

Improved nickel and cobalt recovery from nickeliferous laterites in acidic fluoride media

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Abstract

Nickeliferous laterites were characterized by particle size analysis, X-ray fluorescence (XRF), X-ray diffraction (XRD), scanning electron microscope (SEM) and energy dispersive X-ray analysis (EDX), Fourier transform infrared (FTIR) spectroscopy and thermal analysis. Results showed that the laterites consist mainly of nickel-substituted lizardite with cobble-like morphology and traces amounts of magnetite and phlogopite. As fluoride ions can react with silicon in the lizardite crystal structure and form metal-fluoride complexes, as well as increase the equilibrium constant of the lizardite dissolution in acid solution dramatically, the addition of minor fluoride salts (0.2wt.% NaF) gave a markedly enhanced metal extraction rate (Ni 81.7% and Co 52.3%) under the experimental conditions of particle size $d_{50}=25\ \mu\text{m}$, 10% (v/v) H_2SO_4 reaction time 2 h, reaction temperature 90°C , liquid-to-solid ratio $3\ \text{mL}\ \text{g}^{-1}$ and stirring at 500 rpm compared with H_2SO_4 alone (Ni 69.6% and Co 30.8%).

Key words: Oxide minerals, Mineralogy, Leaching, Nickel/ nickel ores