

Investigation of the Abiotic Reductive Dechlorination Conversion of Perchloroethylene Directly to Carbon Dioxide (CO₂) by the Application of a Nucleophilic Substitution (S_N) Mechanism Promoted by Exposure to the Reducing Reagent *Cool-Ox*[®]-R

This report describes the results of the laboratory treatability study performed to investigate the abiotic reductive dechlorination conversion of perchloroethylene (CCl₂=CCl₂) directly to carbon dioxide (CO₂) by the application of a nucleophilic substitution (S_N) mechanism promoted by exposure to the reducing reagent *Cool-Ox*[®]-R, a patented In-Situ Chemical Reduction (ISCR) Process provided by DeepEarth Technologies, Inc., www.deepearthtech.com

Materials and Methods

Set-Up:

L Erlenmeyer Flasks with a stopper fitted with two PAC traps in series, followed by two Supelco CO₂ traps in series. The PAC traps removed any PCE volatilized before it could reach the base traps. The CO₂ traps captured CO₂. The source of ¹⁴C-labelled tetrachloroethylene (PCE) was Sigma-Aldrich (St Louis MO). The amount of ¹⁴C in the CO₂ traps was determined by Mass Spectrometry (MS).

I. Results:

Table listing results

Parameter	Control	CaO ₂ only	Cool-Ox 1	Cool-Ox 2
Total PCE Removal (%)	4.1	12.6	99.4	97.7
Volatile PCE Removal (%)	4.4	11.3	5.3	6.1
PCE Reduced (%)*	0.0	1.3	94.1	91.6
Recovery of Cl ⁻ (%)	N/A**	N/A	96.7	98.5
Recovery of ¹⁴ C-CO ₂ (%)	N/A	N/A	94.8	95.5

* Calculated as the difference between total and volatile PCE removal.

** N/A=not applicable, because there was no Cl⁻ or ¹⁴C-CO₂ detected.

Cool-Ox 1=the first round

Cool-Ox 2= the second round with second formulation.

Reactor time was 10 minutes, at which point all activity appeared to have ceased.