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DEVELOPMENT OF TECHNOLOGY FOR GRAVITATIONAL ENRICHMENT OF OLCHALIK MINE ORE

Suyarov Jakhongir Usmonkul ugli
Almalyk State Technical Institute
Metallurgy and Chemical Technologies
Deputy Dean of the faculty, PhD.

Annotatsiya
Maqolada Olchalik koni polimetall rudalarining joylashuv shakllari va metallarning murakkabliligini asoslovchi qo'shimcha komponentlar o'rganilgan bo'lib, o'rganish jarayonida barcha turdagi tog' jinslarining moddiy tarkibi va tekstura xususiyatlari, metasomatik o'zgarishlar darajasi, granulometrik tarkibi va ularning o'zaro bog'liqligining mineralogik-petrografik o'rganish ishlari amalga oshirilgan. Olingan xulosalardan kelib chiqib, obyekt ruda namunalari gravitatsiya usulida boyitish ishlari amalga oshirilgan hamda yetarlicha natijalarga erishilgan.

Kalit so'zlar: Polimetall, oraliq mahsulot, graviboyitma, chiqindi, granulometrik tarkib, tog' jinsi, ruda, , tahlil, Knelson.

Introduction

The mining industry plays an important role in raising the economy of our republic to a higher level. It is known that the content of the valuable component in the extracted ores is small. Direct extraction of metals from such ores is not economically or technically justified. Therefore, in most cases, the ore is first enriched after extraction, i.e., the amount of valuable component in it is increased, and the enriched product is sent to metallurgical plants for metal extraction. As a result of ore beneficiation, the following advantages are achieved: Due to the possibility of processing poor ores, mineral reserves will increase. With an increase in the metal content in products, the productivity of metallurgical plants increases, the consumption of electricity, fuel, and chemical reagents decreases, the possibility of complex use of minerals is created, transportation costs are reduced, etc. Therefore, mineral processing is an important branch of industry. Ore beneficiation is one of the main subjects that determine the profession of students specializing in ferrous and non-ferrous metal metallurgy.

In polymetallic ores, gold is usually found in a finely dispersed state in sulfide minerals, primarily pyrite and chalcopyrite, less commonly in galena and sphalerite, and additionally may be in a free state. The technology of gold extraction from polymetallic ores consists in the retention of free gold in the grinding cycle and its more complete extraction with concentrates in contact with the main valuable components.

The special place occupied by gold, silver, and copper minerals among mineral resources, as the most important part of the technology and techniques for enriching mineral resources containing valuable components, determines the constant scientific and technical need to solve the issues of developing their extraction.

In connection with the involvement in the processing of ores containing valuable components of complex composition and the expansion of the practice of their flotation enrichment, the problem of finding rational methods for extracting metals containing valuable components from refractory ores is becoming increasingly relevant.

Currently, the main part of concentrates containing valuable components is supplied to metallurgical plants. However, due to the increasing content of arsenic and antimony in these concentrates, their processing at non-ferrous metallurgy plants is becoming increasingly difficult. Therefore, there is a need to process concentrates at enterprises operating according to local or special technological schemes.

The object of the research is the Olchek deposit located in the Namangan region. The Olchelek deposit is located on the northeastern side of the Kurama Range, in the lower reaches of the Govasay River. The Cherchik deposit is located in the gabbro massif, consisting of many subvolcanic rocks of diabase porphyry, syenite-diorite, quartz porphyry, and fragmented complex rocks of the gabbro-diorite-monzonite series.

During the study, mineralogical and petrographic studies were conducted on the material composition and textural features of all types of rocks, the degree of metasomatic changes, the identification of ore mineral associations, and their interrelationships. The main attention was paid to the study of gold, silver, and copper-containing minerals, the determination of their quantitative and qualitative characteristics, their interrelationships with each other and with other minerals (presence, size, nature of formation), and the determination of grain size.

