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«YOSHLIK» KONI MIS - MOLIBDEN RUDALARINI YANCHISH JARAYONINING XUSUSIYATLARI

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Abstract
For the sustainable development of the mineral raw material base, it is necessary to attract low-quality, off-balance and unconventional mineral resources for processing. This goal can be achieved by increasing the efficiency of extraction of valuable components, reducing energy and economic costs at the subsequent stages of enrichment and processing. The processes of preparing ores for enrichment are the most energy-intensive in mineral processing plants and have a significant impact on subsequent mineral processing processes. In order to optimize the processes of preparing copper-molybdenum ores for enrichment and to study the kinetics of crushing, some research was conducted on the ores of the "Yoshlik" deposit. To quantitatively assess the selectivity of ore preparation operations, the distribution of components by size classes was analyzed according to the results of elemental analysis and granulometric analysis.

Keywords: fragmentation, crushing kinetics, copper-molybdenum ores, selectivity index, porphyry copper deposits, phase analysis, non-ferrous metals, chalcopyrite, optimization.

Introduction

With the advancement of science and development of techniques, the increasing demand for non-ferrous metals, in turn, leads to an increase in the volume of extraction and processing of mineral raw materials. The maturity of the reserves of many types of minerals does not reach 30 years. Given the nearly completed deposits of beneficiary ores, which are non-ferrous free metals, involvement in the identification and development of low-quality, off-balance and unconventional mineral raw materials becomes important. Accordingly, increasing the efficiency of extraction of valuable components while reducing energy and economic costs is an urgent task of the moment.

The main methods of enrichment of minerals containing non-ferrous metals are enrichment by flotation and sometimes gravitation, followed by hydrometallurgical processing. In such methods, in beneficiation and processing schemes for preparation of raw materials for enrichment it is necessary to thresh to the required size (flotation size - 0.074 mm) and, if necessary, requires additional threshing up to -0.044 mm. For preparation of ores for beneficiation of such dimension's traditional standard energy-intensive schemes are used, namely three-stage grinding, two- or three-stage grinding, and semi-self-milling with coarse grinding as well as additional milling of the resulting intermediate product.

Preparation for the concentration of traditional ores, complexing and modernization of the beneficiation schemes is related to the specific features of the sources of non-ferrous metals raw materials, which include a gentle spread of minerals that form ore and hollow rocks, a low content of valuable products, high concentration of harmful impurities, the original structural and textural features. Moreover, the cost of upgrading and processing of poor quality and unconventional raw materials can be several times higher than concentrates obtained from normal easily beneficiary ores. All this together means that it is often not economically feasible to process raw materials. The potential possibility of attracting such raw material processing is the search and practical application of energy-intensive methods, schemes for preparing for processing of ore while reducing costs of raw material mining. It would be appropriate to use the saved economic costs on ways to improve the efficiency and comprehensiveness of subsequent enrichment. In-depth and comprehensive study of physical, technological, mineralogical, morphological, material, structural and other parameters of raw materials, determines the choice of regime parameters of the processes of rational ore fragmentation, as well as determines the use of the cheapest and most efficient methods of enrichment of products. Thus, our goal today is to quantify the study of the selective decomposition of polymetallic ore containing non-ferrous metals and the components distribution of milled products

When assessing the quality of raw materials, it is necessary to know not only the quantitative ratio of minerals contained in the ore, but also the quantitative morphostructural properties of the minerals that compose it, which determines first of all the fragmentation rate of ore and, therefore, it will be possible to predict the methods and methods of its grinding.

The effectiveness of schemes for the processing of concentrates and concentrates, full production of useful components and a wide range of products is usually achieved through the use of the following fundamental methodological approaches: selective preparation of large-scale minerals in preliminary ores for enrichment and enrichment by methods of magnetic, gravitational, electric separator, selective flotation, as well as the production of enriched products (concentrates, intermediate products, slurries) and the rational combination of technical means to select the optimal complex of chemical and metallurgical processes for processing hard-to-master ores.

Today, methods for enhancing the energy impact of the solid and liquid phases of raw materials, which are alternative in terms of energy consumption and difficult to enrich in the field of ultra-fine threshing, are scientifically based and developed. The implementation of these methods can significantly increase the completeness and comprehensiveness of mineral use.

To study the milling properties and material composition of ores under the example of the Yyoshlik-I deposit. Ores of the Yoshlik-I deposit are of the copper-porphyry type.

Porphyry copper deposits account for about 50-60% of the world's copper production and more than 95% of molybdenum. These ores are not only Cu and Mo, but also one of the main sources of Re, W, In, Pt, Pd, and Selenium, along with Au, Ag, Sn

The main method of enrichment of copper-molybdenum ores is flotation, in which first collective copper-molybdenum concentrate is obtained, and then separated into copper and molybdenum concentrates

The main precious minerals are copper (mined average 0.30%) and molybdenum (0.0050%), and related minerals include gold, silver, selenium, rhenium, and tellurum. This deposit is unique in its copper and molybdenum reserves: The main ore minerals are chalcopyrite and molybdenite. The mineral composition and texture of the ores reflect a multi-stage hydrothermic process associated with the formation of molybdenum deposits.

