

## **Cotransport of clay colloids and viruses in water saturated porous media**

### **ABSTRACT**

This study examines the cotransport of clay colloids and viruses in laboratory packed columns. Bacteriophages MS2 and  $\Phi$ X174 were used as model viruses, kaolinite (kGa-1b) and montmorillonite (STx-1b) as model clay colloids, and glass beads as model packing material. The combined and synergistic effects of clay colloids and pore water velocity on virus transport and retention in porous media were examined at three pore water velocities (0.38, 0.74, and 1.21 cm/min). The results indicated that the mass recovery of viruses and clay colloids decreased as the pore water velocity decreased; whereas, for the cotransport experiments no clear trend was observed. Temporal moments of the breakthrough concentrations suggested that the presence of clays significantly influenced virus transport and irreversible deposition onto glass beads. Mass recovery values for both viruses, calculated based on total virus concentration in the effluent, were reduced compared to those in the absence of clays. The transport of both suspended and attached onto suspended clay-particles viruses was retarded, compared to the tracer, only at the highest pore water velocity. Moreover both clay colloids were shown to hinder virus transport at the highest pore water velocity. At the lower velocities MS2 transport was hindered and  $\Phi$ X174 transport was facilitated with the exception of  $U=0.74$  cm/min in the presence of KGa-1b. Both MS2 and  $\Phi$ X174 were attached in greater amounts onto KGa-1b than STx-1b. Also, MS2 exhibited greater affinity than  $\Phi$ X174 for both clays.