

Fate transport and cycling of hexavalent chromium in the soil environment

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In order to understand the long-term bioavailability of inorganic pollutants such as chromium(Cr) it is essential to quantify their cycling, stability, and sorption state. In the environment nontoxic Cr(III) is the preferred species, however, manganese(IV) oxides and industrial activity can transform nontoxic Cr(III) into carcinogenic Cr(VI). Mn oxides can also help immobilize chromium as surface precipitates, resulting in surface passivation of the manganese oxides and a reduction in redox capacity. This process has profound implications to reduce the formation of chromate, sequester free chromium, and minimize the risk of environmental contamination. Despite the significance of Cr in the environment, the current understanding of these reactions is very limited. Our research seeks to address these deficiencies by elucidating the mechanisms of chromium oxidation on manganese surfaces. Additional studies will focus on Cr(VI) desorption from contaminated soils. Synchrotron-based X-ray absorption fine structure spectroscopy (XAFS) is the only technique that can differentiate chromium phases which are essential to understanding their long term environmental stability.