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# Mechanism of Sulfate Adsorption by Kaolinite

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**Abstract:** Sulfate adsorption on kaolinite was followed at 0.7  $\mu\text{eq/ml}$  to 99  $\mu\text{eq/ml}$  solution concentrations at 30° C and at pH 6.0, and the amount of  $\text{OH}^-$  ions released and the change in surface charge were determined. Sulfate was adsorbed at positive and neutral sites by displacing  $\text{OH}_2$  and  $\text{OH}^-$  groups, respectively. Adsorption of sulfate occurred predominantly at positive sites at low (0.7  $\mu\text{eq/ml}$  to 0.9  $\mu\text{eq/ml}$ ) solution concentrations, whereas at higher solution concentrations, the proportion of the sulfate adsorbed at the neutral sites increased, varying from 51% at 4.9  $\mu\text{eq/ml}$  to 68% at 99  $\mu\text{eq/ml}$ . The form of sulfate bonding was apparently governed by the level of the positive charge on the clay surface. Higher positive charge at low and intermediate levels of sulfate saturation resulted in the adsorption of sulfate as a divalent anion by forming a 6-member ring with surface Al. With a decrease in positive charge at higher levels of adsorption, the sulfate ion formed both monodentate and bidentate complexes.

**Key Words:** Adsorption • Bidentate • Hydroxyl • Kaolinite • Monodentate • Sulfate

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