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Chlorinated organic compounds (COCs) represent a major concern and are widespread distributed in soil and groundwater. Due to their strong hydrophobicity and their density higher than water, these COCs infiltrate through aquifers and form DNAPL pools. A large part of DNAPL can be removed by physical technologies (mainly pumping), but an important part will remain trapped and adsorbed in the aquifer matrix. In situ remediation technologies have been then developed in order to destroy in situ the remaining COCs.

This study aims atcharacterizing the chemical reductive dechlorination of a mixture of COCs, mainly composed of hexachlorobutadiene (HCBD) and hexachloroethane (HCA). Many studies have shown the great efficiency of bimetallic Pd/Fe particles for the remediation of COCs(Colombo et al., 2015; Kim and Carraway, 2003; Lien and Zhang, 2007). Preliminary studies have been conducted in order to select the most appropriate reactants, which are Pd/Fe microparticlesdispersed in a polyacidic hydrophobic matrix (Rodrigues et al., 2015).

First, HCBD and HCAwere individually investigated in a monophasic single-component system, i.e. in presence of one dissolved pollutant in deionized water:methanol (99.9:0.1% v/v) solutions. Severalanalytical parameters were studied: pollutant/reactant ratios, temperatures and presence or absence of surfactants.Similar experiments were performed in a monophasic multi-component system, containing dissolved HCBD and HCA, to characterize the impact of a hydrophobic mixture.

Then, as most part of the pollutant is present as a DNAPL in groundwater, HCBD and HCA wereinvestigated in a polyphasic single-component system, i.e. in presence of one pure pollutant in deionized water. This second approach combines both reduction reactions and transport processes, especially solubilization. The aim is to understand the influence of temperature and the presence of a surfactant in a polyphasic system to define the rate-determining step of the global remediation process.Finally, polyphasic multi-component systemswere performed in presence of a mixture of HCBD and HCA, and in presence of a DNAPL taken from a polluted site.

These two approaches allowed the determination of degradation pathways and kinetic laws for the two compounds individually and in mixture.

References

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