



GEOC 242: Shining light on Cr(III) oxidation mechanisms on Mn-oxides

Jason Fischel², Donald Lewis Sparks¹

1. Interdisciplinary Sci Engr Lab, Univ of Delaware, Newark, Delaware, United States
2. Plant and Soil Science, University of Delaware, Hockessin, Delaware, United States

Manganese(IV) oxides are one of the main redox catalysts in the subsurface environment and important sorbents of metals. Their wide-spread distribution in soil, combined with their highly reactive surfaces, allow manganese (Mn) oxides to oxidize trace metals such as chromium from Cr(III), the less mobile and toxic form, to Cr(VI), which is highly mobile and carcinogenic. Despite the significance of Cr in the environment, there is currently an unclear understanding of the mechanisms of Cr(III) oxidation on Mn-oxides. Our research seeks to address these deficiencies by monitoring the step-wise kinetics of the oxidation process, coupled with molecular scale assessment of the reaction products on the mineral surface. A synthetic manganese oxide - hydrous manganese oxide (HMO) – was reacted in a stirred-flow chamber with Cr(III) over a range of time scales. The effluent was speciated for Cr(III), Cr(VI) and Mn via Inductively coupled plasma mass spectrometry to quantify chromium levels over the course of the reaction. At several time points the stirred-flow reaction was quenched, to conduct surface analysis on the HMO. Sorbed chromium was speciated using synchrotron-based X-ray absorption fine structure spectroscopy (XAFS). Identifying reaction products on the manganese surface is crucial in understanding the cycling of Cr in the environment. In particular, how processes such as surface passivation, which leads to a reduction in redox capacity, can preclude the formation of Cr(VI), minimizing the risk of environmental contamination.

Sessions



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Thursday, Mar 22 9:55 AM

Room 338, Ernest N. Morial Convention Center

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