Global 2013, Abstract 8020

Chemical Durability of a ^{129}I Glass Composite Material (GCM) Waste Form

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AgI-Mordenite encapsulated in Bi-Si-Zn-Al glass is an effective waste form for ^{129}I because the glass is chemically durable, I release from AgI-Mordenite is relatively slow, and Bi in the weathered glass may sorb iodide. Moreover, low temperature (< 600^{o}C) Bi-Si-Zn-Al glass sintering minimizes iodide release from the AgI -Mordenite during processing. Single-pass flow through (SPFT) tests show pH-dependent glass degradation at rates similar to high level waste glasses: Glass degradation reaches a minima at near neutral pH at 25^{o}C, increasing at higher and lower pHs. Steady-state Si levels were typically less than 1 ppm and well below saturation with solid silica phases. Measured non-stoichiometric release rates point to formation of a Bi leach layer at the glass surface. Formation of the Bi (oxy)hydroxide leach layer may be important to waste form performance because of the ability of Bi compounds to sorb iodide (Nenoff, T. M. et al. 2011, *Applied Geochemistry*). Ag and I release from AgI-Mordenite under oxidizing conditions are less affected by pH; 25^{o}C rates at pH 5.5 and 9.2 are nearly identical. Working out the interplay between solution chemistry, AgI-Mordenite dissolution, iodide loading, and glass degradation is the key to improving the glass composite waste form for long-term ^{129}I disposal.

* Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.