According to the data given in Table 1., the chemical composition of ore is found by 87.68% lithophilic components. The main one is silicon oxide, the share of which is 51.6%. The share of alumina is at 15.29%. Alkaline and alkaline earth metals account for 16.03% of the total amount. Carbon content is 0.25 and is found in all carbonates.

Table 1 Elemental composition of the studied ore

Elements and Components	Contents %	Item & Particles	Contents %
SiO2	51.6	$Fe_{sulfate}$	0.61
Al2O3	15.29	Fe_{oxide}	4.51
Tall	5.83	S_{common}	1.33
K2O	3.48	$S_{sulphate}$	0.66
Na2O	1.96	With	0.30
MgO	4.76	Zn	0.015
P2O5	0.22	Pb	0.017
General C	0.25	Three	0.048
General Fe	65.12	Mo	0.0054

Ore-forming elements are represented by iron and sulfur. The content of iron is 5.12-6.45%, and the mass fraction of sulfur is 1.33-2.74%. In the sample of "Kalmakqir", sulfur is fully composed of sulfides. In the ore sample "Youth-I", sulfur is distributed in equal proportions in sulfide and sulfate contents.

Precious components are close to the composition of "Kalmakkir" ores – copper – 0.3-0.41%, molybdenum – 0.0045-0.0054% and gold and silver.

To identify the oxidic form of copper in the ore, phase analysis was performed. The results of the analysis are presented in Table 2.

Table 2 Phase Analysis of Copper in Oxide Ore

Hajmi, ulchami	Chemical composition of copper		
	Sulfide	Oxide	Total
Mutloq (absalyut)	0.29	0.01	0.30
Relative	96.7	3.3	100

According to the data in Table 2, copper is almost entirely in the form of sulfide, amounting to 96.7. In oxidized form there are only 3,3% copper minerals, which is absolutely 0,01%.

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Other non-ferrous metals, as well as harmful impurities, such as arsenic, smudge and mercury, constitute no more than a hundredth and a thousandth of a percentage.

Table 3 Mineral composition of youth mine ore

Mineral, group of minerals	Contents %	Mineral, group of minerals	Contents %
Minerals that make up rocks		Ore minerals	
Quartz	17,0	Pyrite	0,7
Chlorite	16,0	Xalcopirite	0,8
Potash feldspars, plagioclases	40,0	Chalcozine, Covellin, Bornite, Blakely Ores	Less Quantity
Slyuda (muskovit, seritsit)	7,0	Molibdenit, sfalerit, galenit, arsenopirit	Less Quantity
Amphiballs	10,0	Silver minerals	Less Quantity
Carbonates (calcite, dolomite)	2,0	Iron oxides, hydroxides	1,6
Gips, angidrit	4,0	Additional minerals	
		Epidote, ilmenite, rutile, barite, apatite, zircone, etc.	0,9
		total	100

Yoshlik - I deposit contains 96% of the ore that form rocks. Unlike the Kalmakkir mine, the Yoshlik I ore is dominated not by quartz, but by potash feldspars and plagioclases, which account for 40%. Quartz makes up only 17%. The ore composition contains mica and chloride, the proportions of which are 7 and 16%, respectively. The total number of carbonates, represented by calcite and dolomite, is 2%. A distinctive feature of the ore of the mine "Youth I" is the presence of amphiboles - 10% and sulfates (gypsum, anhydrite) - 4%.

The main difference between the ore sample "Yoshlik - I" and the ore "Kalmakkir" is less than pyrite - 0.7% and the amount of chalcopyrite is 0.8% (pyrite in the ore "Kalmakkir" contains pyrite 4.5-5.0, chalcopyrite 1-1.5).

In terms of sulfide content, "Ashlik I" – ore samples are characterized by sulfide ore type and the main copper mineral is chalcopyrite.

We see the results in Figure 1 of the sheep when the ore grade of 65 and 80%-0.074 mm is crushed by 65 and 80% of the ore in the Yoshlik - I mine.

By reducing the ore volume, the share of chalcopyrite free grains increases, which favorably affects the indicators of copper enrichment.

The results of granulometric analysis of molybdenite with a crushed size of up to 80% of ores in the grade of -0.074 mm are presented in Fig. 2.

