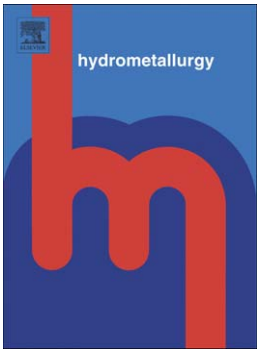

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Anaerobic and aerobic reductive dissolution of iron-rich nickel laterite overburden by *Acidithiobacillus*

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Abstract

Aerobic reductive dissolution (AeRD) of iron, nickel, cobalt and manganese from laterite overburden using *Acidithiobacillus* (*At.*) *thiooxidans* and anaerobic reductive dissolution (AnRD) using *At. ferrooxidans* were examined in laboratory bioreactors. A chemical mobilization of ferric iron occurred in the anaerobic bioreactor inoculated with *At. ferrooxidans* maintained at pH 0.8 but not at pH 1.8. Increasing the pH from 0.8 to 1.8 after seven days was required to provoke an increase of the dissolution rate by biological ferric iron reduction. The aerobic reactors maintained at pH 0.8, either inoculated or non-inoculated with *At. thiooxidans*, showed higher ferric iron release from laterite overburden than the corresponding anaerobic reactors. The aerobic reductive dissolution (AeRD) process using *At. thiooxidans* was far more efficient in extracting total iron, ferrous iron and dissolving manganese, cobalt and nickel than the anaerobic reductive dissolution (AnRD) process using *At. ferrooxidans*. The current study highlights the presence of dioxygen, until yet unconsidered, as key factor to enhance the bio-reductive dissolution of iron-containing minerals.

Keywords: *Acidithiobacillus*, aerobic reductive dissolution, laterite overburden, cobalt, manganese, nickel