SIMULATION OF TRANSPORT NANOIRON PARTICLE AND DESTRUCTION OF CHLORINATED HYDROCARBONS CONTAMINANTS IN POROUS MEDIA

SIMULACE TRANSPORTU ELEMENTÁRNÍHO NANOŽELEZA A DESTRUKCE CHLOROVANÝCH KONTAMINANTŮ V PORÉZNÍM PROSTŘEDÍ

Pavel Mašín, Petra Janouškovcová, Petr Beneš, Martin Kubal
Institute of Chemical Technology Prague, Technická 5, 166 28 Praha 6, Czech Republic, e-mail: Petr.Benes@vscht.cz

Abstract:
Today applications of commercial products nZVI in the well present a number of problems because of aggregation and sedimentation of Fe nanoparticles. These processes complicate their transport in porous medium and contribute to pores colmatage in soil. This work deals with the description of suspension transport of nZVI TODA laboratory stabilized by silica and with simulation of PCE destruction in modeled saturated soil (grain size of 0,25 to 2,5 mm). Transport experiments were performed with 6 suspensions of different Fe concentrations and volume ratios silica / TODA. Degradation experiment was based on the system with the flow of PCE aqueous solution with concentration of 104 mg/l through the soil, previously enriched nZVI. For description of transport and degradation experiments was used mathematic program MATLAB. For evaluation of the Fe nanoparticles suspension flow and its capture in the pores of the soil were in this work defined these variables: the capture coefficient K_D and the colmatage coefficient K_K. Effectiveness of PCE degradation was expressed by kinetic constant of the 1st order. The results of column experiments showed, that optimal concentration range for stabilized product TODA is between 200 to 400 mg/l. Obtained kinetic constants confirmed that stabilized TODA by silica is reducing agent with the same efficiency as commercially available product. In addition TODA also migrates better in porous media.

Keywords:
decontamination technique, in-situ chemical reduction, nanoiron particles, porous media, transport, degradation PCE, reaction kinetics