

ASA, CSSA, and SSSA 2010 International Annual Meetings

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Green Revolution 2.0: Food+Energy and Environmental Security

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220-1 Kinetics of Rapid Redox Processes at the Mineral/Water Interface Using Quick-Scanning X-Ray Absorption Spectroscopy (Q-XAS).

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Tuesday, November 2, 2010: 1:00 PM

Long Beach Convention Center, Room 202B, Second Floor

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Donald Sparks, *Matthew Ginder-Vogel and Gautier Landrot, 531 S College Ave, University of Delaware, Newark, DE*

Measurement of rapid, initial rates of environmentally important reactions at the mineral/water interface is critical in determining reaction mechanisms. Until recently, experimental techniques with sufficient time resolution and elemental sensitivity to measure initial rates were very limited. Techniques such as electron paramagnetic resonance and Fourier transform infrared spectroscopies provide limited elemental specificity and poor sensitivity to inorganic elements, respectively. Ex-situ analysis of batch and stirred-flow systems offers high elemental sensitivity, but their time resolution is not adequate to capture rapid reaction rates that often comprise a significant portion of many soil geochemical processes such as sorption and oxidation-reduction. In this presentation we have employed an in-situ synchrotron-based technique, quick scanning X-ray absorption spectroscopy (Q-XAS), at sub-second time scales, to measure the initial oxidation of As(III) and Cr(III) by hydrous manganese oxide. Results indicate that with this technique, chemical kinetics are being measured. Q-XAS has multiple applications to soil chemical measurements including sorption/desorption, precipitation/dissolution, and solid-phase transformation phenomena.

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