

SECTION A. Project Title: High-Temperature Atmosphere-Controlled Raman Microscope for Fuel Cycle Materials Research – Clemson University

SECTION B. Project Description

The Clemson University proposes to acquire a Raman microscope with high-temperature atmosphere-controlled capability for the characterization of ceramic materials relevant to diverse aspects of the nuclear fuel cycle. Five complementary research thrusts are proposed centered on the unique capabilities of the Raman microscope. These thrusts cover a broad spectrum of topics involving ceramic materials research supporting the fuel cycle, particularly nuclear fuel cladding, nuclear waste immobilization, and radiation damage. The research thrusts include:

- Crystalline and Glass Composite Materials for the Immobilization of Combined High Level
- Characterization of Precursor Derived Nanostructure Si-C-X Materials for Extreme Environment
- Proton and Deuteron Separation through Perovskite Oxide Membranes for Waste Management
- Characterization of Radiation Damage of Ceramics by Raman Spectroscopy
- Characterization of Radionuclide Speciation Within Engineered Barriers

SECTION C. Environmental Aspects / Potential Sources of Impact

Chemical Use/Storage / Chemical Waste Disposal – Chemical acquisition and storage will be necessary to perform project experiments. The particular chemicals have been used in previous experiments and appropriate labeling, storage, and safety procedures are already implemented.

Radioactive Material Use/Radioactive Waste Generation – This project will use samples containing small amounts of radioisotopes including 3H, 14C, uranium, and transuranic compounds. The quantities of each will be very small (typically less than 1 microgram). Clemson University is licensed by the South Carolina Department of Health and Environmental Control to conduct research with a range of fission/activation products (for example, 3H, 57Co, 60Co, 90Sr, 99Tc, 137Cs), uranium isotopes (232U, 233U, 234U, 235U, and 238U), and transuranics (238Pu, 239Pu, 240Pu, 241Pu, 242Pu, 241Am, 237Np, 244Cm, 252Cf). There will be small amounts of rad waste generated, and it will be handled in accordance with the university policy.

All work with radioactive material will be conducted in labs specifically designated as rad labs and those handling radioactive material will be appropriately trained and monitored, in accordance with university policy.

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 aimed at investigating aspects of the nuclear fuel cycle.

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 08/17/2017