Reductive Treatment of 1,2-Dichloroethane Using a Combination of Zero Valent Iron and Controlled Release Carbon Source

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Bench-scale treatability investigations were performed to demonstrate the capability of a combination of controlled-release solid carbon and zero valent iron (ZVI) to stimulate chemical and microbial treatment of groundwaters impacted with high levels of 1,2-dichloroethane (12DCA, also known as "ethylene dichloride" [EDC]). 12DCA is of particular interest in the context of in-situ passive remediation, as this compound is not amenable to abiotic reductive dechlorination by ZVI alone.

Flow through column systems were set up in either a dispersed mode (reactive material mixed with site soil) or a permeable reactive barrier mode (reactive material mixed with sand) for site waters A and B contaminated with 400 mg/L and 20 mg/L of 12DCA, respectively.

In a 98 day long column test for water A, complete treatment of the influent 12DCA concentrations of about 400 mg/L was observed in two dispersed columns. Non-detectable levels were reached within a residence time of 9 days in a column that contained 2% reactive material and within a residence time of 14 days in the 1% reactive material/soil column. In a column that contained 7.5% reactive material mixed with sand, the highest 12DCA removal (85%) was observed after about 60 days of flow, but there was no12DCA treatment after 98 days of contact in this treatment zone. Chloroethane was not detected in any samples and chloride mass balances of close to 100% were obtained in both dispersed columns, confirming complete degradation of the 1,2-DCA without formation of chlorinated byproducts.

A mixture of 2% ZVI/carbon reactive material and site soil was tested for site water B. Complete treatment of 20 mg/L 12DCA was demonstrated throughout the test period, but the dechlorination pathways appeared to transform with time. During the initial 65 days of test, a 100% conversion of 12DCA to chloroethane was detected. However, complete 12DCA dechlorination, without generation of chloroethane, was observed by 225 days of flow.

Results of laboratory testing have shown that a combined chemical and biological approach using aquifer treatment zones amended by a combination of a carbon source and ZVI allow for a reliable and effective *in situ* treatment of 12DCA in groundwater. Applications of this patented technology have been implemented at sites contaminated with 12DCA.

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