

## Next Generation Electrode Materials for Water Treatment Applications

Brian P. Chaplin  
Associate Professor  
Dept. of Chemical Engineering  
University of Illinois at Chicago

Abstract: Electrochemical advanced oxidation processes (EAOPs) have emerged as promising water treatment technologies for the elimination of a broad-range of organic contaminants and inactivation of pathogens. Progress has been facilitated by the development of stable, novel electrode materials that efficiently generate high yields of hydroxyl radicals. However, key challenges still remain, including toxic byproduct formation, low electro-active surface area, and costly electrode materials. In this talk I will discuss our ongoing research efforts aimed at advancing EAOPs, which includes the synthesis of selective electrodes for the minimization of byproduct formation and development of inexpensive, high surface area, porous electrodes for enhanced electrochemical activity. A combination of electrochemical reactivity experiments, electrochemical characterization, and density functional theory modeling was used to develop a mechanistic understanding of the interactions of contaminants with these novel electrode materials. Results from this work are being used to develop more efficient and compact treatment technologies, including 'self cleaning' membranes and multi-functional point-of-use water treatment devices.

### Short Biosketch

Dr. Brian P. Chaplin is an Associate Professor of Chemical Engineering at the University of Illinois at Chicago (UIC). His postdoctoral training was in the area of electrochemistry at the University of Arizona and he obtained his Ph.D. from University of Illinois at Urbana-Champaign in Environmental Engineering. Prof. Chaplin also holds B.S. and M.S. degrees from the University of Minnesota in Civil Engineering. Research and educational activities in his Echem Lab at UIC are focused on novel electrochemical and catalytic processes for water treatment, with an emphasis on developing technologies that promote water sustainability. He is a recipient of the 2015 *National Science Foundation Early CAREER Development Award*, 2019 *Environmental Science and Technology Early Career Scientist Award*, and 2018 *Environmental Science and Technology* best paper award in the area of Environmental Technology.

