Surface complexation modeling of fluoride adsorption onto kaolinite

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Abstract

The aim of this research was to provide a mechanistic interpretation for fluoride adsorption onto kaolinite over a range of experimental conditions that are important environmentally. Proton titration data of kaolinite showed that the $pH_{zpc}=8.9$, and the intrinsic acidity constants (of dominant $\equiv$AlOH) sites were $pK_{a1}=-9.23$, and $pK_{a2}=7.57$. The mineral surface exhibited some site heterogeneity. The diffused layer model using the following reaction stoichiometries was employed to quantify anion adsorption data:

$$\equiv AlOH + H^+ + F^- \rightarrow \equiv AlF + H_2O; \quad \log K_{\equiv AlO\text{-}F} = 15.16$$

$$\equiv SiOH + H^+ + F^- \rightarrow \equiv SiF + H_2O; \quad \log K_{\equiv SiO\text{-}F} = 13.10$$

Keywords: Fluoride; Kaolinite; Surface complexation