KINETIC STUDIES AND COMPARISONS FOR REDUCTIVE DECHLORINATION BY A BINARY MIXED CULTURE

Seungho Yu and Lewis Semprini

Dept. of Civil, Construction and Environmental Engineering, Oregon State University, Corvallis, OR 97331

Recent studies (Yu and Semprini, 2002) demonstrated that a binary mixed culture that combines the cultures isolated from two different contaminated sites can enhance the anaerobic transformation of NAPL PCE and TCE using tetrabutoxysilane (TBOS) as a slow-release anaerobic substrate. Kinetic studies are being performed to characterize the three different mixed cultures: Point Mugu culture (PM), the Evanite culture (EV), and a binary mixed culture (BM) containing PM and EV cultures. The PM culture showed reductive dechlorination of TCE up to a concentration of 3.4 mM, but dechlorinated PCE at slow rate. The PM culture rapidly dechlorinates TCE and *c*-DCE to VC, but slowly transforms VC to ETH. The EV enrichment is capable of reductively dechlorinating PCE at its solubility limit (0.9 mM) and completely dechlorinates PCE to ETH, but slowly transforms *c*-DCE to VC. The k_{max} of PM culture for PCE, TCE *c*-DCE, and VC at 20°C were found to be 11.45, 29, 17.4, and 2.37 μmol/mg of protein/day with K_S values of 6.2, 1.26, 0.78, and 598.6 μM, respectively. These kinetic values for PCE and VC explain why PCE and VC were reductively dechlorinated at very slow rates by PM culture. The k_{max} values of EV culture for PCE, TCE, *c*-DCE, and VC were 13.6, 24.73, 8.25, and 2.93 μM/mg of protein/day with K_S values of 2.0, 1.42, 3.03, and 53.83 μM, respectively. Theses results reflect why the EV culture slowly transforms *c*-DCE to VC. Kinetic studies are currently being performed on PCE, TCE, *c*-DCE, and VC transformation by the binary mixed culture. Model simulations with these kinetic values will be compared with the results from batch reactor studies containing PCE-TBOS NAPL mixtures, described by Yu and Semprini (2002).