Investigating Ni partitioning in a contaminated aquifer

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Improved prediction of the transport and bioavailability of transition metals in contaminated soils and sediments demands a better quantitative understanding of how metals partition between aqueous solutions and mineral phases. In this study, five-step Tessier sequential extractions (Tessier et al., 1979, *Analytical Chemistry* **51**, 844-851) and adsorption experiments were performed on sediments from uncontaminated and nearby Ni contaminated shallow aquifer sediments from a site located near Monroe, MI USA.

Measurable Fe and Ni concentrations were obtained only from the sequential extraction step designed to extract particulate Fe/Mn phases and associated metals. This suggests that Ni partitions primarily into Fe or Mn oxide phases in this aquifer. Based on similar observations, models used to guide remediation efforts at the contaminated site have relied primarily on predicted behavior for Ni adsorption onto ferrihydrite.

However, Ni adsorption experiments performed on whole sediments over a wide range of pH (2-12) are not in agreement with results predicted based on the assumption that Ni adsorption is primarily controlled by ferrihydrite. In particular, there is more sorption of the Ni at low pH than is predicted for a system composed only of ferrihydrite. This suggests that other phases present in the aquifer, such as clay minerals, may significantly affect Ni speciation in this contaminated aquifer.

Chemical speciation study of amphibolite weathering under different climatic setup of Mysore plateau, southern India

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Chemical speciation of elements during weathering of amphibolites has been studied to understand their elemental mobility and redistribution in the weathering products developed under different climatic conditions. The bioavailability of any nutrient element depends on the form in which the element exists in weathered products or soils. Saprolite and soil samples developed on profiles and rinds were collected from semiarid (annual rainfall 70-80 cms) and humid (300-400 cms) regions of Mysore plateau, Southern India. The humid regions of Mysore plateau, the Western Ghats constitute an ecological hotspot in the country. Chemical speciation on the weathered rock samples was performed using the standard methods. We have found that Al and transition metals analyzed (V, Cr, Mn, Fe, Co, Ni, Cu, Zn) are mostly associated with the organic fraction, crystalline iron, amorphous iron and Mn oxide fraction in the listed order. Carbonate fraction is also important for Cu, Zn and Ni. Organic fraction and exchangeable forms are significantly important for Na, K, Mg, Ca, Sr & Ba. For obvious reasons Mn occurs in the Mn oxide and Ca in the carbonate form. We note that despite the differences in climate (semi-arid Vs humid) and mode of weathering (rinds Vs profile), the organic fraction plays an important role in sequestering the mobilized elements during weathering, which could be available to the plants under certain favourable conditions. We also observe that there is a general similarity in the chemical speciation of elements studied here in weathered products of amphibolites irrespective of the nature and extent of chemical weathering. Therefore, we suggest that the chemical speciation of the elements in weathering products was not constrained by varied climatic setups and bulk geochemistry of the weathered products of amphibolites in the study area.