DOE-ID NEPA CX DETERMINATION

CX Posting No.: DOE-ID-21-042

SECTION A. Project Title: Phosphate Mineral and Glass Waste Forms for Advanced Immobilization of Chloride- and Fluoride-based Waste Streams – Clemson University

SECTION B. Project Description

Clemson University proposes to develop waste form options for immobilizing the fluoride- and chloride-salt waste stream in highly durable and easily processable phosphate minerals and glasses. The main objective is to evaluate three options including: i) phosphate ceramic waste forms by focusing on apatite phases with the general formula M10(PO4)6(Cl/F)2, ii) phosphate glass waste forms (particular Sn-P-O-F/Cl glass) with low melting temperature, iii) phosphate glass-ceramic waste forms by targeting crystalline apatite and monazite phases. The options have the ability to fully incorporate full salt waste streams (unseparated salts) and separated salt streams where certain species are removed or recycled. Additionally, an indirect immobilization method using a SAP (SiO2-Al2O3-P2O5) composite via dechlorination of the salt waste will be explored as a comparison with the researchers' proposed phosphate glass waste forms. The major processing approach for these three options will be melt processing in air, similar to that developed for borosilicate nuclear waste glasses. Spark plasma sintering (SPS) will also be used to fabricate phosphate ceramics at lower temperatures and shorter times to compare with melt-processed ceramic samples. Multiple monolithic waste form samples will be provided to DOE national laboratories for further testing.

SECTION C. Environmental Aspects / Potential Sources of Impact

The university has procedures in place to handle any waste that will be generated through this project. The action would not create additional environmental impacts above those already occurring at the university.

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). For purposes of this category, "demonstration actions" means actions that are undertaken at a scale to show whether a technology would be viable on a larger scale and suitable for commercial deployment. Demonstration actions frequently follow research and development and pilot projects that are directed at establishing proof of concept.

Justification: The activity consists of an investigation to develop and evaluate phosphate mineral and glass waste forms for advanced immobilization of chloride- and fluoride-based waste streams.

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

Approved by Jason Anderson, DOE-ID NEPA Compliance Officer, on 08/24/2021.