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DNAPL REMEDIATION POTENTIAL BY ORGANO-GREEN RUST

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Background

Chlorinated solvents have found widespread use on a worldwide scale, causing persistent contamination of soils and groundwater systems. Treatment of the dense non-aqueous phase liquid (DNAPL) is often limited by the contaminant dissolution from the nonaquous phase and the contact between the contaminant and the reactive material. A newly developed green rust intercalated with carboxylic acids, so called organo-green rust (organo-GR), has been shown to provide an improved reduction of carbon tetrachloride (CT) in water soluble concentrations with little accumulation of chlorinated intermediates compared to other GR-reductants.

Aim

The objectives of this study are to evaluate the potential for organo-GR to attach to and/or partition into chlorinated solvent DNAPL, and the potential reduction of trichloroethylene (TCE) and CT DNAPL by organo-GRs.

Relevance

Due to the hydrophobic nature of organo-GR it has a strong affinity for hydrophobic substances such as chlorinated solvent DNAPL. Therefore, it is expected that organo-GR has a potential for degradation of chlorinated solvent DNAPL and thereby for *in situ* treatment of DNAPL's.

Project

In the ongoing laboratory scale experiments organo-GR solution is tested with TCE or CT DNAPL. The first experiments were designed to document the visual changes in the batch reactors via digital photography. Further experiments are conducted with higher organo-GR content where the degradation is followed by measuring the chlorinated solvents and the potential production of their chlorinated degradation products (by GC-MS) and chloride (by IC) over time.

Conclusion

Results confirm that organo-GR has a high affinity towards the free phase leading to accumulation around and possibly into the DNAPL phase. This provides a better contact between the contaminant and the reactive material potentially facilitating degradation on the surface of or within the DNAPL. Interim results showed a degradation of 91 % of the initial CT DNAPL or 70% of the total initial amount of CT (DNAPL and dissolved phase) after 84 days. Minor formation of chloroform was measured (yields < 15 %) while the main degradation product appear to be carbon monoxide.