A modified reductive bioleaching of laterite ores and mine waste using *Acidithiobacillus thiooxidans* and/or *Acidithiobacillus ferrooxidans*

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Biomining of sulfide minerals has been applied for almost more than five decades. However, geobiotechnology for processing of oxide ores such as laterites lags commercially behind. *Acidithiobacillus (At.) ferrooxidans* and *At. thiooxidans* are two of the most relevant acidophilic chemolithotrophic bacteria used in biomining for the oxidation of sulfide minerals. *At. ferrooxidans* can also reduce ferric iron while oxidizing sulfur compounds under anaerobic conditions. This metabolic capability was used for an anaerobic reductive bioprocessing of laterite ores (Ferredox process, [1]). While *At. ferrooxidans* is the most studied iron-oxidizing and -reducing acidophilic biomining bacterium, *At. thiooxidans* is almost only known as sulfur-oxidizer. We show that the ferric iron reduction mediated by *At. thiooxidans* can be applied in presence of molecular oxygen to an aerobic reductive dissolution (AeRD) of nickel laterite tailings as well as other waste material. Interestingly, the consortium of *At. ferrooxidans* and *At. thiooxidans* showed improved capacities of reductive dissolution of laterite materials in presence of oxygen. No requirement for nitrogen atmosphere, reduced acid consumption as well as nickel and cobalt recovered in a ferrous-based pregnant leach solution (PLS), facilitating the subsequent metal recovery, could be mentioned as some of the advantages of AeRD for processing of laterites. Therefore, the development of the AeRD process should be considered as an environmental friendly process to treat laterite with low operational cost and as an attractive alternative to anaerobic reductive dissolution.

[1] du Plessis et al. 2011. *Hydrometallurgy* **109**, 221–229.