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The influence of magnetic fields on the flotation of sulphide minerals

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Abstract

Oscillating magnetic fields have the potential to affect the flotation behaviour of magnetically susceptible minerals. The idea was evaluated by studying the flotation separation of pyrrhotite from a pentlandite, chalcopyrite and pyrite feed. Various analytical, flotation and visual observation techniques were used to establish the effect of an oscillating magnetic field on the flotation process. Oscillating magnetic fields were applied to a Hallimond flotation tube, a bench scale column, and a pilot scale flotation column to test the effect of a magnetic field on flotation of sulphide minerals. It was found that the flotation of non-magnetic minerals was not affected by the magnetic field. In general it was found that the flotation of magnetically susceptible minerals could be depressed by mechanically rotating the particles using an external magnetic field. Magnetic field strength, frequency, and the orientation of the field lines (relative to the particle) were identified as important parameters controlling rotation of the magnetic particles. In some cases the rotating particle dislodged itself from the air bubble to which it was attached and consequently the flotation recovery of the magnetic particles decreased. This has a significant impact on nickel flotation, where pyrrhotite can be selectively depressed during flotation. Chrysotile, a mineral frequently associated with nickel sulphide ores, had a negative effect on flotation recovery of the sulphide minerals. In the presence of chrysotile, the depressing effect of an oscillating magnetic field on pyrrhotite recovery was enhanced. It was also found that quartz could be depressed from the flotation concentrate using an oscillating magnetic field. Pilot scale column work indicated that it is possible to depress pyrrhotite flotation by applying an oscillating magnetic field to a flotation column.

Keywords: *flotation, sulphide minerals, pyrrhotite, low grade nickel deposit, magnetic fields.*

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