Stony Brook University

Department of Civil Engineering

College of Engineering and Applied Sciences

SPRING 2021 ONLINE SEMINAR SERIES

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Monday, March 8th, 2:40 – 3:35 PM

Chemistry for Safe Potable Reuse: From DBP Risk Assessment to Membrane Technology Development

Abstract

Potable reuse of wastewater is an important strategy to overcome water scarcity around the world. Direct or indirect potable reuse often involves advanced treatment using physical (e.g., membranes) and chemical (e.g., disinfection) processes after conventional secondary biological treatment. Reuse of wastewater can also occur unintentionally (i.e., de facto reuse) where treated wastewater effluents from upstream sources constitute part of the drinking water source downstream. In both cases, disinfection byproducts (DBPs) are a group of contaminants of concern. Unlike other wastewater contaminants, DBPs are formed during treatment, from the reactions between disinfectants (e.g., chlorine) and various water constituents. This seminar will introduce some of our recent work on assessing DBP risks in both reuse scenarios and developing new treatment systems for DBP control. First, we examined the roles of sunlight on transforming the precursors of two groups of nitrogenous DBPs under de facto reuse scenarios. For haloacetonitriles, sunlight preferentially attenuated the precursors of the more toxic brominated species over those of the chlorinated species, resulting in an overall reduction in toxicity potential. For trichloronitromethane, however, sunlight irradiation formed additional precursors in the presence of nitrite. These findings suggest that it is crucial to consider the role of natural processes in the watershed when assessing DBP risks in de facto reuse. Second, we explored the feasibility of a new wastewater disinfectant, peracetic acid, to be used as a membrane cleaning agent. We observed stable membrane performance after long exposure to PAA, even in the presence of challenging wastewater constituents (e.g., ferrous iron and chloride). The reaction between PAA and membrane materials was examined using surface characterization techniques and model compound experiments.

ZOOM LINK: Meeting ID: 950 6760 3617; Passcode: 426506
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Biography

Dr. Ning Dai is an associate professor in the Department of Civil, Structural and Environmental Engineering at the University of Buffalo. Dr. Dai's research group applies environmental chemistry to address engineering challenges in water treatment, wastewater reuse, and desalination with a focus on disinfection byproducts, and to enrich the understanding of the photo-transformation of synthetic chemicals on environmental surfaces (e.g., soil and leaf). She received her B.S in Environmental Science and Engineering from Tsinghua University in China, M.S. in Civil and Environmental Engineering from Stanford University, and Ph.D. in Chemical and Environmental Engineering from Yale University. She joined University at Buffalo in 2014 after a brief postdoctoral training in Stanford University. Dr. Dai is a recipient of the National Science Foundation CAREER Award.