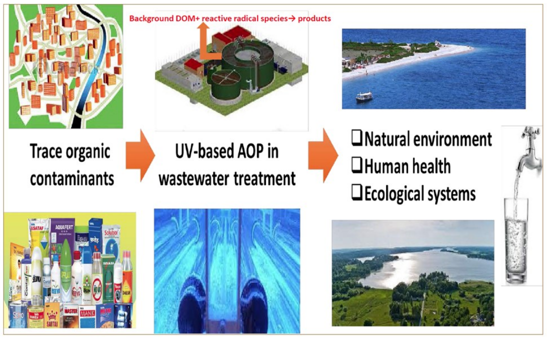
Environmental Engineering Graduate Seminar



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Transformation of Dissolved Organic Matter in Ultraviolet (UV) Photolysis and UV-based Advanced Oxidation Processes

Abstract:

Photolysis with ultraviolet (UV) light is an established technology for disinfection of pathogens and potential oxidation of chemical contaminants in water and wastewater treatment processes. UV-based advanced oxidation processes (AOPs) such as UV/ hydrogen peroxide, UV/chlorine, and UV/persulfate are promising technologies to destroy a wide variety of organic compounds due to the formation of reactive radical species such as hydroxyl radicals (HO•), chlorine radicals (Cl•), and sulfate radicals ($SO_4^{\bullet-}$). The presence of dissolved organic matter (DOM) can affect the performance of UV photolysis and UV-based AOPs. Photons emitted by UV lamps are absorbed and the radical species are scavenged by DOM, consequently reducing the efficiency of photolysis and oxidation in engineered UV photolysis and UV-based AOPs.

This study aims to understand the molecular level DOM transformation induced by UV irradiation and reactive radical species in UV-AOPs. It is hypothesized that the different reactivity of photons (excitation) and radical species (abstraction, addition and electron-transfer) can cause the different patterns of DOM transformation. As a start, we used Suwannee River Fulvic Acid as DOM standard surrogate. The sample solution containing approximately 10 mgC/L of DOC was irradiated by UV light in the absence or presence of hydrogen peroxide, free chlorine, or persulfate by using a 25 W low pressure UV-lamp. Hydroxyl radicals, chlorine radicals, and sulfate radicals were quantified by using probe compounds (e.g., *para*-chlorobenzoic acid). Concentrations of singlet oxygen with furfuryl alcohol and excited triplet state of DOM with 2,4,6 trimethylphenol were also measured. We used a Thermo Scientific Orbitrap Elite Hybrid Ion Trap Mass Spectrometer in negative-ion mode to determine the elemental compositions of DOM.

Jessica Daignault, Graduate Student, and Dr. David Watkins

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Reducing Household Food, Energy and Water Consumption: A Quantitative Analysis of Interventions and Impacts of Conservation

Abstract:

Changes in household-level actions in the U.S. have the potential to reduce rates of greenhouse gas (GHG) emissions and climate change by reducing consumption of food, energy and water (FEW). Over-consumption of FEW has contributed to ecosystem degradation, resource scarcity, and growing income inequality. As consumption increases it has become more evident that FEW is interconnected as a nexus, and that actions taken in any one area affect the other two. This presentation summarizes the National Science Foundation (NSF) funded work led by Dr. David Watkins, which aims to address multiple research questions related to the FEW Nexus through a multi-disciplinary investigation.

Monday, September 18, 2017 @ 3PM **GLRC Room 202**