



Effect of aquatic chemistry on virus sorption onto kaolinite and bentonite

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Bacteriophage MS2 and Φ X174 were used as surrogates for human viruses in order to investigate the interaction between viruses and clay particles. The selected phyllosilicate clays were kaolinite and bentonite. Numerous reactor vessels were filled with 0.5 g of clay and 50 mL of sterile phosphate buffered at pH 7.0. A series of static and dynamic experiments for various bacteriophage concentrations were conducted at two different temperatures. Half of the reactor vessels were placed in a refrigerator at 4 °C and the rest in a constant temperature room at 25 °C. The dynamic batch experiments were performed with the reactor vessels attached to a small bench-top tube rotator. Appropriate adsorption isotherms were determined. Subsequently, the Derjaguin-Landau-Verwey-Overbeek theory was applied in order to determine the interaction energies between the bacteriophage and clay surfaces. The electric properties of the viral surfaces were also obtained at different pH values and ionic strength levels. The experimental results show that virus adsorption increases linearly with suspended virus concentration. The observed distribution coefficient (K_d) was higher for MS2 than Φ X174. Also, the observed K_d values were higher for the dynamic than static experiments, and increased with temperature. Moreover, the results indicate that the electrostatic interactions between viruses and the clays are significantly influenced by the solution's ionic strength and pH. At pH 7, bacteriophage-clay energy barriers were higher for MS2 than Φ X174.