

## Sulfate Sorption on Goethite in the Presence of Pb.

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We studied the effect of lead (Pb) on sulfate ( $\text{SO}_4^{2-}$ ) sorption at the goethite-water interface at pH 4.3, 5.5 and 6.0 using in situ ATR-FTIR spectroscopy. As base line information,  $\text{SO}_4^{2-}$  sorption was studied in the absence of Pb over a range of  $\text{SO}_4^{2-}$  concentrations. At all pH values, both inner-sphere and outer-sphere  $\text{SO}_4^{2-}$  sorption complexes were observed. Inner-sphere  $\text{SO}_4^{2-}$  complexes became more dominant with decreasing pH, and increasing  $\text{SO}_4^{2-}$  concentrations. Adding Pb to the system resulted in an increase of the overall  $\text{SO}_4^{2-}$  sorption and an increase in the contribution of outer-sphere  $\text{SO}_4^{2-}$  complexes. This may be due to Pb competing with  $\text{SO}_4^{2-}$  for inner-sphere sorption sites, and/or electrostatic effects due to inner-sphere Pb sorption. XAFS data for Pb sorbed on goethite showed that Pb forms inner-sphere complexes at the goethite surface. No differences were observed between Pb sorbed in the absence of  $\text{SO}_4^{2-}$  and Pb sorbed in a system with a 500-fold excess of  $\text{SO}_4^{2-}$ .

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