COLUMN EXPERIMENTS AND NUMERICAL MODELLING FOR IN-SITU LEACHING OF SANDSTONE-HOSTED COPPER DEPOSIT

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The BioMOre EU Horizon 2020 project (www.biomore.info) aims at developping "*deep-in situ biomining*" technology which have recently received an increasing attention from research and industry as a cost effective method for recovering metals from deep burried deposits. It consists in injecting a leach solution into the targeted ore body for dissolving base metal bearing minerals, collecting the pregant solution and in regenerating the leach solution thanks to micro-organisms. This technology is being experimented at reactor scale on a Kupferschiefer copper deposit in Poland as part of the BioMOre project.

In this contribution, we present laboratory column experiments investigating the effect of a leaching solution in contact with copper bearing ore crushed at different grain sizes in suitable micro-organism environment conditions. Three stages including (i) water washing, (ii) acid leaching, and (iii) ferric-acid leaching, are successively implemented for progressively dissolving salts, carbonate minerals, and finally copper bearing sulfides.

Models have been implemented in PhreeqC in parallel to the column experiments. They consider a one-dimensional double porosity transport model, where dissolution reactions are described by kinetics. We rely on BRGM's Thermoddem databases [1]. Key parameters such as proportion of advective and diffusive phases, and effective diffusion coefficients were refined by fitting experimental results.

The leaching process was then simulated in 3D at a deposit mesh scale by coupling one-dimensional PhreeqC models with a streamline-based fluid flow simulation approach. Such models will be further used within the BioMOre project for optimizing well-design planning and recovery forecasts.

[1] Blanc *et al.* (2012) Applied Geochemistry 27, 2107-2116.