

The role of minerals in catalysing manganese removal from mine water

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Manganese is a common contaminant of mine and other waste waters, and is notoriously difficult to remove. Systems that effectively remove manganese from mine waters involve oxidising the soluble Mn II species using high pH substrates; to what degree the substrate type and *in situ* microbiological community have upon manganese removal is unclear. In this work, net-alkaline manganese contaminated mine water was treated with the pure minerals dolomite, calcite, magnesite and quartz, to investigate the relationship between the chemical composition and surface roughness of the mineral. In addition, we examined the development of the biofilm community that grew on the substrate surface.

Manganese was removed in all continuous-flow reactors over a 3-month period. SEM, XRD and TG-A were used to assess both the spatial distribution and composition of the precipitates that accumulated on the substrate surface. Mn oxyhydroxides were formed in all the reactor types, however Mn carbonates (kutnahorite) were identified in the quartz reactors and on the reactor plastics only. Mg-rich calcites were identified in the dolomite and magnesite reactors, suggesting that the Mg in these minerals inhibited Mn carbonate formation. Biofilm community development was monitored over time using DGGE. Profiles showed no change over time and no difference between substrate types, suggesting that the microbiological community in the reactors may not play an active role in Mn removal in these systems.

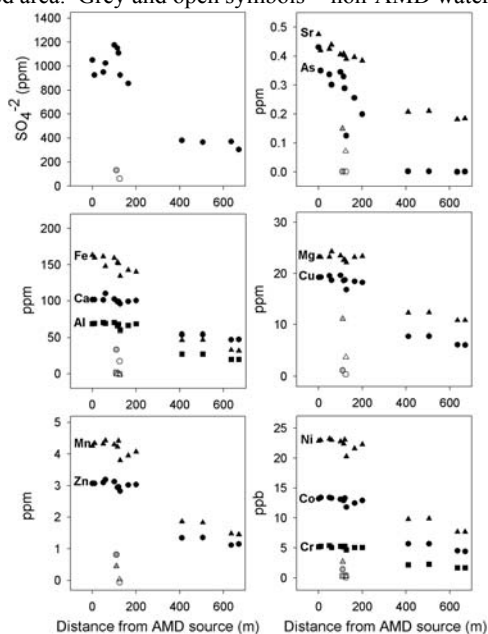
Water mixing and precipitation of arsenic-bearing iron sulfate in the Chinkuashih acid-mine-drainage area, northern Taiwan

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Acid mine drainage (AMD) coming out of a tailing site at Golden Falls is precipitating a mass of schwertmannite deposits along a stream in the Chinkuashih gold-copper mining area. Down stream water chemistry was measured by ICP-MS, ICP-OES, and an on-site photometer (Figure 1).

Figure 1. Compositional variations of stream waters in the studied area. Grey and open symbols = non-AMD waters.



The variations in the concentrations of Mg, Al, Co, Ni, Cu, Zn, Cr, Rb, and Sr and pH value suggest a water mixing ratio of approximately 2/3 between the AMD stream (pH = ~2.6) and the main stream (pH = ~6.0). On the other hand, arsenic and iron concentrations show significant decreases in addition to the mixing effect, concurrent with a decrease of pH values from 2.6 to 3.1. Transformation of schwertmannite to goethite with depths at Golden Falls do not seem to have a significant effect on the arsenic concentration in the AMD solution. The extra changes in As and Fe concentrations are attributed to precipitation of schwertmannite and imply an arsenate sorption process in schwertmannite.