United States Environmental Protection Agency

RESEARCH PROJECT

National Risk Management Research Laboratory
Water Supply and Water Resources Division
Treatment Technology Evaluation Branch

IN-HOUSE COPPER AND LEAD SOLUBILITY/CORROSION STUDIES

IMPACT STATEMENT

Understanding and predicting metal release from pipes of all sizes and types from the treatment plant to the consumer's tap is critical, specifically for regulatory compliance with the Lead and Copper Rule, as well as the performance, corrosion morphology, and longevity of infrastructure materials. Treatments employed by municipal and other water systems must be optimized for lead and copper control; however, these treatments must also not be detrimental to other materials or water quality.

BACKGROUND:

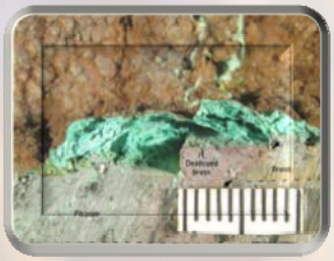
One of the primary goals of the EPA is to protect the water delivered to consumers. In 2007, EPA initiated a new program to evaluate and rehabilitate the nation's aging water infrastructure. When the current water infrastructure system was built, copper and lead were common materials used to construct pipes. Lead is dangerous to human health because of its toxic effects when concentration in the blood increases. Lead poisoning can have devastating effects on the neurological, renal, cardiovascular, and reproductive systems.

With many legacy lead pipes still in use in the United States, and widespread historical use of lead-containing solders and brasses in plumbing devices and materials, lead remains a health concern in drinking water. Copper has been the material of choice for interior drinking water plumbing and service lines for several decades. This presents an infrastructural problem because of plumbing failures due to pitting corrosion of copper. Copper also contributes to adverse health effects and regulatory violations without proper water treatment. EPA is responsible for developing regulatory guidance documents and providing technical support to both the public and private sectors, which requires the development and maintenance of state-of-the-art expertise.

DESCRIPTION:

The Office of Research and Development's National Risk Management Research Laboratory has funded this research project in support of its Aging Water Infrastructure (AWI) Research Program. This project will employ any of several different laboratory (pilot-scale) test system configurations, such as benchtop precipitations studies, pipe rigs, large volume recirculation systems, or small volume recirculation systems. The resulting data from the experiments will be

used to test, adjust and refine the selection of chemical species and thermodynamic data for well-documented existing chemical equilibrium models, and thus make it possible to make quantitative predictions on metal release from corrosion of infrastructure materials, particularly lead, copper and iron. The current focus of these experiments is on lead and copper. Metal release is critical both for regulatory compliance, materials performance, and determining the onset of local corrosion, such as copper pitting.



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EPA GOAL: Goal #2 - *Clean & Safe Water*; Objective 2.1.1- *Water Safe to Drink*
ORD MULTI YEAR PLAN: Drinking Water (DW), Long Term Goal - DW-2 *Control, Manage, and Mitigate Health Risks*

RESEARCH PARTNERS:
Contractors: Student services contractors; Pegasus Technical Services
IAG: US Geological Survey (Assistance with elemental analysis of pipe deposits and development of standard reference materials for deposit analysis calibration and quality assurance. Some analytical procedures for scale analyses used by EPA will use synchrotron facilities operated by the US Department of Energy.)

EXPECTED OUTCOMES AND IMPACTS:

The expected outcomes and impacts include wider compliance with the Lead and Copper Rule; fewer detrimental secondary impacts of corrosion control treatment; fewer treatment mistakes which cause high metal release episodes; extended service life and functionality of existing conveyance systems; reduced life cycle cost; improved guidance on the selection of appropriate plumbing materials for a given water quality or treatment capability; improved prioritization of critical infrastructure to inspect, monitor and assess the performance of rehabilitation; and reduced infrastructure failures caused by corrosion.

OUTPUTS:

Current and future outputs of the project will consist of journal articles and conference presentations.

RESOURCES:

Aging Water Infrastructure Research Program: http://www.epa.gov/awi/

Corrosion, Scaling, and Metal Mobility Research: http://www.epa.gov/nrmrl/wswrd/cr/index.html

EPA (1995). "Effect of pH, DIC, Orthophosphate and Sulfate on Drinking Water Cuprosolvency" - Report. (EPA/600/R-95/085) http://www.epa.gov/ord/NRMRL/pubs/600R95085/effect.pdf

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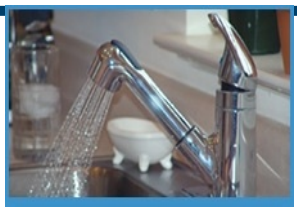
Drinking Water


Aging Water Infrastructure