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# Structural Characterization of Novel Tin Fluorophosphate Nuclear Salt Waste Forms

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## Abstract

Recently, phosphate glass, specifically tin fluorophosphate glass (TFPG), or SnF<sub>2</sub>-SnO-P<sub>2</sub>O<sub>5</sub>, has gained attention as a potential vitrification medium for chloride-based nuclear salt waste. Greater chemical durability and density along with lower melting temperatures imparts TFPG distinct advantages relative to borosilicate glass. These include better stability, decreased waste volume, and easier synthesis, which results in subsequent cost reductions for storage as well as fabrication. In this work, the inclusion of crystalline phases into TFPG was discovered to create glass-ceramic variants (TFPGC) that further stabilize their structural matrices against damaging environmental effects (i.e., hygroscopicity). Structural, topological, and composition analyses of the TFPG/TFPGC sample suites included XRD and SEM-EDS and contribute to our ongoing work in the development of waste immobilization materials.

**Keywords:** nuclear waste vitrification, tin fluorophosphate glass, tin fluorophosphate glass ceramic, chloride, crystalline phase, inclusion, structural characterization, XRD, SEM, EDS

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