219-5 Coupled Biotic and Abiotic Arsenite Oxidation Kinetics with Heterotrophic Soil Bacteria and a Poorly Crystalline Manganese Oxide.

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Arsenic (As) is a redox-active metalloid whose toxicity and environmental mobility depend on oxidation state. Arsenite [As(III)] can be oxidized to arsenate [As(V)] by both minerals and microbes in soils, however, the coupling of these abiotic and biotic processes is not well understood. It has been noted in previous studies that manganese (Mn) oxide minerals can oxidize As(III) and sorb As(V) and that soil bacteria can also oxidize As(III). It is thought that heterotrophic As(III) oxidation is a detoxification mechanism for bacteria. Here, the apparent rate and rate constants of As(III) oxidation by four strains of previously isolated bacteria, *Alcaligenes faecalis*, *Agrobacterium tumefaciens*, *Pseudomonas fluorescens*, and *Variovorax paradoxus*, are determined using batch experiments and the Michaelis-Menten model for enzyme kinetics. To evaluate the combined effects of mineral and microbial oxidants, As(III) depletion rates in batch experiments with a mixture of poorly crystalline manganese oxide (δ-MnO_2) and four strains of bacteria (*A. faecalis, A. tumefaciens, P. fluorescens, and V. paradoxus*) are characterized. The kinetic information on As(III) oxidation presented here contributes to understanding the mechanisms, time dependency, and intricate coupling of microbial and mineral redox processes in soils.

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