

DOE-ID-NEPA CX DETERMINATION

Idaho National Laboratory

SECTION A. Project Title: Radiochemistry Laboratory (RCL) Gloveboxes Research and Development Activities

SECTION B. Project Description:

The objective of this research activity is to conduct laboratory experiments to develop the capability to perform molecular spectroscopy, electrochemistry, optical spectroscopy and actinide synthesis on complex radioactive samples. This capability would enable research into the fundamental chemistry of the actinide elements and enable handling significantly higher activity samples than can currently be handled in a fume hood at the Radiochemistry Laboratory (RCL) at the Material and Fuels Complex (MFC). The results generated from the research performed in these gloveboxes would support multiple programs at the Idaho National Laboratory (INL) including, but not limited to, Fuel Cycle Research and Development (FCRD), the Department of National and Homeland Security (DHS) and laboratory-directed research and development (LDRD). Individual programs utilizing this capability would require a project specific environmental checklist.

The proposed action would enable a researcher to handle radioactive powders/solids. The powdered radioactive materials would be manipulated within the glovebox to enable the preparation of tracer solutions from materials that have been irradiated at Neutron Radiography Reactor (NRAD) or the Advanced Test Reactor (ATR). Project activities also include the preparation of radioactive solids for research purposes. No glovebox servicing/maintenance would be performed under this Environmental Checklist (EC).

This work entails performing chemical investigations on solutions and solids containing high activity actinides in a glovebox environment to enable the study of these solutions or solids by spectroscopic techniques [such as Fourier-transform infrared (FT-IR), Raman, fluorescence and Ultraviolet-Visible-Near Infrared (UV-Vis-NIR)] which are either interfaced into the glovebox using fiber optic feedthroughs, or exist inside the box itself. On some occasions samples may be removed from the glovebox in sealed cuvettes for UV-vis and fluorescence interrogation. Electrochemical studies and manipulations would also be carried out in the glovebox using a potentiostat and electrical feedthrough. These techniques require larger concentrations than normally employed for tracer studies; generally greater than 1.0×10^{-3} M. The chemical investigations would be primarily based on separation techniques, already practiced by INL researchers, including liquid/liquid extraction, liquid/solid extraction, precipitations, and chromatographic techniques. All radioactive work would be performed in the glovebox designed for this work. The initial isotopes considered for this work include ²³⁵U, ²³⁸U, ²³⁷Np, ²³⁹Pu, ²⁴²Pu, ²⁴¹Am, ²⁴³Am, ²⁴⁴Cm, and ²⁴⁸Cm. Actinide materials would be obtained from sources that have been stored in the hot cell at the Hot Fuel Examination Facility (HFEF) which contains both defense and nondefense related materials and contamination. Project materials will have come in contact with defense related materials. It is impractical to clean out defense related contamination, and therefore, waste associated with project activities is eligible for disposal at the Waste Isolation Pilot Plant (WIPP). Other isotopes may be of interest as investigations develop, and prior Environment, Safety and Health (ES&H) and radiological engineer approval would be obtained before using other radioisotopes.

Some studies would be carried out at elevated temperature not to exceed 80°C. This requires heating samples (in glass or plastic vials) using a jacketed beaker and controlled temperature water bath. The water for this system would be circulated from the waterbath outside the glovebox using a feedthrough.

To avoid contamination of the base of the glovebox in event of a radioactive spill, chemical manipulations would be carried out in secondary containment as appropriate, such as a tray inside the glovebox. The glovebox would be operated at a negative pressure relative to facility.

Solutions would be prepared as far as possible outside the glove box environment. However, some manipulations may be required inside the glove box.

The equipment to be used would include standard laboratory apparatus the MBraun UNILab inert atmosphere glovebox and the MBraun custom air box. The gloveboxes are vented into the building high-efficiency particulate air (HEPA)-filtered ventilation system through dedicated HEPA filters. The gloveboxes would be operated according to the manufacturer's instruction manuals. The UV-Vis-NIR Spectrophotometers, diode array fiber optic UV-vis-spectrophotometers, Raman spectrometer, attenuated total reflection-infrared (ATR-IR) spectrophotometer and fluorimeter would all be used according to vendor instructions. The potentiostats utilized in these research activities would also be used according to the manufacturer's guidelines.

SECTION C. Environmental Aspects or Potential Sources of Impact:

Air Emissions - Radionuclide and chemical emissions to the atmosphere from operations within the RCL are covered under Air Permit Applicability Determination (APAD) 10-002 Rev 1. The APAD will not require modification prior to beginning work. Quarterly inventory checks will ensure facilities unmitigated source term remains below 0.1 mrem/yr.

Generating and Managing Waste - Industrial, hazardous, and low-level radioactive waste may be generated. Industrial waste includes common lab waste such as personal protective equipment (PPE) and wash water. Hazardous waste may include corrosives, solvents, and metals-containing waste. Low-level radioactive waste may consist of PPE and wipes. Transuranic (TRU) waste may also be generated. Actinide materials would be obtained from sources that have been stored in the hot cell at the Hot Fuel Examination Facility (HFEF) which contains both defense and nondefense related materials and contamination. Project materials will come into contact with defense related materials. It is impractical to clean out defense related contamination, and therefore, waste associated

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with project activities is eligible for disposal at the Waste Isolation Pilot Plant (WIPP). Project personnel will contact Waste Generator Services (WGS) to identify waste streams, handling, storage, and disposal requirements. All applicable waste will be diverted from disposal in the landfill when possible. Project personnel will use every opportunity to recycle, reuse, and recover materials and divert waste from the landfill when possible. All waste generated will be transferred to the WGS organization for appropriate disposition.

Releasing Contaminants - Small amounts of chemical and radioactive air emissions may occur.

Using, Reusing, and Conserving Natural Resources - All applicable waste will be diverted from disposal in the landfill when possible. Project personnel will use every opportunity to recycle, reuse, and recover materials and divert waste from the landfill when possible. The project will practice sustainable acquisition, as appropriate and practicable, by procuring construction materials that are energy efficient, water efficient, are bio-based in content, environmentally preferable, non-ozone depleting, have recycled content, and are non-toxic or less-toxic alternatives. New equipment will meet either the Energy Star or Significant New Alternatives Policy (SNAP) requirements as appropriate (see <http://www.sftool.gov/GreenProcurement/ProductCategory/14>).

<p>SECTION D. Determine the Recommended 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.</p>
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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, or similar requirements of DOE or Executive Orders; 2) require siting and construction or major expansion of waste storage, disposal, recovery, or treatment or 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) have the potential to cause significant impacts on environmentally sensitive resources (see 10 CFR 1021). 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: National Environmental Policy Act (NEPA) Implementing Procedure, Final Rule, 10 CFR 1021 Appendix B to Subpart D, Categorical Exclusion B3.6 "Small-scale research and development, laboratory operations, and pilot projects."

Justification: Project activities in this EC are consistent with 10 CFR 1021 Appendix B to Subpart D, Categorical Exclusion 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 two years) frequently conducted to verify a concept before demonstration action, 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 that are undertaken at a scale to show whether a technology would be viable on a larger scale and suitable for commercial deployment."

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

Approved by Jack Depperschmidt, DOE-ID NEPA Compliance Officer on: 12/11/2013