

Malachite Ore Treatment with Typical Ammonium Salts and Its Mechanism to Promote the Flotation Performance

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Abstract : The difference in promoting sulfurization between different ammonium salts and its anion's effect on the sulfurization of the malachite surface was systematically studied. Therefore, this study takes malachite, a typical copper oxide mineral, as the research object, field emission scanning electron microscopy and energy-dispersive X-ray analysis (FESEM-EDS), X-ray photoelectron spectroscopy (XPS), and other analytical and testing methods, as well as pure mineral flotation experiments, were carried out to examine the superiority of the ammonium salts as the sulfurizing reagent of malachite at the microscopic level. Additionally, the promoting effects of ammonium sulfate and ammonium phosphate on the malachite sulfurization of xanthate-flotation were compared systematically from the microstructure of sulfurized products, elemental composition, chemical state of characteristic elements, and hydrophobicity surface evolution. The FESEM and AFM results presented that after being pre-treated with ammonium salts, the adhesion of sulfurized products formed on the mineral surface was denser; thus, the flake radial dimension product was significantly greater. For malachite sulfurization flotation, the impact of ammonium phosphate in promoting sulfurization is weaker than ammonium sulfate. The reason may be that hydrolyzing phosphate consumes a substantial quantity of H⁺ in the solution, which hastens the formation of the copper-sulfur products, decreasing the adhesion stability of copper-sulfur species on the malachite surface.

Keywords : sulfurization flotation, adsorption characteristics, malachite, hydrophobicity

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