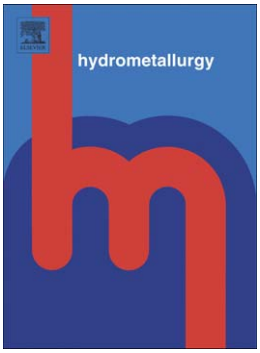

Continuous flow 70 C archaeal bioreactor for iron oxidation and jarosite precipitation

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Continuous flow 70 °C archaeal bioreactor for iron oxidation and jarosite precipitation

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Abstract. This study is the first demonstration of a continuous culture bio-catalysed iron oxidation and jarosite precipitation reactor using thermophilic archaea, for use in hydrometallurgical process flow sheets to oxidize and partially remove iron from solution while minimizing valuable base metal (i.e. Ni and Cu) losses. A two-stage continuous stirred tank reactor (CSTR) system comprised of two CSTRs, each with its own settler, was operated to achieve biological iron oxidation and precipitation at 70 °C. The two-stage reactor configuration was used to allow the growth of microorganisms that prefer different redox regimes. The bioreactors were inoculated with a mixed culture of extreme thermophilic iron oxidisers from genera *Acidianus, Metallosphaera* and *Sulfolobus*. The influent (pH 1.5) contained (g L^{-1}) 15 Fe^{2+}, 1.5 Cu, 1.5 Ni (all as sulfates), nutrients and trace elements. The system demonstrated efficient iron oxidation and precipitation of the oxidised iron in the form of well settling jarosite with only minor loss of Cu and Ni via co-precipitation. At a total hydraulic retention time (HRT) of 13-14 h in the two reactors, the overall