

Relationship of Dichloroethene and Trichloroethylene Concentrations and Dissolve Organic Matters Characteristics

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Abstract

This study investigated trichloroethylene (TCE) and 1,2-Dichloroethene (DCE) concentrations at three polluted wells (K1, R1 and R2). The filtered water samples were measured with fluorescent spectroscopy to examine chemical composition and the structure of the dissolved organic matter (DOM). In all samples, the TCE concentration ($222 \pm 202 \mu\text{g/L}$) was significantly higher than the DCE concentration ($79 \pm 89 \mu\text{g/L}$). TCE and DCE concentrations had a significantly positive correlation ($r = 0.78$, $p < 0.001$). Total dissolved organic carbon (DOC) concentration was $0.71 \pm 0.53 \text{ mg/L}$ and DOC concentrations had positive correlation with TCE ($r = 0.52$, $p = 0.001$) and DCE ($r = 0.53$, $p < 0.001$) concentrations. Mean values of UVA_{254} , $\text{A}_{250-400}$, and HIX were $0.053 \pm 0.008 \text{ cm}^{-1}$, $0.332 \pm 0.707 \text{ nm cm}^{-1}$, and 0.51 ± 0.16 , respectively. DCE and TCE concentrations had positive correlation with values of UVA_{254} , $\text{A}_{250-400}$, and HIX ($r = 0.49-0.58$, $p < 0.001$). Three fluorescent regions, PLF, FLF, and HLF, were designed to represent protein-, fulvic acid-, and humic acid-like substances. The fluorescence intensity and ratios for the three fluorescent regions suggested that extent of humification of DOM at site K1 was higher than extent of humification of DOM at site R2. TCE and DCE concentrations had a positive correlation with the intensities of HLF. The relationship of DCE and TCE concentrations with indicators suggested that high aromatic and polar functional groups and high humic acid-like substances in the DOM caused high concentrations of TCE and DCE.

Key words: Groundwater; Trichloroethylene (TCE); 1,2-Dichloroethene (DCE); Fluorescent spectroscopy; Dissolved organic matter (DOM); Hydrophobic organic compounds (HOCs).

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