



EEE Research Seminar

Date: Nov 12 at 10:30 AM

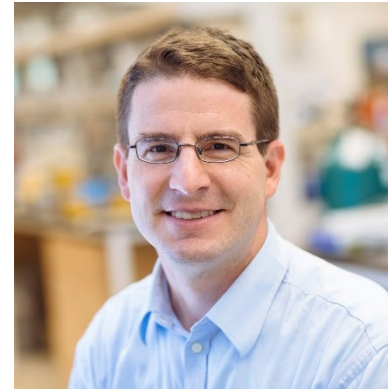
Location: POTR 234 (Fu Room)

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Lead in drinking water: The role of water chemistry and reactions at the pipe scale-water interface

Abstract

Orthophosphate and sodium silicate are often added as corrosion inhibitors to control lead release to drinking water from lead service lines and from lead-containing materials in premise plumbing. The effectiveness of these corrosion inhibitors and their impact on the composition and structure of pipe scales was evaluated in a series of bench-scale experiments with lead pipes and with copper pipes connected with lead-containing solder. The responses of the lead pipes were examined for pipes relevant to three different scenarios. The first is the addition of orthophosphate to pipes with scales that contain lead (IV) oxide in advance of a change in disinfectant from free chlorine to chloramine, a switch that can dramatically increase lead concentrations in the absence of orthophosphate. The second is the application of orthophosphate at a pH value higher than the range over which orthophosphate is typically used. The third is the supplementation of a blended phosphate with the addition of sodium silicates. For each of these scenarios, the dissolved and total lead concentrations in the water are tracked as the water composition changes, and the results are compared with predictions based on the solubility of the solid phases that comprise the scales on the inner surfaces of pipes. These observations are complemented by detailed characterization of the structure and composition of the scales using electron microscopy, X-ray diffraction, and Raman spectroscopy.

Bio

Professor Giammar is the Walter E. Browne Professor of Environmental Engineering in the Department of Energy, Environmental and Chemical Engineering at Washington University in St. Louis. Professor Giammar's research focuses on chemical reactions that affect the fate and transport of heavy metals, radionuclides, and other inorganic constituents in natural and engineered aquatic systems. His recent work has investigated the removal of arsenic and chromium from drinking water, control of the corrosion of lead pipes, geologic carbon sequestration, and biogeochemical processes for remediation of uranium-contaminated sites. His research has been sponsored by the National Science Foundation, Department of Energy, and Water Research Foundation. Professor Giammar is currently an Associate Editor of *Environmental Science & Technology*. Professor Giammar completed his B.S. at Carnegie Mellon University, M.S. and Ph.D. at Caltech, and postdoctoral training at Princeton University before joining Washington University in St. Louis in 2002. He is a registered professional engineer in the State of Missouri.