

AN EVALUATION OF ADVANCED OXIDATION PROCESSES FOR THE REMOVAL OF 4-NONYLPHENOL FROM WATER AND WASTEWATER

¹James Wagner, ¹Alok Bhandari, ²Harmit Singh, and ²Finlay MacRitchie

¹*Department of Civil Engineering, Fiedler Hall, Kansas State University, Manhattan, KS 66506; Phone: (785)532-5862; Fax: (785)532-7717.*

²*Department of Grain Science and Industry, Shellenberger Hall, Kansas State University, Manhattan, KS 66506; Phone: (785)532-6161; Fax: (785)532-7010.*

Abstract

Endocrine-disrupting chemicals (EDCS) constitute an emerging class of microcontaminants in surface waters. Nonylphenol (NP), an estrogenic EDC, has been seen to result from the incomplete biotransformation of alkylphenol-polyethoxylate (APNEO) surfactants in municipal wastewater treatment facilities. Due to its lipophilicity, NP formed in wastewater treatment plants can accumulate to high concentrations in wastewater biosolids. Despite sorption of NP to biosolids, concentrations of NP in treated wastewater remain high. Our research attempted to evaluate the effectiveness of three advanced oxidation techniques—peroxidase-mediated oxidation, sonication, and Fenton's reagent-mediated oxidation on the removal of 4-NP from water and wastewater. The effect of enzyme concentration, sonication time, $\text{Fe}^{2+}:\text{H}_2\text{O}_2:\text{NP}$, solution pH, ionic strength, and presence of a co-contaminant on NP removal was evaluated. Results indicate that advanced oxidation processes can result in effective (>95%) removal of NP from water. These techniques can be used for water treatment or to "polish" the final effluent at municipal wastewater treatment facilities.

Key words: nonylphenol, endocrine disruptors, oxidation, treatment, wastewater