

Title: Impact of Advanced Oxidation Processes on the Composition and Biodegradability of Soluble Organic Nutrients in Wastewater Effluents

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Abstract: Since soluble organic nutrients typically constitute the bulk of nitrogen (N) and phosphorus (P) in highly treated wastewater effluents, the ability to minimize their concentrations is critical for facilities to meet stringent nutrient removal requirements. The purpose of this research was to determine the impacts of advanced oxidation process (AOP) treatment on composition and biodegradability of soluble organic nutrients in wastewater effluents. Generally, we found no statistically significant change in soluble organic N or P for three wastewaters that were treated with low-pressure ultraviolet (UV) irradiation (1,000 to 2,000 mJ/cm²), hydrogen peroxide (H₂O₂) (5 to 10 mg/L), or both. Some statistically significant changes in biodegradable soluble organic N concentrations were observed with AOP treatment. Dissolved organic matter composition, measured via fluorescence spectrometry, was transformed during AOP treatment, particularly when samples were treated with a combination of UV/H₂O₂. Based on our research, it appears that treatment of wastewater effluents with moderately high doses of UV and/or H₂O₂ is unlikely to be effective for reducing soluble organic nutrients in the wastewater effluents tested. Additional research on the impacts of other AOP processes on soluble organic nutrients in wastewater effluents, and a sustainability evaluation via life-cycle assessment for balancing gain from nutrient reduction and cost for implementing AOP technologies is recommended.