

## **THE EFFECTS OF SINTERING TIME AND ATMOSPHERE ON SURFACE FILM FORMATION IN THREE CERAMIC WASTE FORMS USING X-RAY DIFFRACTION**

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The Department of Energy (DOE) plans to immobilize approximately 25% of the 50 tons of excess weapons-grade Pu in a ceramic form for final geologic disposal. The proposed waste form is a titanate based ceramic consisting primarily of pyrochlore with small amounts of rutile, brannerite, perovskite, and zirconolite.

Studies on surrogates, uranium, and plutonium ceramic waste forms have shown a surface film formation. The objective of this research was to determine what effects sintering time and atmosphere have on this film formation. Three surrogate ceramic forms, Baseline (A0), Zirconolite rich (B3-7), and Brannerite rich (B3-8), were investigated in this research. Cerium was used as a surrogate for plutonium on a mole per mole basis in all three ceramic forms. The precursors were ball milled, dried, and pressed into half-inch pellets. The pellets were sintered at 1, 2, 3, 4 hours at 1350 °C under different atmospheres, including air, argon, and safe gas (4%hydrogen 96% argon). The focus of this research was to use x-ray diffraction (XRD) to determine the phase assemblage on the surface of the pellets and compare this to the bulk mineral composition.