

SECTION A. Project Title: Speciation and behavior of neptunium and zirconium in advanced separation process – Oregon State University, Pacific Northwest National Laboratory, and University of Nevada Las Vegas**SECTION B. Project Description**

Oregon State University (OSU), in collaboration with the Pacific Northwest National Laboratory (PNNL) and the University of Nevada Las Vegas (UNLV), proposes to obtain fundamental data on the speciation and redox properties of neptunium (Np), zirconium (Zr), and reduced technetium (Tc) species in radiation fields. Computational methods will be used to estimate molecular structures of the complex species. The tasks associated with this project are (1) Scoping experimental studies of the redox reactions of Np, Tc, and plutonium (Pu) with uranium (U) IV and hydrazine with and without the degradation products and complexing agents; (2) Use computational modeling and simulations to describe the observed chemical reaction and new complex structures as well as reaction kinetics in the separate phases; (3) Investigate the effect of radiation on physicochemical parameters, such as viscosity of organic phase and interface tension; (4) Solid species possibly isolated from the studied solutions will be characterized by X-ray diffraction spectroscopy and X-ray absorption fine structure spectroscopy; and (5) Adjust extraction flowsheet to best manage Tc, Zr and Np concentrations in the process streams and test proposed adjustments. Existing laboratory facilities will be used.

SECTION C. Environmental Aspects / Potential Sources of Impact

Radioactive Material Use – The radioactive and hazardous materials will be within the quantities already used with in the TRUCLAB at OSU. The radioactive materials Tc-99 and MP-237 will be used in mg quantities, in total <1 g each. Pu-239 (and possibly Am-243) might also be used in small quantities (<10 mg). At OSU, the Environmental Health and Safety (EHS) Office will oversee these activities. The radioactive and hazardous materials used will be well within the quantities already used within the Radiochemical Processing Laboratory at PNNL. At UNLV, radiological protection will be provided through the UNLV Radiation Safety Office (RSO) in compliance with the RSO guidelines and all state and federal regulations. Planned exposures will not exceed UNLV RSO guidelines.

Radioactive Waste Generation – Small quantities (<5 kg) of materials are anticipated, mixed transuranic wastes at the level of less than 1 kg/yr. Disposal of radioactive wastes will be performed according to established OSU procedures. At OSU, the EHS Office will oversee these activities. Management and disposal of radioactive wastes will be performed according to established PNNL procedures. All radioactive waste at UNLV will be accumulated, documented, and managed in compliance with the UNLV RSO guidelines and all state and federal regulations. Projected waste streams are expected to be less than 1 m³/yr (compacted), consisting primarily of potentially contaminated gloves, paper towels, etc.

Mixed Waste Generation – Small quantities (<5 kg) of materials are anticipated, mixed transuranic wastes at the level of less than 1 kg/yr. Disposal of radioactive and hazardous wastes will be performed according to established OSU procedures. At OSU, the EHS Office will oversee these activities.

Chemical Use/Storage – Chemicals to be used include nitric acid, aqueous hydrazine, zirconyl nitrate, dodecane, and tri-butyl phosphate, in quantities not exceeding a few grams at a time in individual experiments. Chemical use and storage will be performed according to established OSU procedures. At OSU, the EHS Office will oversee these activities. Chemical use and storage will be performed according to established PNNL procedures. All chemicals at UNLV will be stored, labeled, and used in accordance with the Risk Management and Safety (RMS) guidelines from the RMS department.

Chemical Waste Disposal – Management and disposal of chemical wastes will be performed according to established OSU procedures. At OSU, the EHS Office will oversee these activities. Management and disposal of chemical wastes will be performed according to established PNNL procedures. Chemical wastes will be accumulated, documented, and managed in compliance with the UNLV RMS guidelines. Based on current research activities, the projected 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 m³, compacted) of potentially contaminated material, such as gloves, paper towels, sample containers, etc. that may need to be managed.

Hazardous Waste Generation – Management and disposal of hazardous wastes will be performed according to established OSU procedures. At OSU, the EHS Office will oversee these activities. Management and disposal of hazardous wastes will be performed according to established PNNL procedures. The hazardous waste generated at UNLV will be accumulated, documented, and managed in compliance with the UNLV RMS guidelines. Based on the current research activities, 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 m³, compacted) of potentially contaminated material, such as gloves, paper towels, sample containers, etc. that may need to be managed.

DOE-ID NEPA CX DETERMINATION

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 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 optimize extraction of plutonium in nuclear fuel reprocessing.

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 08/20/2019