

SECTION A. Project Title: Controlling Neptunium and Zirconium in Advanced Extraction Processes – Colorado School of Mines**SECTION B. Project Description**

The Colorado School of Mines (CSM) proposes to study fundamental behaviors of neptunium (Np) and zirconium (Zr) extracted from spent nuclear fuel in the presence of radiation fields in tributyl phosphate (TBP)-based advanced separation systems. More complete information is needed regarding Np speciation for advanced, tailored separations, and Zr tends to form extremely complex, polynuclear complexes, likely in both the aqueous and organic phases. Accurate speciation information for zirconium would allow mitigation of unwanted interfacial precipitates, improving the precision with which materials could be produced in advanced separations. This project will use optical spectroscopy, electrochemistry, EXAFS and SAXS, as well as quantum mechanical and molecular dynamics modeling to understand the influence of radiation fields and radiolytic extractant degradation products on Np and Zr speciation in advanced TBP-based separations.

SECTION C. Environmental Aspects / Potential Sources of Impact

Radioactive Material Use – The proposed work will use radioactive neptunium at CSM and Idaho National Laboratory (INL). The amounts of radioactivity used will be between 0.1 and 30 μ Ci, well within the scope of existing procedures and licenses at both institutions.

Radioactive Waste Generation / Mixed Waste Generation – The work will generate radioactive and mixed wastes. Solid low-level waste will include standard lab items such as gloves, wipes, pipet tips, and vials at a rate of less than 5 gallons per year. Liquid waste from experiments will include low level and mixed waste at less than a gallon per year. Procedures are in place for radioactive waste in the CSM labs and at INL and it is handled in accordance with all applicable regulations by the EH&S Office (CSM) or INL Waste management

Chemical Use/Storage / Chemical Waste Disposal / Hazardous Waste Generation – Chemical used and the generation of chemical and hazardous waste will occur at both the CSM and INL sites under the oversight of the EH&S office (CSM) or according to approved Work Planning Documents and Procedures (INL). Experiments at INL will generate less than 1 gallon per year chemical and/or hazardous waste. Experiments at CSM will generate less than 6 gallons per year. Waste disposal is handled in accordance with all applicable regulations by the EH&S Office (CSM) or INL Waste Management.

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 an investigation to understand fundamental behaviors of extracted elements in the presence of radiation fields.

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 7/30/2020