

The Rates and Mechanisms of Borate and Sulfate Adsorption at the Iron Oxide/Aqueous Interface

J. D. Peak, R. G. Ford, W. R. McKinney and M. C. Martin

Although fully understanding the reactions of sulfate and borate with soils is important for both environmental and agronomic reasons, there are still many unanswered questions about the processes that these oxyanions undergo in the soil environment. While it is accepted that borate sorbs on variably charged surfaces as an inner-sphere complex, it is currently debated in the literature whether sulfate forms outer-sphere or inner-sphere complexes in such systems. This study investigates the kinetics and mechanisms of sulfate and borate adsorption at the goethite/aqueous interface over a range of pH, ionic strengths, and time scales. Goethite was used as a model soil constituent since it is a very common component of variably charged soils and it is known that oxyanions are quite reactive with iron oxides. Direct spectroscopic evidence obtained via Attenuated Total Reflectance (ATR) FIR spectroscopy will be presented to complement laboratory studies, with particular emphasis on any changes in surface complexes that occur over time.