

In-situ Groundwater Remediation Using composite nano-ZVI: Large Scale Experiment to Investigate Transport and Reactivity in a PCE Source Treatment Approach

Figure 1 Mass flux change of PCE and degradation products after particle injection

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Introduction

NanoRem (Nanotechnology for contaminated land Remediation) is a research consortium (EU, FP7) dedicated to develop in-situ groundwater remediation technologies. Nanoparticles are developed and injected into a contamination to create a reactive zone for contaminant degradation. The performance of a microsized carbon/nano-ZVI composite particle (Carbo-Iron®: CI) in terms of particle transport and source-remediation (chemical reduction) has been investigated in a large-scale experiment (L x W x H = 6 x 1 x 3 m) with a narrow monitoring grid under field-relevant conditions at VEGAS, University of Stuttgart.

Experiment

The aquifer ($v = 0.2$ m/d) in the VEGAS container was contaminated with a perchloroethene (PCE) source of 2 kg ($V_{\text{source}} \sim 0.8$ m³). After the corresponding plume showed steady state conditions, 0.7m³ of CI suspension ($c_{\text{CI}} = 20$ g/L) was injected with the injection rate of 0.25 m³/h in the center of PCE source zone (iron limitation conditions).

Result and Conclusion

The particle concentration change during the injection was monitored at sampling ports in the aquifer and the transport distance was confirmed between 0.5 and 1 m.

After the injection, a significant decrease of PCE and increase of degradation products were observed in the aquifer. In the presentation the experiment, the outcome and its implication on field injection of Carbo-Iron® will be discussed.

