Investigation of gravity effect on biocolloid and colloid transport through water-saturated porous media

C.V. Chrysikopoulos[1],* and V.I. Syngouna[2]
[1]Department of Environmental Engineering, Technical University of Crete, 73100 Chania, Greece
[2]Environmental Engineering Laboratory, Department of Civil Engineering, University of Patras, 26500 Patras, Greece

*Corresponding author: E-mail: cvc@enveng.tuc.gr, Tel +30 2821037797

Abstract
The role of gravitational force on biocolloid and colloid transport in water-saturated columns packed with glass beads was investigated. Transport experiments were performed with biocolloids (bacteriophages: ΦX174, MS2) and colloids (clays: kaolinite KGa-1b, montmorillonite STx-1b). The packed columns were placed in various orientations (horizontal, vertical, and diagonal) and a steady flow rate of Q=1.5 mL/min was applied in both up-flow and down-flow modes. All experiments were conducted under electrostatically unfavorable conditions. The experimental data were fitted with a newly developed, analytical, one dimensional, colloid transport model, accounting for gravity effects. The results revealed that flow direction has a significant influence on particle deposition. The rate of particle deposition was shown to be greater for up-flow than for down-flow direction, suggesting that gravity was a significant driving force for biocolloid and colloid deposition.

Keywords: gravity effects, ΦX174, MS2, clay minerals, KGa-1b, STx-1b, biocolloid transport

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