are presented in the form of gradient indicators comparing the quality mining operations, showing how many tons of ore or diluting rocks in the contact zone accounts for 1 rm or 1 m2 of area of contact.

The proposed to use them to establish the relationship of loss and dilution, and comparing the quality mining operations at working deposits zones contacts and rocks. The direct application of models of loss and dilution and the volatility of the contact length to justify their normative values for iron ore pits, considered in work [2].

V.V. Sharin [3], as a criterion for assessing the degree of the contour complexity of the selective mining is proposed so-called coefficient of contact zones ($K_{p.k.ç}$),which is calculated as the ratio of the volume of ore body (v_p)to the surface area (S_k).

$$K_{p.k.ç} = \frac{v_p}{S_k} = \frac{S_{cp}\sin\alpha}{\sum l}, \qquad (1)$$

where α - the angle of falling contact of plane drawing, hail.; $\sum l$ - average length of contacts' cross section, m,.

The author points out that the rate of hard structural deposits $K_{p.k.ç}$ more fully than the power and angle of incidence, characterizes the conditions of occurrence of ore bodies.

In the work [4], as a measure the contour complexity of occurrence, it is proposed the so-called factor of geological and morphological structure of the block, defined as the ratio of the total area of contact layers on all the cuts the block to the total area (S_i) of all geological sections in the block, etc.

$$\varphi = \frac{\sum_{i=1}^{i=P} \varpi_{ïð} L_{K_i}}{\sum_{i=1}^{i=P} S_i}, \qquad (2)$$

where $\varpi_{ïð}$ - empty city's layer power which is falling within the ore, or thickness of the layer of ore falling into the rock excavation at recess, m; L_{K_i} - the total length of the contact bodies within the i-th section of the geological , m; S_{K_i} - i-th area of the geological section, m^2.

The quantity $\varpi_{ïð}$ is recommended to be determined by calculation based on the condition of the minimum allowable dilution depending on the width of the bucket in the development of near-contact zones.

Prof. G.G. Lomonosov [5], as an indicator of the contour complexity of occurrence of ore body, taking into account the curved shape of contacts and their size, suggests using the ratio of the volume in the contact zone, fulfills the free point wall rocks ($v_{пк}$),for total volume ($v_{об}$):

$$\lambda = \frac{v_{пк}}{v_{об}} \text{ или } \lambda = \frac{\sum_{i=1}^{n} S_{k_i}}{\sum_{i=1}^{n} v_i}, \qquad (3)$$

where $\sum S_k$ - estimated contact surface area of deposit,m^2.

The indicator λ based on technological and geometric complexity estimate of occurrence which is developed ore bodies.

On the anvil [6] factor of the structure is assumed to be homogeneous with respect of the average volume of the rock mass, which must be removed separately (v_i),to the volume of the entire reservoir (v_o).

On the anvil [7] a new method for the analytical description of the complexity of the contact area of the deposit, based on the involvement of the hierarchy of the formation of its structure.

The total assessment model complexity of the contact zone deposits by levels ofhierarchy formation of its structure expressed analytically summarized

as follows:

$$\varphi_{пз} = \frac{M\left\lfloor \Delta' {}^{x}\!/_{y} \right\rfloor}{H_{x/y}} \ln \Omega_{y/x}, \qquad (4)$$

where $M\left\lfloor \Delta' {}^{x}\!/_{y} \right\rfloor$- indicator of feature variability .

The main parameter, defined as the ratio of the expectation to the amount of uncertainty ($H_{x/y}$), represents the average modification intensity of the input factors investigated by subsystem $\lambda_{x/y} = \frac{M(\Delta^{/}{x/y})}{H_{x/y}}$. The input and output factors as interrelated elements of the "contact zone of the reservoir," are expressed in the form of natural geological and artificially mountainous geometrical factors of mineral development. The input factors are in general sense costly elements of production and output factors are elements of the final product. The second term of models the complexity of the near-contact zones of deposits is a measure of conditional diversity values of the output factors, the relative input factor subsystem. This indicator, as a characteristic diversity of output indices of subsystems defined by the formula:

$$\ln \Omega_{y/x} = \ln\left(d_{y/x}^{\max} - d_{y/x}^{\min}\right). \qquad (5)$$

The analytical expression of the model complexity of the near-contact zones of deposits through some transformation to obtain comparable results, presented in the form:

$$\varphi_{пз} = e^{\kappa v}\left[\ln\left(d_{\max} - d_{\min}\right) - 1\right], \qquad (6)$$

where $d_{\max}, d_{\min}$ - the maximum and minimum values of the output parameters.
Value of the difficulty $\varphi_{пз}$ ranges from 0 to 1, a percentage from 0 to 100%.