The main ore-forming minerals of the samples are pyrite and chalcopyrite. Vismutin, tetradymite, sphalerite, arsenopyrite are rare. Ore minerals are unevenly distributed in the ore sample. They form a spotted, thick, and spotted vein-like texture.

In ore-bearing rocks, the main rock-forming minerals are quartz, feldspars - potassium feldspar, plagioclase (mainly of medium composition) and their products: sericite, chlorite, actinolite, carbonates. Accessory minerals include apatite, rutile, sphene, and magnetite. The valuable components of the ore are gold, silver, and possibly its companion bismuth. According to the results of chemical analysis, the content of valuable and ore components in the average ore samples was determined (Table 1).

Table 1. Results of the chemical analysis of the average ore sample.

Components	Quantity, %	Components	Quantity, %
SiO_2	64,42	K_2O	2,28
Fe_2O_3	0,88	$S_{общ.}$	2,8
FeO	5,56	SO_3	0,62
TiO_2	0,33	P_2O_5	0,31
MnO	0,23	CO_2	3,19
Al_2O_3	11,1	H_2O	1,85
CaO	3,74	Au, г/т	2,48
MgO	2,17	Ag, г/т	2,44
Na_2O	0,73	Cu	0,63

To determine the granulometric composition and distribution of valuable components, wet sieve analysis of crushed ore to a particle size of -05+0 mm was carried out on a ASM200 sieve analyzer. The results of the sieve analysis are presented in Table 2.

Table 2. Results of granulometric analysis - crushed ore with a size of 0.5+0 mm

Size class, мм	yield, %	Quantity			Distribution by classes, %		
		g/t		%			
		Au	Ag	Cu	Au	Ag	Cu
-0,5	31,05	2,26	8,25	0,65	28,62	30,24	31,7
-0,315	23,29	2,55	8,56	0,67	23,88	23,53	24,5
-0,155	17,74	2,25	8,16	0,56	16,25	17,1	15,64
-0,125	9,88	3,08	8,35	0,63	12,63	9,74	9,8
-0,100	4,43	2,42	8,73	0,65	4,31	4,56	4,53
-0,08	3,73	2,37	8,67	0,62	3,65	3,8	3,64
-0,036	1,71	2,45	8,87	0,66	1,78	1,8	1,77
-0,044	8,17	2,51	8,21	0,64	8,44	8	8,23
Primary ore	100	2,48	8,47	0,63	100	100	100

Experimental tests on the material composition of the ore were carried out on the basis of enrichment methods. In this case, the gravitational method of enrichment was taken as the main method. Ore grinding was carried out on a 40 ML laboratory ball mill with a S:L ratio of 1:0.75:8. Gravity beneficiation of the ore was carried out on a laboratory concentrating table of the 30-KS brand, on a Knelson KC-MD3 concentrator developed by the company "FLSmidth." Ore flotation was carried out on laboratory flotation machines FM-1, FM-2, FL-237. The results of the enrichment experiments were evaluated based on chemical analysis data for valuable components using an atomic absorption spectrometer from the "Perkin-Elmer" company.
Gravity beneficiation was carried out to separate relatively large particles of pure gold and sulfides from the ore into a gravity concentrate. The size of the material received for gravity beneficiation was determined based on the size of the initial ore. In this case, the dimensions varied from -0.5+0 mm to -0.1+0 mm.
An ore sample was tested on a Knelson KC-MD3 centrifugal concentrator on a gravity unit.
The Knelson machine is suitable for any type of ore beneficiation process, centrifugal concentrators are among the most widespread types of gravity machines in industry today.
In this centrifugal concentrator, enrichment was carried out according to the following scheme with various parameters, and the best indicator is the value of the centrifugal force 70G, water consumption 3-3.5 l/min. Received when available.

