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The Leaching Behavior and Speciation of Contaminant Metals and Non-metals in Cementitious Waste Forms

JOELLE T REISER[1], MIROSLAVA PETERSON[1], JAMES NEEWAY[1], JARED M OSHIRO[1], RODNEY S SKEEN[2], GARY L SMITH[1] AND MATTHEW ASMUSSEN[1]

[1]Pacific Northwest National Laboratory
[2]Washington River Protection Solutions, LLC
Presenting Author: joelle.t.reiser@pnnl.gov

In the US, various Land Disposal Restriction (LDR) inorganics (i.e., Ag, As, Ba, Be, Cd, CN, Cr, Hg, Ni, Pb, Sb, Se, and Tl) can be found in liquid wastes that require immobilization in cements before disposal, including some liquid waste that are co-mingled with radionuclides. Proposed cementitious waste forms (CWFs) for these liquid wastes must satisfy the waste acceptance criteria for a disposal site. This includes passing the requirements of the Toxicity Characteristic Leaching Procedure (TCLP, EPA 1311), which evaluates the release of LDR inorganics from the CWF into the near field. In some instances, the long-term release of these species from the CWF must be modeled, and, as such, the leaching behavior of each species within the CWF needs to be known. However, the leaching behavior of LDR inorganics from CWF has not been robustly investigated. To address this knowledge gap, a series of CWFs containing relevant LDR inorganic concentrations were fabricated and characterized to evaluate the effects of LDR inorganics on CWF structure, to identify LDR inorganic speciation, and to observe any chemical associations of LDR inorganics within the CWF. Lastly, the LDR inorganic-containing CWFs were subjected to leach tests to observe LDR inorganic release behavior, which will aid in the development of models used to predict the release of these constituents at relevant disposal sites.