

# Graduate Student Paper Competition

## Investigation of the Residence Time Effect on Phosphate (P) Adsorption/Desorption

### Mechanisms at the Ferrihydrite/Water Interface using P XANES and ATR-FTIR

Yuji ARAI\* and D.L. SPARKS, University of Delaware

The fate and transport of P in acid soils is highly dependent on adsorption/desorption reactions at the amorphous mineral/water interface. In this study, we investigated residence time (<24h and >24h) effects on P adsorption/desorption at the ferrihydrite/water interface at pH=4, I=0.1M NaCl, and  $[P]_0=1\text{mM}$ . Adsorption kinetics were initially fast, resulting in 93% of the total adsorption within 6h, followed by a slow P uptake. Desorption were carried for 24h under same reaction conditions using a stirred-flow apparatus. Only  $\cong 5\%$  of total adsorbed P is recovered after being incubated for 2d and the total P recovery decreases to <1% with increasing aging time from 2d to 10months. Temperature studies show that the overall adsorption is an endothermic reaction, suggesting a predominantly chemically-controlled reaction. *In-situ* FTIR studies suggested the formation of inner-sphere (monodentate mononuclear or bidentate binuclear) complexes and whereas P-XANES indicated the formation of an amorphous iron phosphate-like surface precipitates.

Yuji Arai, (302)831-1595, ugarai@udel.edu