

Study on the extraction of metals from tails of flotation enrichment of copper sulfide ores

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Abstract

Flotation processing of copper-pyrite ores is accompanied by the formation of flotation tailings containing 0.2-0.7 % wt Cu and 0.6-1.4 g/t Au. Deeper extraction of these components into commercial products is of practical interest. The possibility of additional recovery of copper and gold using the example of tailings from the current processing of PJSC “Gaysky GOK” was studied. It was shown that thin emulsion impregnation of chalcopyrite (less than 10 μ) in pyrite prevented the copper and gold from being extracted from the tailings by ore dressing methods. A scheme for the deep extraction of valuable components, based on the preliminary concentration of gold and copper by pyrite flotation, was proposed. About 84.5% of gold and 60.9% of copper were extracted into pyrite concentrate, while the gold content in the chamber product was 0.25 g/t. The increase in the extraction of copper was impossible due to nature of copper phase in chamber product that consisted mainly of copper oxides. Further processing of the pyrite concentrate can be accomplished by the way based on oxidative roasting (550-600 °C), with subsequent sulfuric acid leaching of copper from the calcine, washing and cyanidation of washed cake. Acid leaching is recommended to be done without external heating with solutions of 10-20 g/l of sulfuric acid. Copper was precipitated from leachates by cementation with iron powder in the form of copper concentrate (22-32 % wt Cu), then the gold-containing solution is processed to produce ligature gold. The optimal conditions for the cyanidation of the calcine were determined as follows, L:S = 2, the initial concentration of NaCN was 2 g/l, the duration of cyanidation was 2 hours. The possibility of achieving end-to-end extraction of 66% of gold, and 45% of copper in commercial products is shown. The proposed scheme makes it possible to reduce the specific consumption of NaCN during cyanidation from 2.5-2.8 to 0.8 kg/t of tailings. It is assumed to gain sulfuric acid from the burning gases.

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