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THE CURRENT STATE OF THEORY AND TECHNOLOGY ENRICHMENT OF POLY METALLIC ORES AND ENRICHMENT PRODUCTS

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ABSTRACT

Many lead and especially lead-zinc ores contain copper. The copper content in lead concentrates obtained by enriching such ores with flotation is significant (3.5%). The presence of copper in lead concentrates reduces the extraction of lead during metallurgical alteration, and also complicates and increases the cost of lead smelting, and, in addition, creates difficult working conditions for workers in metallurgical workshops. In practical terms, the task of separating lead-copper concentrates by selective flotation is one of the most difficult. Researchers in recent *years have been able to significantly develop and improve the technology for the separation of lead-copper concentrates, due to which a number of factories have reduced the copper content in lead concentrates and increased lead extraction. However, this issue has not yet reached its radical solution, due to the difference in ores of different deposits in its chemical, mineralogical composition and other features.*

KEYWORDS: *Selection, Desorption, Depression, Extraction, Product Output, Content, Ammophos, Mineralogical Composition, Phase Analysis, Polymetallic Ores, Qualitatively Quantitative Scheme.*

INTRODUCTION

Uzbekistan in the proven reserves of gold, copper, lead, zinc, uranium and other metals occupies a leading place among the CIS countries. In the conditions of independence of the republic, the mining and metallurgical industry faced a whole complex of complex problems. This is primarily an increase in environmental requirements, an increase in the need for non-ferrous metals, including copper and lead, a shortage of flotation agents, requirements for the cleanliness of the resulting product, and the problem of waste disposal.

The task of creating a rational and integrated technology for the processing of technologically advanced polymetallic industrial products is very relevant.

Increased production of lead and zinc requires the involvement of new deposits, off-balance sheet ores, and waste from concentration plants.

Improving the technology of enrichment of polymetallic ores and methods of separation of collective concentrates can significantly increase the production of copper, lead, zinc, rare and noble metals without high costs.

Main part

Material-complicated polymetallic ores are processed at most concentration plants according to various technological schemes.

Polymetallic sulfide ores are enriched according to the collective selective flotation scheme with a collective concentrate. Then the collective concentrate is sent for selection.

Preliminary search experiments showed the positive effect of ammophos as a depressor, however, the reproducibility of the results was unstable. Therefore, we put experiments to determine the optimal parameters of the flotation separation of lead-copper concentrate.

The experiments caused by the consumption of ammophos (0-10 kg/t) without preliminary desorption of reagents from the surface of lead-copper concentrate did not give stable positive results, there was a significant transition of halenite to the foam product, and with an increase in the consumption of ammophos of more than 10 kg/t concentrate and copper minerals are noticeably depressed. The selection was successful in some cases and not with a fresh concentrate. This is due to the fact that particles of minerals are covered with films of flotation reagents (Xantogenate, foaming agent, T-92, etc.). These films do not allow the interaction of ammophos with the surface of particles.

The process of desorption of collective concentrate was carried out in the following order: a certain amount of collective concentrate was mixed with a solution of sodium sulfate for 15-20 minutes, then the pulp was diluted with tap water to H: L - 1: 20, mixed, defended and drained the illuminated part to solid content in a condensed pulp equal to 50%.

The effect of the duration of contact of the pulp with sulfur sodium and the number of collective concentrate was studied on the degree of separation of lead-copper concentrates. Further experiments conducted preliminary desorption of reagents with sulfur sodium.

An increase in the number of launderers slightly improves the separation of copper and lead minerals. However, this improvement was not highly effective. Therefore, when conducting further experiments, we produce one washout using water dilution to H: L = 1:20.

Experiments have shown that in order to remove flotoreagettes from the surface of particles, it is necessary to contact the concentrate with a solution of sodium sulfate for 15 minutes. when the last 6-8 kg/t is consumed.

The collective concentrate cleared of flotation regents was subject to flotation separation. The dependence of the degree of separation of copper was studied

and lead during flotation from ammophos consumption from the duration of contact with ammophos, from pH of medium.

The results of experiments on the effect of ammophos consumption on the degree of separation of copper and lead showed that a fairly complete separation occurs when ammophos 2.5-3 kg/t is consumed. concentrate. With fewer ammophos, it is apparently not enough to cover all particles of ammophos with film, and at high costs ammophos depression and copper minerals begin. The effect of the duration of mixing collective concentrate with ammophos after desorption and washing was also studied. Agitation in various experiments lasted from 15 to 60 minutes. Ammophos consumption was 2.5 kg/t. The results of the experiments are presented in the table.1

TABLE 1 DEPENDENCE OF THE DEGREE OF EXTRACTION OF COPPER AND LEAD DURING FLOTATION ON THE CONSUMPTION OF AMMOPHOS.

