

SECTION A. Project Title: Multicomponent Thermochemistry of Complex Chloride Salts for Sustainable Fuel Cycle Technologies

SECTION B. Project Description

The University of Pittsburg, in collaboration with the University of Texas at San Antonio (UTSA) and the Idaho National Laboratory (INL), proposes to develop a comprehensive thermodynamic database for multicomponent chloride salts through thermodynamic modeling and thermochemical measurements. This research will be accomplished by the following tasks: (1) develop a multicomponent thermodynamic database for the chloride salt system; (2) determine phase equilibria for the unknown binary and ternary systems through experimental measurement of the phase transitions; (3) model calibration using experimental inputs from complex simulants chloride salts for predicting solubilities; and (4) perform sensitivity analysis of the developed database.

SECTION C. Environmental Aspects / Potential Sources of Impact

Radioactive Material Use: Small scale experiments using actinide chloride salts will be performed in support of this work. All materials will be handled in accordance to the UTSA Radiological Safety and Chemical Safety Protocols under an approved, laboratory-specific Radiation and Laser Safety Committee Application. Amounts to be handled under this program will not exceed 5-gram of depleted uranium. The INL will handle less than 20-gram of uranium bearing, chloride salts.

Radioactive Waste Generation, Hazardous Waste Generation: Materials following small scale experimentation will be disposed of as radiological waste, per established protocols at the UTSA. Waste generated can include contaminated fixturing and personal protective equipment, and therefore the total radionuclide waste will not exceed 5 grams, but total waste generated could include up to 100 grams of waste. Waste Generator Services will be handling the chemical water disposal for experiments at the INL. It is expected that a small quantity of chloride salt with depleted uranium will be dispositioned as waste. All solid waste will be managed by Waste Generator Services using approved laboratory procedures.

Chemical Use/Storage: Chemicals to be used and stored under this program include solvents, for fixturing cleaning and anhydrous salts. These will be stored and disposed of in accordance with the UTSA Chemical Safety Procedures under and approved, laboratory specific chemical use protocol. At INL, acquiring, using, storing, and dispositioning chemicals will follow INL procedures.

Chemical Water Disposal: Chemical waste, in the form of used solvents, will be disposed of in accordance with UTSA Chemical Safety Policies and amounts will not exceed 2 liter of solvent waste over the duration of the 2-year performance period. Overall, waste Generator Services office will be handling the chemical water disposal for experiments at the INL. All chemicals will be managed in accordance with laboratory procedures. Although not anticipated, there is a potential for spills when using chemicals.

Air Emissions: If stationary air emission sources emit radionuclides, they will follow the procedures at INL. The emissions part does not apply to UTSA. There is no airborne radionuclide work.

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 develop a comprehensive thermodynamic database for multicomponent chloride salts through thermodynamic modeling and thermochemical measurements

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

DOE-ID NEPA CX DETERMINATION

Approved by Jason Sturm, DOE-ID NEPA Compliance Officer on 9/01/2020