

## Study of deep *in situ* biomining of copper ore.

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Nowadays, deep *in situ* biomining is considered as a viable technic (about cost and environment) to extract metals from low-grade rocks and below the land surface [1]. In this framework, the BioMore project [2] aims at evaluating the rates of copper recovery with this technic. That is why, a high pressure set up was designed in this work to reproduce deep *in situ* leaching process. The aim is to characterize the (bio)geochemical mechanisms implied. The experiments were performed at 130 bars and 55°C on two different types of sandstones with and without inoculating bacteria. As in the industrial process, rocks were firstly washed with mineral water and with sulfuric acid solution (pH=1.5) to dissolve carbonates. Finally, an oxidative solution ([Fe<sup>3+</sup>]=10g/l) was used to dissolve the copper ore. The outlet water was then stored in an high pressure cell before its analysis (composition, pH and redox). The volume used for analysis was replaced by a fresh solution and reused to percolate through the rock with the remaining outlet water.

The results underline that the washing steps were efficient in dissolving all the carbonates. The dissolution of the Cu-bearing materials started at a pH lower than 4 (Figure 1).

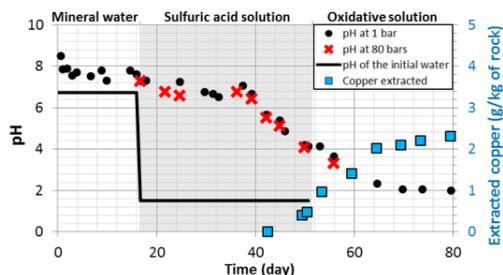


Figure 1: Evolution of the pH and the quantity of extracted copper with one of the sandstone (abiotic test).

The dissolution rate for copper was high since the saturation in respect to secondary phases was quickly reached [3]. The quantity of dissolve copper reached 2 g/kg of rock after only 10 days of oxydative step. Preliminary results of the biotic tests are promising and demonstrate a specific reactivity of the system.

[1] Brierley (2008) Hydrometallurgy 94, 2–7. [2] BioMOre: An Alternative Mining Concept — Raw Materials Commitment (European Commission, 2014). [3] Blanc *et al.* (2012) Appl. Geochem. 27, 2107–2116.