Name product	Exit, %	Content, %		Extraction , %		Consumption ammof.kg/t concentrate
		Cu	Pb	Cu	Pb	
Copper.concen.main one	56,4	4,6	54,75	77,4	60,20	0
Tails are copper.flotation	43,6	1,74	46,83	22,6	39,80	
Ex. Pb - Cu concentrate	100,0	3,35	51,30	100,00	100,00	
Copper.concen.main one	23,7	11,4	23,5	80,9	10,86	0,5
Tails are copper.flotation	76,3	0,84	59,90	19,1	89,14	
Ex. Pb - Cu concentrate.	100,0	3,35	51,30	100,00	100,00	
Copper.concen.main one	22,0	12,6	19,6	82,73	8,40	1,0
Tails are copper.flotation	78,0	0,74	60,24	17,27	91,60	
Ex. Pb - Cu concentrate	100,0	3,35	51,30	100,00	100,00	
Copper.concen.main one	21,30	15,30	17,60	84,60	7,30	2,5
Tails are copper.flotation	78,70	0,65	60,40	15,40	92,70	
Ex. Pb - Cu concentrate.	100,0	3,35	51,30	100,00	100,00	

Copper.concen.main one	23,00	12,30	20,40	84,40	9,15	5,0
Tails are copper.flotation	77,00	0,69	60,50	15,60	90,85	
Ex. Pb - Cu concentrate.	100,0	3,35	57,30	100,00	100,00	
Copper.concen.main one	28,90	10,80	33,50	93,00	18,87	10,0
Tails are copper.flotation	71,10	0,33	58,50	7,00	81,13	
Ex. Pb - Cu concentrate.	100,0	3,35	51,30	100,00	100,00	

In the presence of ammophos with an increase in the duration of agitation, the lead content in copper concentrate is reduced.

When campaigning for 15-30 minutes, incomplete depression of halenite occurs and the flotation of chalcopirit is deteriorating. When campaigning for 45 minutes, satisfactory results were achieved.

When campaigning for more than 45 minutes, copper minerals are partially depressed and the copper content in copper concentrate decreases.

Experience in determining the effect of pH in which lead-copper concentrate with ammophos was mixed (45 min., consumption 2.5 kg/t) were carried out by adding a solution of soda ash. The results of the experiments are given in table 2.

These experiments have shown that creating an alkaline environment (pH 8.9 and higher) negatively affects breeding. If with pH from 6.4 to 8.2 the lead content in copper concentrate was 25.7% - 28.9%, then with pH = 8.9 this content increased sharply to 38.1%.

This is because the depression of lead minerals is associated with the displacement of xanthogenate ions with phosphate ions from its surface.

With low pH formed $PbHRO_4$, which shows a deterioration in the separation of lead-copper concentrate. With a higher pH = 9-10, the balance shifts towards education $Pb_3(PO_4)_2$ Therefore, we can conclude that at pH = 8.5, hydrophilization of the surface of halenite occurs and HP ions are formed. bO^{-2} RO_4^{-3} $4ON^{-}$ due to what positive results obtained. Therefore, depression should be carried out at pH not more than 8.2.

Thus, the following conditions of copper-pig breeding were determined from laboratory experiments: the pulp of the original lead-copper concentrate is mixed with 15 min with sodium sulfate (cost 6-8 kg/t) at H: L = 1: 3. Then follows water dilution to H: L = 1:20, sucks and draining of the illuminated part to the solid content in the condensed pulp, equal to 50%.

Galenite depression is carried out by 45 minutes when mixed with washed collective concentrate with ammophos (cost 2.5 kg/t), then basic copper flotation and four copper concentrate reins in an open cycle. According to this technology, various experiments produced copper concentrate with a copper content of 18-30% (extract of 50-81%), lead - 2.3-3.4% (extract from 0.2-0.7%) .

When breeding lead-copper concentrate, metal losses in mixed concentrates are inevitable. Losses of lead with copper concentrate can be reduced by introducing an additional lead-free operation of copper concentrate.

