



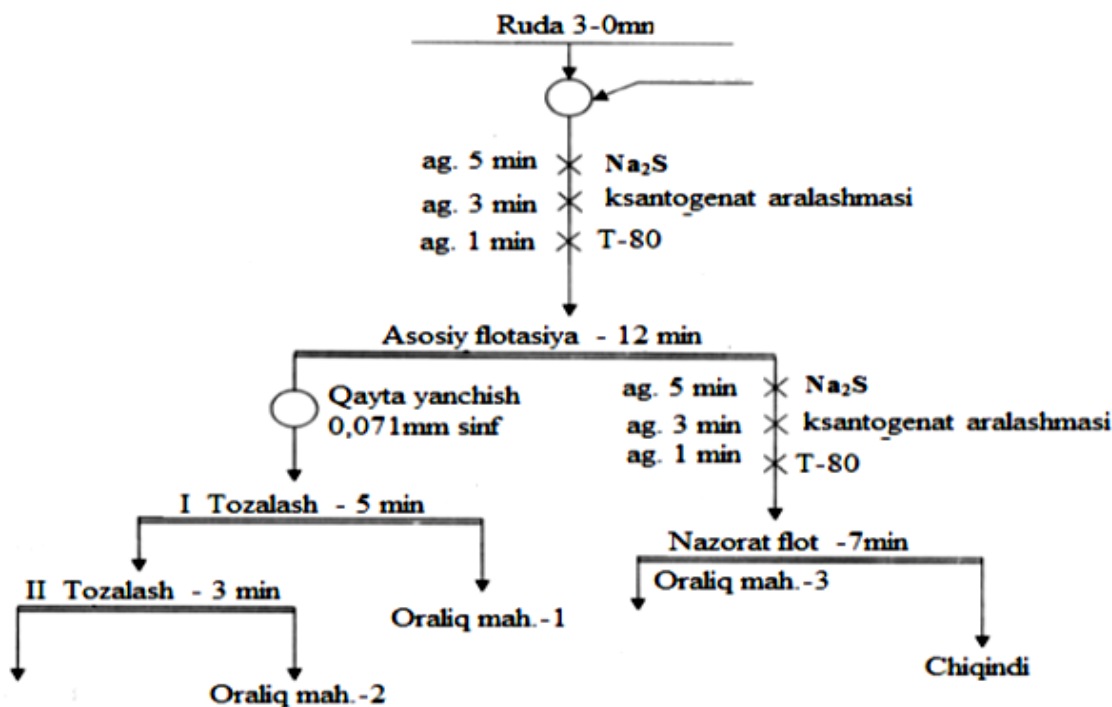
STUDY OF BENEFICIATION OF COPPER-MOLYBDENUM ORES

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The main and control flotation experiments were carried out in 3 l flotation machines, and the cleaning operations were carried out in 1 l and 0.5 l flotation machines with Q:C =1:3 and 1:4 ratios.

The flotation scheme includes the separation of copper-molybdenum enrichment and the flotation of pyrite from the flotation waste of the intermediate product of the collective flotation cycle. The mechanism of influence of various flotation reagents on technological indicators of flotation was studied. Before flotation, ore crushing was used to separate the individual minerals from the overburden and expose the useful components to the surface. Therefore, through experiments, the degree of complete opening of the surface of minerals was determined.



1 – picture. Scheme of flotation of copper-molybdenum ore from the Kalmakir mine

Flotation experiments were carried out according to the scheme presented in Fig. 1. Grinding was carried out by loading 6 kg of balls into the mill at one stage. Loss of copper in flotation waste was 5.2% in sample 1, 12.3% in sample 2, 10% in sample 3, and 5% in sample 4.

Based on previous experiments, the necessary alkalinity of the flotation solution was determined. The alkalinity of the main copper-molybdenum flotation at the operating concentrator (Almalik Mining and Metallurgical Combine Copper Concentrating Factory) is pH 9.5-10. We tried using lime and baking soda to maintain the desired pH. It was not possible to obtain the desired pH using soda as a medium regulator. Experiments conducted in sample 1 using soda gave the same enrichment indicators as when lime was used, while the results obtained in samples 2, 3, 4 were worse. Therefore, only lime was used as a medium modifier in subsequent experiments. The residual concentration of lime in the soil is 54 mg/l.

T-92 is used as a foaming agent in the flotation process in the currently operating factory. The average consumption of foaming agent in the flotation cycle of copper-molybdenum ore is 35-40 g/t. Experiments conducted in the laboratory showed that the best consumption of T-92 can be considered as 40 g/t. It was observed that the consumption of T-92 can be reduced if the experiments are conducted in a closed cycle.

In addition to T-92, the foaming properties of hexanol (an isomeric mixture of hexanol-hexynel alcohols) were also studied for the studied ore. The obtained results showed that hexanol can be used for flotation of copper-molybdenum ores, but its price is much higher than T-92.

In our experiments, potassium butyl xanthate, sodium isopropyl xanthate, butyl xanthate with apolar reagents (kerosene, transformer oil), emulsion of xanthate with OPSB (propylene oxide of butyl alcohol), mixture of xanthate with aeroflots were used as collectors. Experiments were conducted both on a two-stage flotation scheme and on a one-stage flotation scheme. The collector was added to intercycle, main and control flotation in a ratio of 1:1:2. Good results on separation of copper and molybdenum were obtained at 20 g/t of xanthogenate. It should be noted that molybdenum was separated very well from sample 1. As the amount of molybdenum in the samples decreased (in samples 2 and 3 - 0.002 and 0.001% molybdenum), the separation of molybdenum decreased. Copper was separated worse from sample 2, where the ratio of chalcopyrite and pyrite was less favorable. Increasing the consumption of xanthogenate above 20 g/t did not lead to loss of copper in the waste.

Experiments on flotation were also carried out using a mixture of xanthogenate and paraffin. Flotation of transformer oil with OP-10 emulsion stabilizer in 1:1 ratio was considered. Special attention was paid to molybdenum flotation. Research has shown that transformer oil is the best non-polar collector. It allows reducing the consumption of xanthogenate, which is an expensive and scarce reagent, to 10 g/t. In this case, the loss of molybdenum in the composition of flotation waste is 11.7 in samples 1, 2, 3, 4, respectively; It decreases to 6.8, 9% and 9.5. Determining the required time of flotation was carried out by fractionally removing the foam on the bottom. In this case, the inter-cycle flotation time was increased to 7 minutes, the main flotation time was increased to 7 minutes, and the control flotation time was increased to 10 minutes. Extending the total time of flotation up to 24 minutes did not affect the loss of copper in the composition of the waste.

I- main (intercycle) flotation time - 7 minutes.

II- for main flotation - transformer oil emulsion with xanthogenate - 5 g/t, flotation time - 7 minutes.

I- for control flotation - transformer oil emulsion with xanthogenate -10 g/t, T-92 -20 g/t, flotation time - 10 minutes.

I- for control flotation - emulsion of transformer oil with xanthogenate - 2.5 g/t, flotation time - 5 minutes (according to the scheme in Fig. 1).

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