

**SECTION A. Understanding of Radioactive Molten Salt Chemistry****SECTION B. Project Description**

The University of Nevada, Las Vegas (UNLV), in collaboration with Pacific Northwest National Laboratory (PNNL), proposes to advance fundamental understanding of radioactive molten salt chemistry through determination of important redox and thermodynamic properties of nuclear fuel Uranium (U-238) and Plutonium (Pu-239) in both chloride- and fluoride-based molten salts. Boron-doped diamond (BDD) electrodes will be developed for spectroelectrochemical measurements in various molten salts. In the first phase of this project, corrosion/fouling of the BDD electrode surface will be studied. This will be completed in radioactive molten salt environments including U-238 and Pu-239. Experiments at low radionuclide activity will be completed at UNLV while those at higher radionuclide activity will be completed at PNNL. Exposure to a high energy gamma/neutron source will also be completed at PNNL. In the second phase of the project, a custom-built spectroelectrochemical cell will be used for determination of the redox and thermodynamic properties.

**SECTION C. Environmental Aspects / Potential Sources of Impact**

**Radioactive Material Use:** The proposed bench-scale research projects will involve the use of radioactive materials. Radiological protection will be provided through the UNLV Radiation Safety Office, in compliance with the UNLV Radiation Safety Office (RSO) guidelines, in accordance with all state and federal regulations. Planned exposures will not exceed UNLV RSO guidelines.

**Radioactive Waste Generation:** The proposed bench-scale research projects will involve the generation of radioactive waste. All radioactive waste will be accumulated, documented, and managed in compliance with the RSO guidelines, in accordance with all state and federal regulations. Projected waste streams are expected to be less than 1m<sup>3</sup> per year (compacted), consisting primarily of potentially contaminated gloves, paper towels, etc.

**Chemical Use/Storage:** The proposed bench-scale research projects will involve the storage and use of chemicals. All chemicals will be stored, labeled, and used in accordance with the Risk Management and Safety (RMS) guidelines from the University RMS department.

**Chemical Waste Disposal:** The proposed bench-scale research projects will involve the generation of chemical wastes, which will be accumulated, documented, and managed in compliance with the RMS guidelines (in accordance with all state and federal regulations). Based on the current research activities, the projected chemical waste streams generated from these projects is expected to be less than 10 liters per year, and is expected to consist of solvents (acid, base, and/or organic) with trace amounts of rare earths and heavy metals. There is also likely to be small volumes (less than 5 m<sup>3</sup>, compacted) of potentially contaminated material, such as gloves, paper towels, sample containers, etc.

**Hazardous Waste Generation:** The proposed bench-scale research projects will involve the generation of hazardous waste, which will be accumulated, documented, and managed in compliance with the RMS guidelines (in accordance with all state and federal regulations). The projected hazardous waste streams generated from these projects is expected to be less than 2 liters per year, and is expected to consist of solvents (acid, base, and/or organic) with trace amounts of rare earths and heavy metals. There is also likely to be small volumes (less than 5 m<sup>3</sup>, compacted) of potentially contaminated material, such as gloves, paper towels, sample containers, etc.

**SECTION D. Determine the Level of Environmental Review (or Documentation) and Reference(s):** Identify the applicable categorical exclusion from 10 CFR 1021, Appendix B, give the appropriate justification, and the approval date.

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

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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 activity consists of university-scale research activities to develop understanding of radioactive molten salt chemistry through determination of important redox and thermodynamic properties of nuclear fuel Uranium (U-238) and Plutonium (Pu-239) in both chloride- and fluoride-based molten salts.

Is the project funded by the American Recovery and Reinvestment Act of 2009 (Recovery Act)  Yes  No

Approved by Jason Sturm, DOE-ID NEPA Compliance Officer on 8/10/2020