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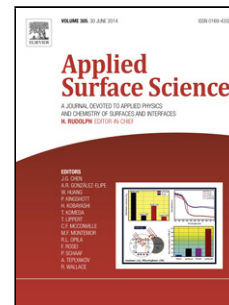
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Influence of microwave irradiation on ilmenite surface properties

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Highlights

- Microwave irradiation converts Fe^{2+} to Fe^{3+} ions on ilmenite surface.
- Fe^{3+} ions react with oleate ions forming $\text{Fe}(\text{Ol})_3$ layer more stable than $\text{Fe}(\text{Ol})_2$ layer.
- The more oleate adsorption after irradiation improves the ilmenite hydrophobicity.
- The study of ilmenite surface by XPS, FTIR, zeta and contact angle measurement.

Abstract

In this study, the effect of microwave irradiation on ilmenite surface properties and its flotation behavior was investigated. After microwave irradiation, Fe^{2+} ions on the ilmenite surface are oxidized to Fe^{3+} ions. XPS analysis indicated that the relative content of Fe^{3+} increased from 48.5% to 66% after microwave irradiation for 2.5 min. This conversion decreased the ilmenite surface zeta potential in a wide pH range and resulted in the shift of PZC from a pH of 5.4 to a pH of 2.7. FTIR spectra and zeta potential measurements showed that the microwave irradiation enhances the adsorption of oleate ions on the ilmenite Helmholtz layer. The greater stability of chemisorbed ferric iron oleate than ferrous iron oleate resulted in the increase of contact angle and the decrease of surface zeta potential. Therefore, the microwave irradiation pretreatment improves the ilmenite hydrophobicity and floatability in a wide pH range. The maximum floatability of ilmenite occurring at a pH of 6.3 was 73.5% and 94% for non-irradiated and irradiated ilmenite, respectively.

Key words: *ilmenite, Flotation, microwave irradiation, surface properties, zeta potential.*

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