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Treatment of Acid Mine Drainage. Column experiments and X-ray microtomography.

Francesco Offeddu (1), Ion Tiseanu (2), Jordi Cama (1), Josep M. Soler (1), and Carlos Ayora (1)

(1) Institute of Environmental Assessment and Water Research (IDAEA-CSIC), Barcelona, Spain, (2) Institute for Laser, Radiation and Plasma Physics, Bucharest, Romania

Column experiments to emulate the behavior of passive treatment systems for acid mine drainage (AMD) were carried out. Synthetic acidic solutions made up of H2SO4 and Fe (III) (200-1500 ppm) at pH 2 circulated through columns filled with grains of calcite, aragonite or dolomite at a constant flow rate (6e-7 or 1e-6 m3/m2//s). Grain size ranged between 1 and 2 mm.

The columns worked as an efficient barrier for some time, increasing the pH of the circulating solution to about 7 and removing its metal content. Results show that acidic solution reacts with the carbonate surfaces and newly precipitated gypsum coats the carbonate grains, eventually causing the passivation of the system. Metal-oxyhydroxysulfates precipitate mostly at the central regions of pore space.

Variation in porosity and secondary mineral precipitation (gypsum, goethite, schwertmannite in some cases) was investigated with X-ray microtomography. Reaction fronts advance along the columns (precipitation of gypsum and Fe-oxyhydroxysulfates). Variation in porosity due to secondary mineral precipitation is quantified and formation of preferential flow paths in the porous medium is observed. In addition, X-ray fluorescence was performed to map the metal content and metal distribution.