

Mineral surface-processes on the nanoscale in contaminated acid soils

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The role of mineral surfaces in contaminated acid soils is of critical importance as they influence transport, retention and chemical transformation of metal(loid)s. Acid soils occur worldwide but are typically associated with point sources of SO₂ emissions such as the base-metal smelters of the Greater Sudbury area, Canada, which emitted roughly 3.5 million tons of SO₂ and 1000 tons of Cu and Ni annually from 1900 to 1972. Relicts of these smelter activities are highly leached acid soils containing thousands of mgkg⁻¹ Cu and Ni mainly in the form of spherical particular matter [1]. In order to assess interfacial processes in these soils, mineral surface-coatings were characterized on the nano- to micrometer level. Silica-rich coatings are composed of clay-minerals along the coating-mineral interface and Cu- and Ni-bearing oxides and amorphous silica along the coating-soil interface. Minerals between these interfaces occur on the nano-scale and the transition from clay to oxide minerals reflects most likely changes in the soil chemistry due to the beginning of mining activities in the area. Iron-rich coatings are composed of an amorphous Fe-silica matrix containing nano-size crystals of Cu- and Ni-bearing Fe-oxides and sulfates as well as petrified bacteria in association with jarosite and magnetite. The occurrence of these phases and bacteria give insights into the uptake mechanisms of metal(loid)s during coating formation and biogenic-controlled redox processes on mineral surfaces.

[1] Lanteigne *et al* (2012) *Water Air Soil Pollut.* **223**. 3619-3641.