

NICKEL RECOVERY AND STABILIZATION OF NICKEL WASTE TAILINGS

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ABSTRACT

Nickel waste tailings are produced during the hydrometallurgical leaching of nickel–cobalt ore slurry with concentrated sulphuric acid. They are classified by the Toxicity Characteristic Leaching Procedure (TCLP, US EPA Method 1311) as hazardous materials owing to the extremely high levels of leachable nickel (about 400 mg/l). This study demonstrates that Ligmet™, a stabilizer formulated from ferric–lignin derivatives, has significant nickel-adsorption capabilities allowing it to significantly immobilize leachable nickel components in the tailings. For reducing the heavy loading of leachable nickel that apparently engenders long-term stability, the tailings are practically leached with 2% sulphuric acid to recover valuable nickel at specified condition. Approximately 5.98%–7.69 g/l of nickel was recovered in the final acidic solution at a purity of about 70%. Following the nickel recovery, the leachable Ni-components remaining in the tailings were readily immobilized with the Ligmet™ stabilizer, and reduced to a level lower than the limits set by the Alberta Provincial Regulations (i.e. TCLP Ni < 5 mg/l) for non-hazardous materials.

Key words: Nickel recovery; Waste tailings; Leachability; Stabilization; Lignin derivatives; Adsorption isotherm

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