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Treatment of Groundwater Contaminated with 1,4-Dioxane, Tetrahydrofuran, and Chlorinated Volatile Organic Compounds Using Advanced Oxidation Processes

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ABSTRACT

Ozonation and four types of advanced oxidation processes, including O_3/H_2O_2 , O_3/UV , $O_3/H_2O_2/UV$, and UV/H_2O_2 , were evaluated for the treatment of contaminated groundwater at a Superfund site in Simpsonville, South Carolina using bench-scale, batch ozone and UV apparatuses. Although the contaminants of concern were 1,4-dioxane, 1,1-dichloroethene, and trichloroethene, several other chlorinated organics as well as tetrahydrofuran were found in the groundwater samples. The O_3/H_2O_2 treatment with O_3 and H_2O_2 doses of 6 and 1.5 mg/L, respectively, and the UV/H_2O_2

treatment with UV and H₂O₂ doses of 1,000 mJ/cm and 20 mg/L, respectively, were sufficient to degrade 200 µg/L of 1,4-dioxane, 110 µg/L of 1,1-dichloroethene, and 10 µg/L of trichloroethene below their performance standards of 10, 7, and 4 µg/L, respectively. Due to a high bromide concentration (0.35 mg/L) in the groundwater sample, bromate formation was found to be significant in ozone-based treatment, including O₃/H₂O₂.

KEYWORDS: Ozone, 1,4-Dioxane, Advanced Oxidation Processes, Chlorinated Solvents, Contaminated Site Remediation, Groundwater, SVOC, Tetrahydrofuran, VOC

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