

Real-time surface-chemistry of arsenite oxidation by hydrous manganese oxide: Impact of oxyanions

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Matthew Ginder-Vogel, mattgv@udel.edu¹, Sanjai J. Parikh, sjparikh@udel.edu¹, Jason S. Fischel, fischjs06@juniata.edu², and Donald L. Sparks, dlsparks@udel.edu¹. (1) Department of Plant and Soil Sciences and the Center for Critical Zone Research, University of Delaware, 152 Townsend Hall, 531 South College Avenue, Newark, DE 19716, (2) Department of Chemistry, Juniata College, 1700 Moore Street, Huntingdon, PA 16652

Arsenite (As(III)) oxidation to arsenate (As(V)) by manganese(IV) oxide is an important reaction impacting the natural cycling of As. The arsenite species is substantially more toxic and tends to bind more weakly to soils than As(V) does. Heterogeneous oxidation of As(III) on the surface of manganese oxides has been well characterized; however, the surface chemistry of the oxidation reaction remains poorly characterized, particularly during the initial phase of the oxidation reaction. Using quick-scanning X-ray absorption spectroscopy (Q-XAS), which allows the collection of X-ray absorption near edge structure (XANES) and extended X-ray absorption fine structure (EXAFS) spectra in 2 to 3 seconds, we have monitored the As oxidation state and local-binding environment during the oxidation reaction. We will present information on the oxidation rate of As(III), as well as changes in the Mn(IV) oxide structure and As binding environment. Additionally, the effect of phosphate and sulfate on As(III) oxidation and binding will be explored. This information will further our understanding of As oxidation and mobilization processes.

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