TABLE 2 THE EFFECT OF PH ON THE SELECTION OF LEAD-COPPER CONCENTRATE

Name product	Exit, %	Content, %		Extraction , %		pH at agitation with ammophos
		Cu	Pb	Cu	Pb	
Copper concentrate.	30,0	11,62	28,9	95,0	15,6	6,4 Without soda
Tails are copper.flotation	70,0	0,30	67,1	5,0	84,4	
Ex.Pb-Cu concentrate.	100,0	3,70	55,4	100,0	100,0	
Copper concentrate.	23,1	12,36	25,7	96,0	13,1	7,6
Tails are copper.flotation	76,9	0,20	66,9	4,0	86,9	
Ex.Pb-Cu concentrate.	100,0	3,70	55,4	100,0	100,0	
Copper concentrate.	30,0	11,72	28,6	90,0	15,5	8,2
Tails are copper.flotation	70,0	0,20	66,8	10,0	84,5	
Ex.Pb-Cu concentrate.	100,0	3,70	55,4	100,0	100,0	
Copper concentrate.	35,2	10,19	38,1	95,7	23,1	8,9
Tails are copper.flotation	64,8	0,25	55,5	4,3	76,9	
Ex.Pb-Cu concentrate.	100,0	3,70	55,4	100,0	100,0	

The operation of desalination of copper concentrate, as is known from the practice of domestic and foreign factories, is carried out by depression of copper minerals with cyanide and before flotation of lead minerals into the foam product. An overhanging operation can take place without prior desorption of reagents from the surface of minerals if copper minerals are represented by chalcopyrite.

Experience in debating copper concentrate IV miscalculations were carried out at cyanide consumption from 0.2 to 2 kg/t of the initial lead concentrate. The duration of the contact (10 minutes) was selected experimentally, the flotation time was 5 minutes.

Copper losses in lead concentrate of do flotation were 5.4% of the original product, or 7.5% of the operation. The content in copper lead concentrate is reduced to 1.25%.

Since the output of the lead product after lead is insignificant, it can be sent directly to the finished lead concentrate.

To obtain the final version of the technological scheme for the separation of lead-copper concentrates, two identical experiences were set: desorption of reagents with sulfur-sodium for 15 minutes, at pH = 8.5 agitation with ammophos 45 minutes, ammophos consumption 2.5 kg/t of concentrate and four stripping with brass concentration at optimal parameters with an open and closed cycle. Based on the results of these experiments, we can conclude that the results of the experiments in the closed cycle are more real and the copper content in the copper concentrate is high. (Table 3)

The results of experiments in the open cycle of separation of lead-copper concentrate allow us to conclude that when used as a depressionor of lead minerals of ammophos (2.5 kg/t of concentrate) and the introduction of the operation of desalination of copper concentrate (cyanide consumption 1.0 -1.5 kg/t), a copper concentrate with high rates is possible. The concentrate contains 30.3 % copper, 1.6% lead when 56.8 % copper and 0.24 % lead are extracted into it.

The results of the experiments were close and can be considered quite satisfactory in all respects. A copper concentrate with a copper content of 32.6 % and a extraction of -90.45 % were obtained.

TABLE 3 RESULTS OF EXPERIMENTS IN A CLOSED CYCLE

Product Name	Exit, %	Content, %		Extraction, %	
		Cu	Pb	Cu	Pb
Copper concentrate.	8,2	32,60	1,70	90,45	0,22
Pb concentrate.	91,8	0,31	70,10	9,55	99,78
Ex.copper-plumbum.concent	100,0	2,96	64,34	100,00	100,00

With him, 0.2-0.22% of lead was lost. The quality of lead concentrate increased by 5-5.76 %. The foam product of copper concentrate had a yield of 1.4-1.6 % and contained 13.7-17.2 % copper, 2.1-7.2% lead and 2.4 % zinc. This technology has been recommended for industrial testing.

DISCUSSION

Accelerating scientific and technological progress requires increasing the complexity of ore processing, the completeness of the extraction of valuable metals from them. Decisions of the Government of the Republic of Uzbekistan provide for a significant increase in the production of non-ferrous metals. At this is given special attention to the development of poor and complex deposits through the development of new technologies and reagent regimes, the wide automation of technological enrichment processes. The task of creating a rational and integrated technology for the processing of technologically advanced polymetallic industrial products is very relevant.

Increased production of lead and zinc requires the involvement of new deposits, off-balance sheet ores, and waste from concentration plants.

As a result of the studies, the mechanism of action of ammophos on the surface of copper and lead minerals has been comprehensively studied and disclosed, and it has been proven that ammophos is an effective depression of lead minerals when dividing lead-copper concentrates.

CONCLUSION

1.It was found that the results of flotation of pure minerals of lead and copper mainly depend on the flow rate of the reagent, on the size of the grinding, pH of the medium, mixing speed, etc.d.

2. The process of selection of lead-copper concentrate using ammophos has been studied and the optimal flotation mode has been established: flushing the initial collective concentrate with a solution of sodium sulfate at a flow rate of 6-8 kg/t for 15-20 minutes, then flotation of copper at a consumption of ammophos of 2.5 kg/t, butyl xanthogenate 30 g/t.

3. A highly efficient, new technology for breeding collective lead-copper concentrate using cheap, non-toxic local raw materials - ammophos, as an effective depressionor of lead minerals has been developed.

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