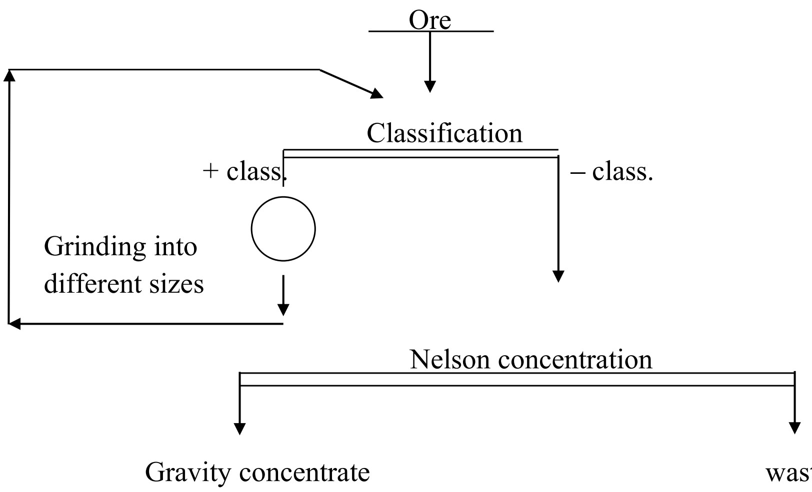

Figure 1. Ore sample enrichment scheme in a centrifugal concentrator

Table 3.

Enriched product	Yield, %	Quantity			Extraction			Size, mm
		g/t		%	%			
		Au	Ag	Cu	Au	Ag	Cu	
Concentrate	2,96	48.23	150,8	7	57,56	52,7	32,9	-0,5+0
Waste	97,04	1.08	4,12	0,43	42,44	47,3	67,1	
Ore	**100**	**2,48**	**8,47**	**0,63**	**100**	**100**	**100**	
Concentrate	3,05	46,31	135,8	6,32	56,9	48,93	30,6	-0,315+0
Waste	96,35	1,1	4,48	0,45	43,1	51,07	69,4	
Ore	**100**	**2,48**	**8,47**	**0,63**	**100**	**100**	**100**	
Concentrate	2,73	53,6	160,37	7,75	59,1	51,69	33,6	-0,25+0
Waste	96,69	1,05	4,2	0,43	40,9	48,3	66,4	
Ore	**100**	**2,48**	**8,47**	**0,63**	**100**	**100**	**100**	
Concentrate	3,17	51,43	154,8	6,9	65,7	57,94	34,78	-0,1+0
Waste	96,83	0,88	3,68	0,42	34,3	42,06	65,22	
Ore	**100**	**2,48**	**8,47**	**0,63**	**100**	**100**	**100**	

As can be seen from the presented data, ore enrichment in the concentrator gives the best results when the ore size is -0.1+0 mm.

Based on the results of a number of studies conducted above, as well as the results of laboratory studies, the gravity method is recommended for enriching the ore of the Olchyk deposit according to the material composition, and when enriched according to this scheme, the degree of gold recovery is higher than 65%.

CONCLUSION

Based on the conducted research on the topic of developing a technology for the complex extraction of valuable components from polymetallic ore of the Olchyk deposit, the following conclusions of theoretical and practical significance are presented:

1. The beneficiation technology of polymetallic ores was selected taking into account the large variety of stages and conditions of mineral formation, the ratio of the main ore and rock-forming minerals, the fibrous shape, texture, and structural features of the ore.
2. The results of chemical analysis of the average sample showed that the gold content in the studied ore sample was 2.48 g/t, silver 8.47 g/t, and copper 0.63%.
3. By mineral and chemical composition, the ore belongs to the gold-carbonate-quartz low-sulfide type of ore;
4. When enriching the sample by the gravity method, the best indicators were obtained with a crushing fineness of -0.1+0 mm. In this case, a gravel concentrate containing 51.43 g/t of gold, 154.8 g/t of silver, and 6.9% of copper was obtained, and the extraction of precious metals amounted to 65.7%, 57.94%, and 34.78%, respectively.

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