

Determining Diffusive Properties of Acetate and Dissolved Hydrogen in Soils

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Remediating polluted groundwater and soil is one of the essential environmental issues in industrialized countries. More than 100,000 sites polluted by Volatile Organic Compounds (VOCs) such as tetrachloroethene (PCE), trichloroethene (TCE) and their intermediate decomposition products like cis-dichloroethene (cis-DCE) are potentially existing throughout Japan. These pollutants are biologically decomposable, and bioremediation is considered as a practically applicable, low cost remediation technology. A special type of microbes, specifically *Dehalococcoides* having the ability to completely decompose PCE and TCE to ethylene, has been used to remediate polluted sites. For stimulating the activity and decomposability of the microbes, an organic matter slowly releasing hydrogen is frequently injected into the sites. Dissolved hydrogen and acetate released from the organic matter are considered to be an electron donor and carbon source for *Dehalococcoides*, respectively. For an effective remediation, especially when remediating an aquitard, delivery of hydrogen and acetate to microbes is required.

To evaluate the transport properties of acetate in soils, diffusion tests on clay soils were performed. In-diffusion test was applied to analyze effective diffusion coefficient of acetate, and a commercially-available kaolin clay was used for preparing the test specimens. The results were discussed and compared with the data previously tested for the dissolved hydrogen by the authors. The diffusivity of acetate is lower compared to that of dissolved hydrogen having smallest molecular size, and a technique to accelerate the delivery of organic matter in aquitards is necessary when performing an in situ remediation.

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