



Cotransport of TiO₂ nanoparticles and *Pseudomonas putida* in porous media

Ioannis Zaharis (1), Ioannis D. Manariotis (1), and Constantinos V. Chrysikopoulos (2)

(1) Department of Civil Engineering, University of Patras, 265 04 Patras, Greece , (2) School of Environmental Engineering, Technical University of Crete, 731 00 Chania, Greece

The scope of this study was to investigate the cotransport of *Pseudomonas putida* and TiO₂ nanoparticles (NPs) in porous media. Flowthrough experiments were conducted in glass columns with diameter of 2.5 cm and length of 30 cm, packed with 2-mm diameter spherical glass beads. Anatase TiO₂ NPs solutions were prepared in distilled water of at two different concentrations: 5 and 50 mg/L. The concentration of *P. putida* solutions varied from 105 to 109 cfu/mL. Initially, transport experiments were conducted separately for *P. putida* and TiO₂ NPs. Subsequently, TiO₂ and *P. putida* cotransport experiments were conducted. The concentration of TiO₂ NPs was measured by a fluorescence spectrophotometer and *P. putida* concentration was determined by plate counts on agar plates and optical density measurements. All experiments were conducted with two different flow rates: 1 and 2 mL/min. The transport experiments with *P. putida* exhibited similar transport behavior with the tracer (NaBr) indicating that there was not considerable retention. The mass recovery of *P. putida* was close to 100% in all of the transport experiments conducted. However, the transport experiments with TiO₂ NPs suggested that a significant portion of the NPs was retained in the column. Based on the cotransport experimental data, it is evident that the transport of *P. putida* was not significantly affected by the presence of TiO₂. It should be noted that the mass recovery of NPs in the transport and cotransport experiments was between 40 and 60%.