Bench-Scale Evaluation of Chemically Bonded Phosphate Ceramic Technology to Stabilize Mercury Waste Mixtures

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Paul M. Randall[1] and Sandip Chattopadhyay[2]

[1]Sr. Chemical Engineer, National Risk Management Research Laboratory, Land Remediation and Pollution Control Div., U.S. EPA, 26 W. Martin Luther King Dr., Cincinnati, OH 45268 (corresponding author). E-mail: randall.paul@epa.gov

[2]Sr. Engineer, Tetra Tech EM Inc., 250 West Court St., Suite 200W, Cincinnati, OH 45202. E-mail: sandip.chattopadhyay@ttemi.com

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Abstract

This bench-scale study was conducted to evaluate the stabilization of mercury (Hg) and mercuric chloride-containing surrogate test materials by the chemically bonded phosphate ceramics technology. This study was performed as part of a U.S. EPA program to evaluate treatment and disposal alternatives to the current land disposal restriction (LDR) treatment standards for mercury. The stabilized materials were subjected to a suite of leaching tests: one test characterized the solubility and release behavior of mercury as a function of pH between the pH values of 2 and 12; the second test used the toxicity characteristic leaching procedure (TCLP); and the third leaching test used the TCLP "cage" modification. TCLP results showed that leachability of Hg decreased by approximately two orders of magnitude and a maximum of five orders of magnitude. The three leachability test methods produced similar amounts of leached mercury, but the test that studied mercury solubility as a function of pH released slightly higher levels (at pH 2) compared to the TCLP methods. On comparing the results obtained with the standard TCLP and the TCLP cage modification, we learned that the leachates from stabilized wastes containing 50 wt % loading of elemental Hg and $HgCl_2$ were within the LDR requirements. However, wastes containing higher loadings (i.e., 70 wt % loading of Hg and $HgCl_2$) had leachate concentrations exceeding the 0.2 mg/L treatment standard and therefore would not meet the Resource Conservation and Recovery Act disposal requirements.

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