The Department of Civil and Environmental Engineering at the University of Houston presents...

CIVE 6111 Graduate Seminar

Removal and Destruction of Perfluoro- and Polyfluoroalkyl Substances (PFAS) from Contaminated Groundwater by UV-Sulfite Treatment

Timothy J. Strathmann
Professor of Civil and Environmental Engineering
Colorado School of Mines

Friday, April 20, 2018
2:45PM-3:45PM
Classroom Business Building (CBB Room) 106

Abstract
Treatment and remediation of groundwater sites impacted by past use of aqueous film-forming foam (AFFF) at fire training areas has proven to be especially challenging due to recalcitrant and poorly sorbing nature of perfluoro- and polyfluoroalkyl substances (PFASs). Currently, remediation efforts with granular activated carbon (GAC) have proven to be costly when compared to treatment of other legacy contaminants. More importantly, while GAC and other separation processes (e.g., ion exchange and nanofiltration) only serve to separate PFASs from contaminated groundwater and produce a concentrate stream that requires further treatment or disposal offsite. It follows that effective and economical strategies for destruction of PFASs in groundwater and concentrate streams are of great interest for site remediation efforts. This presentation describes recent efforts to advance UV photochemical treatment strategies using sulfite as a sensitizer to generate strongly reducing hydrated electrons (e_{aq}^-; -2.9 V). Sulfite is advantageous as it is a low cost bulk chemical already used by the water industry, and produces only sulfate ions as a residual. We will describe results of experimental work from batch and commercial annular UV reactors simultaneously treating a wide diversity of PFAS structures, including perfluoroalkyl carboxylates and sulfonates as well as polyfluorinated precursors (e.g., sulfonamides). Study of the treatment of complex AFFF mixtures is facilitated by use of high resolution LC-QToF-MS analysis with a target screening list of >1000 PFAS structures. Results for direct groundwater treatment versus hybrid strategies involving UV treatment of concentrate streams will be discussed. Comparison of results to the related UV-persulfate (produces oxidizing sulfate radicals) will also be discussed.

Bio
Timothy Strathmann is a Professor in the Department Civil and Environmental Engineering at the Colorado School of Mines, and holds a joint appointment at the National Renewable Energy Laboratory (NREL). He is also a member of the Re-inventing the Nation's Urban Water Infrastructure (ReNUWIt) Engineering Research Center. From 2003 to 2014 he was on the faculty at the University of Illinois at Urbana-Champaign. His research focuses on the development sustainable technologies for water treatment and waste valorization, and the study of redox transformation mechanisms for contaminants of emerging concern (CEC). Dr. Strathmann is the recipient of a National Science Foundation CAREER Award, and his research is sponsored by DoD-SERDP, AFCEC, NSF, USDA, and DOE. Prof. Strathmann currently serves as an Associate Editor for *Environmental Science & Technology*. Dr. Strathmann's formal training includes a PhD in environmental engineering from Johns Hopkins, BS and MS degrees from Purdue, and postdoctoral training at Princeton.