

Organic chemical contaminants in the aquatic environment: new tools for the characterization and remediation of impacted environments

Damian E. Helbling, Ph.D., P.E.

Assistant Professor, School of Civil and Environmental Engineering, Cornell University

Abstract. There are hundreds of thousands of chemicals used around the world to meet global demands for food, energy, and a higher standard of living. Decades of environmental monitoring studies have demonstrated that many of these chemicals accumulate in the aquatic environment. The incredible number of chemicals that may be present in any given water system poses challenges for water quality monitoring and associated engineered solutions. In the first part of the presentation, new techniques for water quality monitoring afforded by high-resolution mass spectrometry will be introduced. Case studies will be used to highlight the advantages and challenges associated with target screening, suspect screening, and non-target screening techniques. In the second part of the presentation, a new polymer will be introduced that outperforms many conventional adsorbents for the removal of organic chemicals from water at environmentally relevant concentrations. Initial characterization studies demonstrate that the polymer exhibits unprecedentedly high adsorption kinetics, excludes interactions with natural organic matter, and can be regenerated with a mild washing solution at ambient temperatures without a loss in performance. These features all suggest that the polymer may be a promising alternative adsorbent for the removal of trace organic chemicals during water and wastewater treatment.

Bio. Damian Helbling did his undergraduate work at The Pennsylvania State University where he received a BS in civil engineering with a minor in environmental engineering. During his years as an undergrad, Helbling also held a position as a National Science Foundation REU fellow at the Center for Biofilm Engineering in Bozeman, Montana. Following graduation, Helbling worked for several years as an environmental engineering consultant before turning to graduate school. He received his MS and PhD in civil and environmental engineering from Carnegie Mellon University. His graduate research focused on the use of sensor networks within drinking water distribution systems to monitor and control post-treatment water quality. Helbling did his postdoctoral work at the Swiss Federal Institute for Aquatic Science and Technology (Eawag) in Dübendorf, Switzerland where he explored the fate and transport of organic chemical contaminants in the environment with a particular focus on biological transformation processes. Helbling joined the School of Civil and Environmental Engineering at Cornell University as an assistant professor in January 2014.

