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Development of Hydrometallurgical Processes of Non-Ferrous and Rare Metals Recovery from Untraditional Mineral Raw Materials and Natural Brines

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Abstract

In connection with gradual lowering of supplies of traditional ore raw materials involving non-ferrous and rare metals, which is treated by well-known technologies, involving into the production of untraditional, secondary and technogeneous raw materials appears to be actual task.

Difficult of enrichment ore raw materials is usually characterized by low contents of precision components and unusual compositions of minerals that complicate development of rational technologies of their processing. Owing to this, the technologies based on application of hydrometallurgical processes are the most attractive ones.

In particular, the method of desegregation of mineral associates was developed to treat difficult of enrichment ores such as fine dispersion coppering and vallerite ores. Halcopyrite is formed during thermo decomposition of vallerite and then it covers mineral surfaces providing the enrichment of these ores through traditional flotation schemes. For intensification of flotation processes several reagents of basic nature were tested like additions to butyl air-float or butyl xanthogenate used. During tests in industrial scale expense of the base reagent-collector was decreased up to 40 %. Intensification reagents were effectively used in flotation of polymetal lead-zinc ores.

The selective binary extractant was developed for solutions after leaching of oxidized copper ores to increase recovery of copper and separation coefficients, $\beta_{Cu/Fe}$. The sorption-extraction technology of copper recovery from oxidized ores of Udokan deposit was developed and tested. At the first stage of the technological scheme sorption leaching of ore by solution of sulfuric acid and collective sorption of copper and iron on sulfocationite were proceeded with subsequent separation of these metals from silica and other impurities. After desorption and concentration of metals with sulfuric acid solution, copper was effectively extracted with the binary extractant. The binary extractant is essentially excelled in the extraction characteristics alkyl derivatives of oxyoximes. A capacity of the binary extractant towards copper increases 3-5 times. Separation coefficients of copper and iron increase twice and more. Recovery of copper from oxidized ore enhances up to 6-8 %. Velocity of extraction and stripping increases 10 times. Copper is extracted from high acidic aqueous solutions and stripping process proceeds with diluted ammonia solution. From stripped solutions copper can be obtained as a powder copper or Cu_2O. The developed process can be successfully applied for selective recovery of copper from leaching solutions of polymetal concentrates and dump slag, waste copper electrolytes and galvanic solutions as well as other objects.

Natural brines and oil waters in some Russian regions involve considerable amounts of rare metals and other precision elements. The processes of recovery and concentration of bromides of calcium and lithium from chloride-calcium brines of different deposits were developed. The technological scheme of recovery of calcium bromide was tested and data obtained were used in creating production of processing of career waters of AC "Alrosa". The devise for processing of Siberian brines was made. The recovery of bromide from brines was found equal to 85 %. The developed technology can be applied for other objects.