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Study of the speed of dissolution of copper and zinc ferrite by the rotating disc method

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Abstract

Flotation processing of copper-smelting dump slags expedites accumulation of floatation tails. According to chemical analysis results, these tails contain about 0.5 % mass. of copper and 4 % mass. of zinc. Copper and zinc are both included into primary and secondary mineral compounds as isomorphous impurities, and form their own mineral phases, including copper (0.76 % mass.) and zinc (9.24 % mass.) ferrites.

To develop technology for extraction of copper and zinc from tailings, it is necessary to determine the direction of research. To this end, copper and zinc ferrite ($CuFe_2O_4$, $ZnFe_2O_4$) was synthesized according to the ceramic technology, which consists in the joint thorough grinding of the stoichiometric amount of copper, zinc and iron oxides, followed by sintering in a muffle furnace at T = 1000-1100 °C and holding for at least 12 hours. From synthesized ferrites were compressed tablets on a hydraulic press under a load of 40 MPa. Tablets of 20 mm size were pasted into the holder of PTFE using epoxy glue. An experimental study was made of the rate of dissolution of copper and zinc ferrite by the rotating disc method. A laboratory setup was used, which consists of a water bath, a stirring device with speed control, a thermometer and a pH meter.

Kinetics of copper and zinc ferrite dissolution in aqueous solution of sulfuric acid were examined under different concentrations, temperature, and hydrodynamical regime. According to the Arrhenius equation, the value of the experimental (apparent) activation energy of the process. The experimental rate constants are calculated. A conclusion is drawn on the kinetic and diffusion modes of dissolution of $CuFe_2O_4$ and $ZnFe_2O_4$, respectively. The data obtained are the basis for the technology being developed.

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