

Hydrogen Release Compound *HRC*[®]

Reductive Dechlorination Reactor (RDR) Studies

The reductive dechlorination reactor (RDR), developed under the guidance of Dr. Joseph Hughes at Rice University, is used to determine the efficacy of different HRC formulations. The system, shown in Figure 1, recirculates CAH laden water through a bed of activated microbes that are capable of metabolizing CAHs. The advantage of this is that it can be fed and monitored continuously. Due to this, continuous removal kinetics can be studied in the system.

The system is comprised a packed bed of glass beads which simulate the soil system. Bacteria that are acclimated to the dechlorination of TCE and PCE are allowed to grow over the beads. To initiate the system, HRC is placed in a tube between the pump and the packed bed. The TCE laden solution flows out of the liquid reservoir, through the pump, through the HRC, through the packed bed and then drips back into the liquid reservoir. Each day the solution is augmented with 5 mg/L of TCE and sampled. TCE is measured by gas chromatography and lactic acid (from the HRC) is measured by liquid chromatography. After approximately 8 hours the solution is sampled and measured again. This procedure is followed for several days until it is certain that the particular formulation of HRC is facilitating reductive dechlorination of TCE.

The system is maintained in the anaerobic state by keeping it closed and adding and removing samples through the valves and sampling port. The system contains an oxygen indicator to indicate the presence of dissolved oxygen. If any air accidentally penetrates the system it usually returns to an anaerobic condition in several hours. This is facilitated by the presence of lactic acid.

As of yet there has not been a single case where HRC failed to facilitate remediation of TCE in the bioreactor. A typical RDR result is presented in Figure 2, which shows continuous TCE remediation at all levels of TCE added to the system. Although it is not illustrated in the figure, it is interesting to note that when TCE is added to the system there is an initial burst of vinyl chloride in the gas headspace analysis. As the TCE level reduces to near zero the vinyl chloride also decreases and is eventually remediated by the time of the next inoculation of TCE.



Figure 1

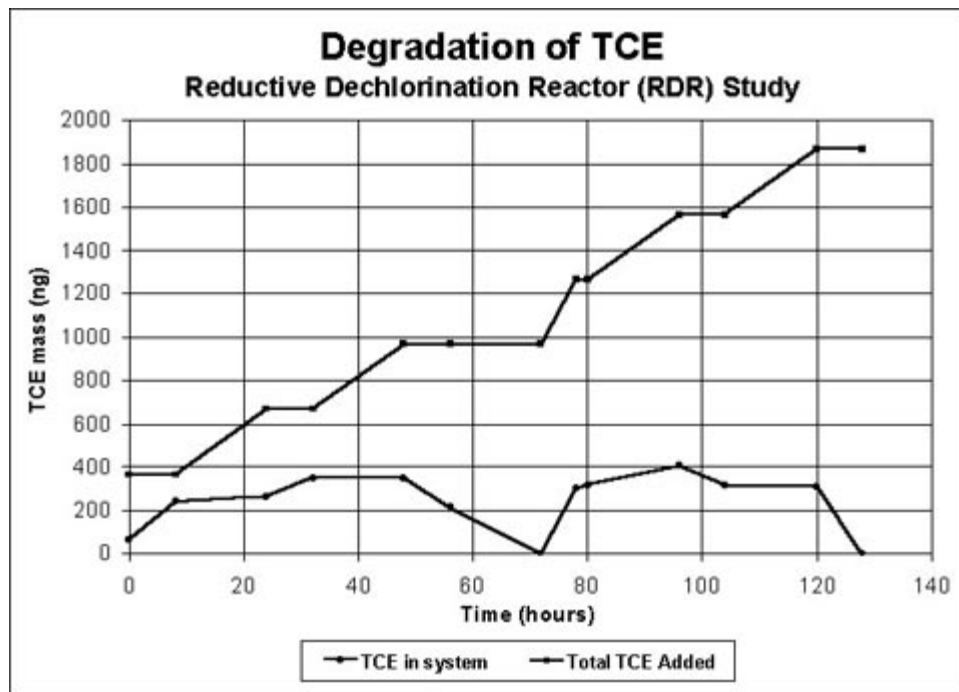


Figure 2

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