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Geogenic Nickel Speciation in Serpentine Soils and Its Relationship to Nickel Uptake in Hyperaccumulator Plants.

Tuesday, November 3, 2009: 3:00 PM
Convention Center, Room 334, Third Floor

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Hyperaccumulating plants have an extraordinary ability to extract pollutants from soil. Some can accumulate up to 20g/kg nickel in dry shoot biomass. This ability can be utilized to economically remediate contaminated soils. Nickel is a transition metal that occurs in soils from both geogenic and anthropogenic sources. Many nickel hyperaccumulating plants are endemic to serpentine soils, which have geogenically augmented nickel concentrations. Nickel concentration increases in serpentine soils because geochemical weathering processes alter and proportionally increase its concentration from the ultramafic ferromagnesian silicate parent rock. Concentrations can increase enough to form commercially exploitable soil. In the soil, nickel is weathered into secondary minerals by substitution for Mg2+ in garnierite silicates like serpentine, talc, sepiolite, smectite, and chlorite. Nickel also largely accumulates with iron and manganese oxides. Identifying nickel species via in situ molecular scale methods such as X-ray absorption spectroscopy (XAS) in serpentine soils has not been previously conducted. In this study XAS is employed to determine the speciation of Ni in serpentine soils. We have coupled the Ni speciation studies with Ni uptake experiments to determine the relationship between the Ni speciation in the soil and the Ni uptake in the hyperaccumulator plants. Determining this relationship is critical to assess phytoremediation potential. These data will assist in determining if phytoremediation is a suitable technology for a specific polluted site or if phytomining is possible to extract nickel from a soil for profit. Stirred-flow studies and batch experiments were also conducted to provide dissolution data to correlate any links between nickel speciation, solubility, and plant uptake.

See more of: It's About Interfaces: Plant-Soil-Microbe Interactions that Influence Contaminant Cycling in the Critical Zone