HYDROGEN GAS DELIVERY TO ENHANCE REDUCTIVE BIODEHALOGENATION OF CHLORINATED SOLVETS IN AQUIFERS: A FEASIBILITY STUDY

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Groundwater contaminants such as chloroethenes (tetrachloroethene, PCE, trichloroethene, TCE, dichloroethene, DCE, and vinyl chloride, VC) affect high-quality water availability worldwide. Chlorinated solvents undergo reductive dechlorination through organohalide respiration (OHR) by anaerobic bacteria such as *Dehalococcoides* and *Dehalogenimonas*. Enzymes involved in dechlorination activity are reductases encoded by *pceA*, *tceA*, *bvcA*, *vcrA* and *cerA* genes. Microbial dechlorination is a recognized ally in remediation of chloroethenes contaminated sites although biodegradation rate is limited by the amount of electron-donors available to bacteria. Biostimulation with dihydrogen (H_2) gas is proposed as a bioremediation strategy that allows to fuel microbial reductive dehalogenation with benefits from some operational points of view and conservation of water quality.
Since knowledge of the effectiveness of H_2 injection on OHR microbial communities of anaerobic groundwaters is still scarce, the aim of the present work was to investigate the effect of H_2 pulses to enhance OHR in a 150-300 mg/L chloroethene-contaminated aquifer.
Experimental results at a microcosm-scale level are presented. GC-MS analyses demonstrate chloroethenes transformation by OHR bacteria, evidencing the effect during 2 months' incubation. OHR biomarkers for *tceA*, *vcrA* and *cerA* reductases and *Dehalococcoides*

and *Dehalogenimonas* 16S rRNA genes were quantified by Real Time quantitative PCR in the range of 10^4-10^7 gene copies/mL. The impact of H_2 addition on microbial community is under investigation by 16S rRNA Illumina libraries. Assessment of H_2 injections is the base for promising in situ results where biological aspects, including biodegradation rates, will be compared to traditional biostimulation strategies.

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