

<b>SECTION A. Project Title: Understanding fundamental science governing the development and performance of nuclear waste glasses</b>
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<b>SECTION B. Project Description</b>
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This proposal aims to combine the strengths of experimental and computational materials science to address four difficult technical challenges related to development and performance of glass based radioactive waste forms. The project consists of four tasks:

1. Understanding the fundamental science governing the nucleation and growth of spinel crystals as a function of glass chemistry and melt environment (oxygen fugacity), along with the crystal accumulation rate as a function of idling time, temperature, and viscosity of the glass melt.
2. Understanding the fundamental science governing the chemical durability and aging resistance of HLW borosilicate glasses.
3. Understanding the thermochemistry controlling the incorporation, solubility, and retention of anionic species (Cl-, SO<sub>4</sub><sup>2-</sup>, MoO<sub>4</sub><sup>2-</sup>) in borosilicate glasses.
4. Computational and experimental assessment of chemistry of technetium affecting fate and transport from waste through to glass.

<b>SECTION C. Environmental Aspects / Potential Sources of Impact</b>
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Rutgers has procedures in place to handle radioactive materials and any waste that will be generated through this project. The action would not create additional environmental impacts above those already permitted at the university.

<b>SECTION D. Determine the Level of Environmental Review (or Documentation) and Reference(s):</b> Identify the applicable categorical exclusion from 10 CFR 1021, Appendix B, give the appropriate justification, and the approval date.
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Note: For Categorical Exclusions (CXs) the proposed action must not: 1) threaten a violation of applicable statutory, regulatory, or permit requirements for environmental, safety, and health, including requirements of DOE orders; 2) require siting and construction or major expansion of waste storage, disposal, recovery, or treatment facilities; 3) disturb hazardous substances, pollutants, contaminants, or CERCLA-excluded petroleum and natural gas products that pre-exist in the environment such that there would be uncontrolled or unpermitted releases; 4) adversely affect environmentally sensitive resources. In addition, no extraordinary circumstances related to the proposal exist which would affect the significance of the action, and the action is not "connected" nor "related" (40 CFR 1508.25(a)(1) and (2), respectively) to other actions with potentially or cumulatively significant impacts.

References: B3.6 Siting, construction, modification, operation, and decommissioning of facilities for small-scale research and development projects; conventional laboratory operations (such as preparation of chemical standards and sample analysis); and small-scale pilot projects (generally less than 2 years) frequently conducted to verify a concept before demonstration actions, provided that construction or modification would be within or contiguous to a previously disturbed or developed area (where active utilities and currently used roads are readily accessible). Not included in this category are demonstration actions, meaning actions that are undertaken at a scale to show whether a technology would be viable on a larger scale and suitable for commercial development.

Justification: The project consists of research and development activities designed to provide a fundamental understanding of glass science and chemistry particularly in the context of vitrification of Hanford's nuclear waste in borosilicate glasses.

Approved by Jason Sturm, DOE-ID Acting NEPA Compliance Officer on 7/05/2016