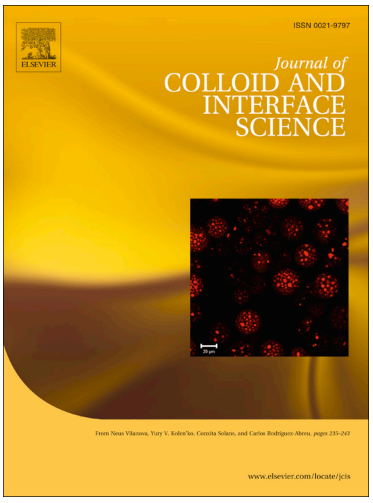

Adsorption of a novel reagent scheme on scheelite and calcite causing an effective flotation separation

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Adsorption of a novel reagent scheme on scheelite and calcite causing an effective flotation separation

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Abstract: The efficient separation of scheelite from calcium-bearing minerals, especially calcite, remains a challenge in practice. In this work, a novel reagent scheme incorporating a depressant of sodium hexametaphosphate (SHMP) and a collector mixture of octyl hydroxamic acid (HXMA-8) and sodium oleate (NaOl) was employed in both single and mixed binary mineral flotation, and it proved to be highly effective for the separation. Furthermore, the role of the pH value in the separation was evaluated. Additionally, the mechanism of the selective separation was investigated systemically via zeta potential measurements, fourier transform infrared (FTIR) spectroscopy analysis, X-ray photoelectron (XPS) spectroscopy analysis and crystal chemistry calculations. It turns out that the selective chemisorption of SHMP on calcite (in the form of complexation between $H_2PO_4^-/HPO_4^{2-}$ and Ca^{2+}) over scheelite is ascribed to the stronger reactivity and higher density of Ca ions on the commonly exposed surfaces of calcite minerals. The intense adsorption of HXMA-8 on scheelite over calcite due to the match of the O-O distances in WO_4^{2-} of scheelite and –CONHOH of HXMA-8 holds the key to the successful separation. We were also interested in warranting the previous claim that NaOl is readily adsorbed on both minerals via chemisorption. Our results provided valuable insights into the application of mixed collectors and an effective depressant for flotation separation.

Keywords: octyl hydroxamic acid; sodium oleate; sodium hexametaphosphate; scheelite; calcite; flotation

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