Mechanisms of Boron Adsorption on Metal Oxides. C.V. TONER, IV* and D.L. SPARKS, Univ. of Delaware.

It is widely known that boron reactions with oxides present in soils often regulate the amount of boron in the soil solution. Yet the reaction mechanism has not been firmly established. Pressure-jump relaxation kinetic experiments were conducted to determine the mechanism of borate adsorption on alumina (γ-Al_2O_3) in boric acid/borate solutions. Total boron was maintained constant while borate concentration was manipulated by varying the pH. Relaxation times (τ) were measured in borate/alumina suspensions from pH 7.0 to 9.7. A plot of τ^{-1} vs. borate and surface site concentration yielded an adsorption rate constant of 26.7 M^{-1} s^{-1} and a desorption rate constant of 741 s^{-1}. The ratio of the adsorption and desorption rate constants yielded an equilibrium constant (log K_{eq}) of -1.44. This was in substantial agreement with the equilibrium constant obtained from isotherm calculations (log K_{eq} = -1.81). The borate anion appears to be specifically adsorbed on neutral surface sites of alumina.

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