

Atmospheric heap leaching of the Piauí Ni-Co laterite deposit, Brazil

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Co and Ni are both important technology enabling elements and in 2014 Co was included in the European Commission list of 14 Critical Raw Materials (CRMs). The Piauí Ni-Co laterite deposit, located in the Piauí State of northeastern Brazil, has resources totalling over 72 Mt containing 1.0% nickel and 0.05% cobalt [1]. Heap leach technology [2] is being applied at the Piauí deposit and it has been successfully producing a Ni-Co loaded Metal Hydroxide Product (MHP) for ~ 6 months.

The mineralogy of the deposit is dominated by quartz, Fe-Al-Ni silicates, Fe-Mg-Ni silicates and Fe-oxides. Co is mainly associated with Mn-rich phases such as asbolane, whilst Ni is also found with oxides and silicates. From the test excavation pit three distinct units were identified; a ferruginous saprolite, a silicate saprolite and a Mg-silicate saprolite.

In all three units, leaching the material under atmospheric conditions with sulfuric acid released both Ni and Co into solution, with the concentration increasing as a function of leaching time. The recovery varied greatly between the different ore types, with the Mg-silicate saprolite unit releasing over 85% of the total nickel/cobalt during a 28 day leach period. Bulk analysis of the leached residues showed minimal mineralogical changes however the mechanisms of mineral degradation and transformation have been observed using electron microscopy.

The lab scale investigations carried out here will be compared with the test work currently being undertaken at the Piauí site.

[1] Oxley, Smith & Caceres (2015), *Proceedings of Heap Leach Solutions*, InfoMine, 123-133.

[2] Oxley, Smith & Caceres (2016), *Minerals Engineering* 88, 53-60.