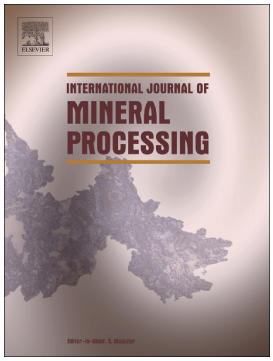

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Parisa Semsari Parapari, Mehdi Irannajad, Akbar Mehdilo

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Effect of acid surface dissolution pretreatment on the selective flotation of ilmenite from olivine and pyroxene

Parisa Semsari Parapari, Mehdi Irannajad, Akbar Mehdilo

Department of Mining and Metallurgical Eng., Amirkabir University of Technology, Tehran, Iran

Email: iranajad@aut.ac.ir

Abstract

The influence of acid surface dissolution as a pretreatment method on the improvement of ilmenite selective flotation from olivine-pyroxene was studied by carrying out the flotation experiments in micro and laboratory (flotation cell) scales. The microflotation experiments show that after surface dissolution, the flotation recovery of ilmenite improves from 73.5% to 92.1% at a pH of 6.3, while that of olivine-pyroxene decreases from 59.6% to 44.6%. The improvement of ilmenite floatability is in good accordance with the relative content of Fe^{3+} in ilmenite surface which increases from 48.5% to 59.8% after surface dissolution as evidenced by XPS analysis. This conversion increases the formation of an insoluble layer of ferric iron oleate, and enhances ilmenite hydrophobicity. FTIR spectra and zeta potential measurements indicated that the adsorption of oleate ions on the surface of olivine-pyroxene decreases significantly after surface dissolution. As evidenced by ICP analysis, this can be due to the dissolution of Fe cations as the active sites from the olivine-pyroxene surface. The cell flotation experiments show that before surface dissolution, an optimal concentrate with 21.2% TiO_2 and 78.3% recovery is achieved using 1000 g/t sodium oleate, 100 g/t $Pb(NO_3)_2$ (activator) and 80 g/t quebracho (depressant). After surface dissolution, the best concentrate containing 25.6% TiO_2 and 80.6% recovery is obtained in the presence of 1000 g/t collector and 100 g/t activator without any depressant agent. As a general result, the acid surface dissolution pretreatment enhances the selectivity of ilmenite flotation and its separation efficiency.

***Keywords**: Ilmenite, Flotation, Acid surface dissolution, Zeta potential.*