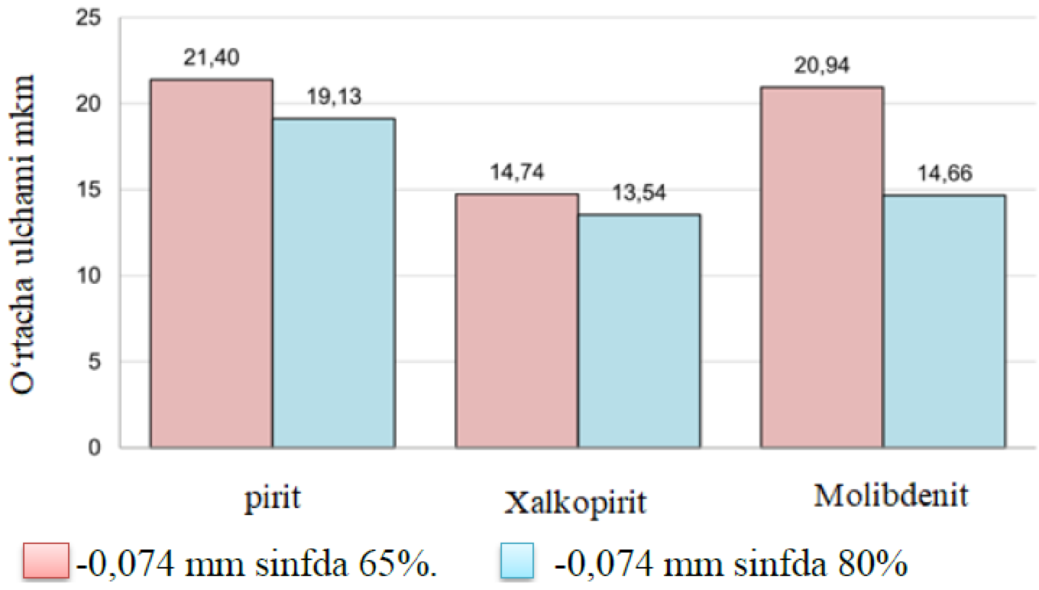

Figure 1. Disclosure size of surface surface of mineral particles when crushed "Yoshlik - I" mining ores at a grade of -0.074 mm.up to 65 and 80% respectively.

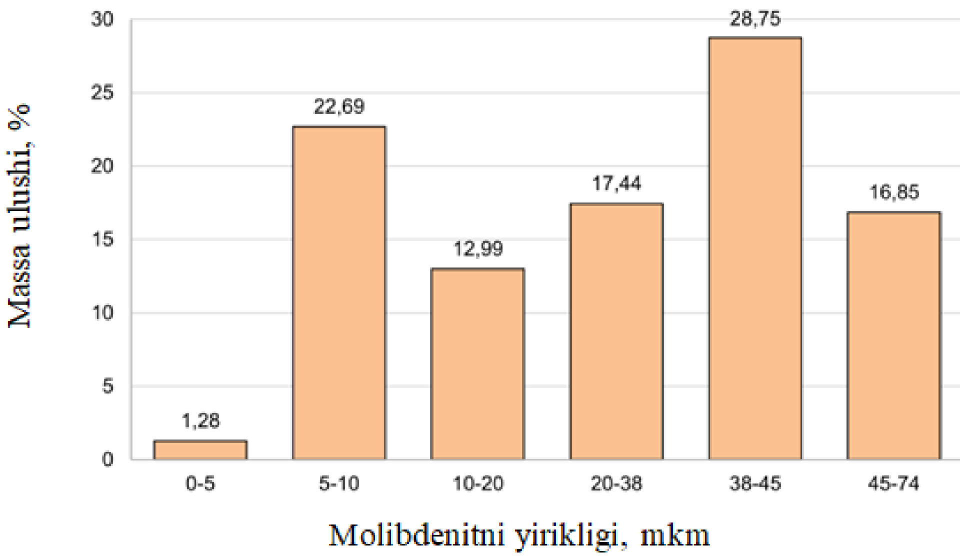

Figure 2. Granulometric characterization of molybdenite in the ore "Youth - I".

Disambiguation pages with short descriptions The percentage of mass of molybdenite particles between 5 and 74 µm varies from 12,99 to 28,75%. The small particles of molybdenite with a volume of less than 5 microns does not exceed 1.28%. Maximum particle size 74 micron

Ore "Yoshlik - I" is considered to be medium hard ore (12-14), therefore when grinding such ores it is necessary to avoid an excess of a working load, since in the following stages it will lead to an increase in electricity consumption. Preparation of such treatments requires maximum reduction of grinding steps and use of semi-self-milling mills and additional milling processes in ball mills.

According to the results obtained, it was found that the highest quantities of copper, molybdenum, and sulfur are characteristic of the subclasses, and quartz and calcium are equally distributed across all classes. A series of experiments on the milling kinetics of the milling were made to determine the properties of redistribution of major components during the milling and fragmentation of copper-molybdenum ores.

As a result of the milling, it was established that, regardless of the time, molybdenum and copper pass to the crude grade most quickly, since minerals containing the main molybdenum and copper (molybdenite and chalcopyrite) have a tendency to sludge.

Based on research, it has been established that the optimal time for threshing is 20 minutes. This time is considered enough to prepare the raw material for the next major flotation.

When analyzing the obtained results, it turns out that in the class -0.5 +0.25 mm, almost all minerals are interbedded with waste rocks. With the decrease in dimensions, the surface opening of minerals increases and at the same time decreases the amount of useful components in the waste rocks.

If classification is used after threshing, this will allow pre-concentration of raw materials at the ore preparation stage and increase the amount of valuable components in the product, which can be flotated.

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