

- 066. Kinetics and Mechanisms of Lead Sorption and Desorption at the γ -Al₂O₃/Water Interface.** D.G. Strawn and D.L. Sparks. Department of Plant and Soil Sciences, University of Delaware, Newark, DE, 19717-1303, USA.

An understanding of the kinetic behavior of metal reactions on soils and soil constituents has important industrial, agricultural, and environmental applications. It is often observed that sorption reactions occur fast initially, and then the reaction rate slows down. However, many researchers have not considered the slow sorption step, and assume that the reaction has reached equilibrium when in fact sorption is continuous for long periods. Studies of Pb sorption on γ -Al₂O₃ indicated that in 24 hours the reaction was only 80% complete, and equilibrium was not obtained until 200 hours. In an effort to determine if the changes in sorption rates are due to different retention mechanisms, X-ray absorption fine structure (XAFS) spectroscopy was employed to study the local chemical environment on the γ -Al₂O₃ surface with time. The radial distribution structure (RDS) functions demonstrate that the sorbed Pb has only a single Pb-O peak at 1.9 Å. This suggests that the formation of a surface precipitate is not occurring, and is not responsible for the slow kinetic reaction. Two other possibilities for the slow reaction remain: sorption to sites of variable reactivity, and slow diffusion processes. Fitting and modeling of the time resolved XAFS data will indicate whether or not sites of variable reactivity are responsible for the slow reaction. Validation of the slow sorption step will provide important data on the rate-limiting process. Such information can be used in data modeling and experimental design, as well as predicting the overall fate of Pb in the environment.