



Effects of grain size and temperature on virus attachment onto quartz sand

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Virus transport in groundwater is controlled mainly by attachment onto the solid matrix and inactivation. Therefore, understanding how the various parameters affect virus attachment can lead to improved virus transport predictions and better health risk evaluations. This study is focused on the attachment of viruses onto quartz sand under batch experimental conditions. The bacteriophages Φ X174 and MS2 were used as model viruses. Three different sand grain sizes were employed for the static and dynamic experiments. The batch sorption experiments were performed under static conditions at 4°C and 20°C and dynamic conditions at 4°C. The experimental data were adequately described by the Freundlich isotherm. It was shown that temperature significantly affects virus attachment under static conditions. The attachment of both MS2 and Φ X174 onto quartz sand was greater at 20°C than 4°C. Higher virus attachment was observed under dynamic than static conditions, and in all cases, the affinity of MS2 for quartz sand was greater than that of Φ X174. Furthermore, in most of the cases considered, bacteriophage attachment was shown to decrease with increasing quartz sand size.