Performance of granular dead anaerobic sludge as permeable reactive barrier for containment of lead from contaminated groundwater

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ABSTRACT

This study investigates the performance of granular dead anaerobic sludge (GDAS) bio-sorbent as permeable reactive barrier (PRB) in removing lead from a contaminated shallow groundwater. Batch tests have been performed to characterize the equilibrium sorption properties of the GDAS and sandy soil in lead-containing aqueous solutions. A 1D advection–dispersion equation, solved by computer solutions Multiphysics 3.5a software which is based on finite element method, has been used to simulate the equilibrium transport of Pb^{2+} ions within groundwater. This equation has taken into account the pollutant sorption onto the GDAS and sandy soil which is performed by Langmuir equation. Numerical results proved that the PRB plays a potential role in the restriction of the contaminant plume migration. These results also show that the thicker PRB is better than the thinner ones in lead treatment and the barrier starts to saturate with contaminant as a function of the travel time. A good agreement between the predicted and experimental results was recognized with root mean square error not exceeded the 0.0499.

Keywords: Granular dead anaerobic sludge; Lead; Permeable reactive barrier; Groundwater; Transport