Laboratory Column Study for Anaerobic Bioremediation of MTBE Using a Biological Permeable Reactive Barrier.

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Abstract. Methyl *tert*-butyl Ether (MTBE) is a gasoline additive that has been used since the late 70s as a gasoline oxygenate and to improve the combustion efficiency of gasoline. Due to its high water solubility and the tendency of underground storage tanks to leak, this contaminant has become a common groundwater contaminant. Bioremediation is an attractive treatment approach due to the low construction and operational cost associated with this technology. Aerobic biodegradation of MTBE has been extensively studied and demonstrated at field-scale. However, in groundwater anoxic to anaerobic conditions prevail, which make bioremediation challenging. In this study, the feasibility of using alternative electron acceptors to promote anaerobic biodegradation was investigated. A laboratory-scale experiment using four continuous-flow vertical columns was conducted in order to compare Fe^{+3} and SO_4^{-2} as electron acceptors. Both soluble and sparingly soluble (gypsum and ferric hydroxide) sources were compared, individually and as mixtures. In order to determine the effect of inoculum, three of the columns were seeded with a Fe-reducing anaerobic MTBE-degrading enrichment culture. The feed rate to the columns was 500 mL/d with an MTBE concentration of 10 mg/L. Samples from the influent, intermediate sampling ports and the effluent were analyzed for MTBE with the aid of a GC. Preliminary results indicate that MTBE can degrade under both sulfate-reducing and iron-reducing condition. A pure culture associated with anaerobic MTBE biodegradation was isolated and determined to have high sequence similarity with *Desulfosporosinus*, a genus characterized by both sulfate and iron reduction.

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