



Metals, minerals and microbes: geomicrobiology and bioremediation

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Microbes are intimately involved in many geological phenomena, and these include biotransformations of metals and minerals, as well as related elements like metalloids, and metal radionuclides. Such processes are involved in bioweathering, mineral dissolution and formation, and soil formation and development. Integral to all these, and other, mechanisms are microbial interactions with metals, and a variety of processes determine mobility and bioavailability. Metal mobilization can arise, e.g. from leaching mechanisms, and complexation by metabolites. Immobilization can result from sorption, transport and intracellular sequestration or precipitation as a variety of organic and inorganic biominerals, e.g. oxalates (fungi), carbonates, phosphates and sulfides. Secondary minerals may also result as products of organic matter decomposition or mineral dissolution react with other environmental constituents. Our research seeks to understand the nature of metal-mineral-microbe interactions and their relevance to important biosphere processes such as element cycling and biomineralization, and their applied significance in bioremediation, biodeterioration and corrosion. This presentation will describe several examples of metal-microbe interactions mediated by fungi and/or bacteria and the basic principles and mechanisms involved. Specific topics may include degradation and transformations of metal- and mineral-based substrates, depleted uranium and uranium oxides, sulfide precipitation and reduction of metalloid oxyanions to elemental forms.