Determination of experimental and theoretical collision efficiencies for biocolloids migrating in water saturated columns packed with sand

Vasiliki I. Syngouna and Constantinos V. Chrysikopoulos

University of Patras, Civil Engineering Department, Environmental Engineering Laboratory, Patras 26500, Greece
(kikisyg@yahoo.gr, gios@upatras.gr)

The effects of grain size and water velocity on the kinetics of biocolloids deposition onto clean quartz sand in columns packed with sand were investigated theoretically and experimentally. To assess the importance of biocolloid attachment, the single collector removal efficiency, and the collision efficiency were quantified using classical colloid filtration theory. Interaction Force Boundary Layer (IFBL) and Maxwell approximations were employed to calculate the theoretical collision efficiencies. The results clearly show that theoretical collision efficiencies are many orders of magnitude smaller than those measured experimentally. The experimental collision efficiencies are in good agreement with the Maxwell model predictions, but they are significantly greater from those predicted by the IFBL model. The results of this study indicate that the secondary energy minimum plays an important role in biocolloid deposition even for the smaller of the particles examined (e.g. viruses).