

Inner/outer sphere complexation of 1,2,4-benzenetricarboxylate at the goethite (α -FeOOH)/water interface

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The complexation of 1,2,4-benzenetricarboxylate (trimellitate) at the goethite/water interface was investigated in 0.1 M NaNO₃ at 298.2°K in the pH range 2.7 to 10.0. The system was investigated at equilibrium by means of diffuse reflectance FTIR spectroscopy, potentiometric titrations, batch adsorption experiments, and ζ potential determinations by electroacoustics.

The analysis of the FTIR spectra provide clues to the binding modes of trimellitate complexed at the goethite/water interface. The interpretations suggest that trimellitate is in outer-sphere coordination above

pH 6 and that below this value it is in inner-sphere coordination with the goethite surface. The combined potentiometric titrations and batch adsorption data were used to constrain an equilibrium surface complexation model which is consistent with the interpretations of the FTIR spectra. Formation constants for inner- and outer-sphere surface complexes were evaluated using the extended constant capacitance model. Model calculations of the surface potential of goethite in equilibrium with trimellitate are also in qualitative agreement with ζ potential measurements.