

## Advances in and Limitations Associated with In-Situ Bioremediation of Chlorinated Solvents

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Chlorinated solvents, like perchloroethene (PCE) and trichloroethene (TCE), have been widely used by many industries, especially in developed countries like Japan. Because of their wide applications, lack of proper regulation, poor handling, storage and disposal practices in the past, chlorinated solvents have become a type of the most prevalent contaminants for soil and groundwater pollution. In recent years, the environmental concern and interest is growing for bioremediation of such chlorinated solvents, commonly called VOCs in Japan, in soil and groundwater including aquatards. Research works in the recent decades have demonstrated 3 types of biodegradation resulting in degradation of VOCs.

In this presentation, the 3 types of bioremediation, specifically reductive dechlorination, cometabolism and direct oxidation together with some recent advances in bioremediation are overviewed. The overview presented the current research trend in understanding the mechanisms of biodegradation with regard to in situ applications, including potential application to aquatards. Limiting factors in bioremediation are examined from biochemical, geochemical and hydro-geological aspects. In addition, the fusion of technologies that could be used to enhance or accelerate the bioremediation are discussed and proposed.

Keywords: Biodegradation, VOCs, Reductive Dechlorination, Cometabolism, Direct Oxidation, Limiting Factors