

## Biogeochemical cycling of copper during supergene weathering

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The occurrence of copper oxides, secondary copper sulphides and native copper is a common feature in copper-bearing supergene deposits. However, the processes contributing to the formation of native copper in these environments are not fully understood. Native copper has been observed in core samples of the oxidised zone of the E1-North Mine, Mt Isa, North-West Queensland, Australia. Field and hand specimen observations showed that native copper occurs as micrometre- to millimetre-scale minerals within the supergene weathering horizon. The present study investigates the contribution of biogeochemical factors to the formation of native copper and other copper-bearing minerals. Structural and chemical characterisation of polished thin sections using light microscopy and high-resolution, scanning electron microscopy (SEM) with energy dispersive spectroscopy (EDS) revealed micrometre-scale copper-bearing iron-oxide structures that were spatially associated with native copper and were interpreted as microfossils. Whole mount, SEM micrographs of weathered material from the deposit demonstrated that the iron-oxide minerals possessed an acicular texture, comparable to jarosite mineral assemblages produced by *Acidithiobacillus ferrooxidans*. The occurrence of native copper in potentially biogenic jarosite suggests a biogeochemical contribution to copper immobilisation and native copper formation.