
Alteration Phases on Hanford LAW Glasses after Long-Term Leaching.

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Abstract

Long-term leaching experiments using the Product Consistency Test (PCT)-B protocol with glass surface to volume ratio (S/V) of 2000 m⁻¹ at 90°C, were conducted on 203 different Hanford Low-Activity Waste (LAW) glasses for periods of from one to over 18 years. The glass/leachant reaction is tracked by regular solution sampling and many tests are still on-going. Phases developed on reacted glass samples were characterized using XRD and SEM/EDS. Because LAW wastes contain predominantly sodium, the glasses studied have Na₂O concentrations ranging from 5 to 25 wt%. That upper soda limit is nearly twice that of high-level waste glasses from West Valley, which were the subject of a similar study [1]; interestingly, however, these two types of glasses are found to behave similarly. In many cases, long running PCTs show resumption of leaching after years of relative inactivity (slow residual rate). Secondary phases formed on the glass surfaces are of two primary mineral types. Large quantities of euhedral zeolites form mostly on samples that have reached resumption. Analcime dominates many of the XRD patterns for the most reacted samples; but SEM revealed much greater numbers of smaller, different morphology zeolite crystals (chabazite, phillipsite, and gmelinite) in many glasses beyond resumption. Phyllosilicates are observed in all LAW PCT samples investigated, regardless of whether resumption is reached or not. Micron to sub-micron smectites crystallize within the altered gel-layer to form layered, textured intergrowths. Beidellite and nontronite were found in samples with compositional variations in Ca, Fe, P, and Ti, with little to no effect on the time to resumption. Glass composition differences were reflected in changes in smectite chemistry. [1] "Characterization of Alteration Phases on HLW Glasses after 15 Years of PCT Leaching," I.S. Muller, S. Ribet, I.L. Pegg, S. Gin, and P. Frugier, *Ceramic Transactions*, Vol. 176 (2005).

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