Water Chemistry Effects on Zeta Potential of Concentrated Hematite Ore

Researchers: Howard Haselhuhn, Shannon Ennis

Abstract

The effectiveness of selective flocculation and dispersion processes for the concentration of hematite ore are strongly dependent on the ionic content of the process water. It has been noticed that magnesium ions are more detrimental to iron recoveries during gravity separation and flotation processes than calcium. This phenomenon was studied by measuring the zeta potential of hematite ore at various concentrations of sodium, magnesium, calcium, strontium and barium at a pH of 11. Results show that zeta potential inverts from negative to positive at very low concentrations of magnesium ions in the solution. It takes a significantly higher concentration of calcium, ions to achieve the same effect. This difference may be attributed to the ability of magnesium ions to adsorb to all surface hydroxyl groups, whereas calcium, due to their larger size, can only adsorb to every other hydroxyl group. This hypothesis was confirmed by results similar to those seen with calcium when this test was repeated with strontium and barium ions. The tendency for calcium ions to adsorb to every third surface hydroxyl group causes higher concentrations of calcium to be less detrimental to hematite concentration processes than magnesium.