The works on the foundations of rational ways to evaluate difficulties in the contact zones of deposits involving information measures are now widely found in biology, geology, geochemistry, subsurface geometry, etc. In the mining geometry the acceptability of informational-theoretical method based on the concept that the results of mineral deposits testing is a sample of the different sets of random variables, which are regarded as the implementation of a non-stationary random sex, expectation and variance depend on the studied field bowels.

The various aspects of the use of theory information in geology was first reported in the papers.[8-10].

A.B. Vistelius [8], to assess the variability concentration of the chemical elements, proposed an information ratio, defined by the formula:

$$H_i = \frac{\ln - H}{\ln n}, 0 \le H_i \le 1. \qquad (7)$$

The value of entropy H it determines the formula that gives an unbiased estimate:

$$H = -\sum_{i=1}^{n} P_i \ln P_i + \frac{n}{2N}, \qquad (8)$$

Where N – the number of observations; n – the number of sub-objects that differ in the aggregate properties.

T.G. Petrov и S.V. Moshkin[9] have shown the value of entropy information , which is considered as a characteristic of the complexity of the chemical composition of systems.

The issues related to use connection between the values of the informational characteristics of minerals and their thermodynamic parameters and involving for this purpose the concept of not-entropic principle of information devoted to the work of F.A. Letnikova , M.L. Antokolski and other [9,10].

The first work in which the study of the geological field followed a systematic approach is the work of prof. V.F. Myagkova [11]. In this work, the regular and random components of the geological fields are described on the basis of the hierarchical level of structure, the levels of preliminary exploration, detailed exploration and operational levels of intelligence and operational testing. The level is variability have alternating and relativity, and differ in the degree of knowledge and information density. However, the estimates are limited only in terms of the process of geological exploration.

M.M. Chagin [12-14] and authors [13,14], for quantifying the complexity of geochemical systems, suggest using the formula of entropy as a more effective information measures. At present there are other data evaluation of complexity or heterogeneity of systems, based on the dispersion measures and correlation theory of random functions, surveying and planning, geochemical, thermodynamic, and other systems that can be used in the mining geometry.

From the analysis of sources, covering the issues of assessing the complexity of geometry which is near-contact zones with the practice of their use, follow the conclusions of which are used as methodological concepts for further research on this issue.

1. The complexity indicators loop deposits proposed by various authors, based on geological and geometric contour assessment of the ore body. This indicator is often represented as the gradient, taking into account lost tons of ore per unit length of the contact. The common approach for estimating the complexity of the geometry of the contact ore and host rock is the method of graph-analytical description of the complexity of their structure as the above figure, the ratio determined by the actual size to its corresponding basic size.

As the base size used length of the horizontal projection of the required quantity or any other of its geometric size.

2. The complexity indicators of occurrence, based on the technological and geometric assessment take into account the deviation of the contact surface with respect to the geological process the surface mining of the ore body. The indicators determined by the size of areas (or volumes) of the near-contact zones and ore bodies, etc.

3. The bound for the complexity of contacts ores and host rocks is carried out without sufficient regard mountainous geometrical indicators near-contact zones. Consequently, the results of the assessments are limited. Therefore, when evaluating geometry of contact ore and host rock should involve methods of systems research, taking into account all the various factors, which affect the formation of the complexity of the near-contact zones of deposits.

4. The existing information and assessment measures are not sensitive to changes in components due to their incommensurability with the estimated parameters, and this is due to the ineffectiveness of their use. At the same time, almost all the existing information and assessment measures relate only to the problems of geological exploration, not to mountainous geometrical and mountainous geotechnical tasks mining deposits.

5. The recommended system-level approach to the assessment of the structure of the near-contact zones of deposits is that the complexity the structure of the contact zone mountainous geometrical estimated differentiated by levels of the hierarchy of its formation in three stages (exploration, design, dredging) of the field development.

This structural and hierarchical approach to the evaluation of the structure of the contact area due to the diversity of their own goals of tasks, and the complexity of the near-contact zones differ degree levels of development processes of exploration, engineering and dredging deposits. There coordination strategy boils down to establishing an optimal process of incorporating the various aspects of the influence of the complexity and structure of the near-contact zones of deposits on the solvable problems of exploration, design and excavation with sufficient completeness.

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