Title: Evaluating the cement stabilization of arsenic-bearing iron wastes from drinking water treatment

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PII: S0304-3894(15)00588-9
DOI: http://dx.doi.org/doi:10.1016/j.jhazmat.2015.07.051
Reference: HAZMAT 16978

To appear in: *Journal of Hazardous Materials*

Received date: 2-4-2015
Revised date: 30-6-2015
Accepted date: 19-7-2015

Please cite this article as: T.M. Clancy, K.V. Snyder, R. Reddy, A. Lanzirotti, S.E. Amrose, L. Raskin, K.F. Hayes, Evaluating the cement stabilization of arsenic-bearing iron wastes from drinking water treatment, *Journal of Hazardous Materials* (2015), http://dx.doi.org/10.1016/j.jhazmat.2015.07.051

Abstract

Cement stabilization of arsenic-bearing wastes is recommended to limit arsenic release from wastes following disposal. Such stabilization has been demonstrated to reduce the arsenic concentration in the Toxicity Characteristic Leaching Procedure (TCLP), which regulates landfill disposal of arsenic waste. However, few studies have evaluated leaching from actual wastes under conditions similar to ultimate disposal environments. In this study, land disposal in areas where flooding is likely was simulated to test arsenic release from cement stabilized arsenic-bearing iron oxide wastes. After 406 days submersed in chemically simulated rainwater, <0.4% of total arsenic was leached, which was comparable to the amount leached during the TCLP (<0.3%). Short-term (18 h) modified TCLP tests (pH 3-12) found that cement stabilization lowered arsenic leaching at high pH, but increased leaching at pH <4.2 compared to non-stabilized wastes. Presenting the first characterization of cement stabilized waste using μXRF, these results revealed the majority of arsenic in cement stabilized waste remained associated with iron. This distribution of arsenic differed from previous observations of arsenic-calcium solid phases when arsenic salts were stabilized with cement, illustrating that the initial waste form influences the stabilized form. Overall, cement stabilization is effective for arsenic-bearing wastes when acidic conditions can be avoided.