FY2020 Nuclear Energy University Programs

CINR Webinar – August 7, 2019

PROGRAM SUPPORTING: FUEL CYCLE TECHNOLOGIES

ELIGIBLE TO LEAD: UNIVERSITIES ONLY

MATERIAL RECOVERY AND WASTE FORM DEVELOPMENT (FC-1)

- **FC-1.1: NUCLEAR FUEL CYCLE CHEMISTRY**
- **FC-1.2: ELECTROCHEMICAL SEPARATIONS**
- **FC-1.3: WASTE FORMS DEVELOPMENT AND OFF-GAS CAPTURE**
  - **FC-1.3a: Iodine Immobilization from Caustic Scrubber Solution**
  - **FC-1.3b: Salt Waste Recycle and Immobilization**

FC-1.3a: Iodine Immobilization from Caustic Scrubber Solution

The size and cost of using silver-based solid sorbent material alone to remove I-129 are relatively large. Recent studies have demonstrated that the combination of a caustic scrubber followed by a silver-based solid sorbent polishing bed may reduce the sorbent usage by ~90%. The recovered iodine, associated tramp halogens, and co-absorbed carbon (C-12 plus C-14) in the caustic scrubber solution must be converted to a highly stable and corrosion resistant waste form.

Proposals are requested to develop conversion process(es) for the spent scrubber bottoms solution into highly durable waste form. The proposed waste forms/processes that avoid the use of silver or other hazardous metals are preferred. The conversion process should also consider, and experimentally verify, the fraction of the halogens and carbon that would be released during the conversion process and that would require recapture.

The proposed effort should include the production of multiple, 20 gram monolithic waste form test samples that would be provided to the DOE National Laboratories for testing beginning no later than 15 months into the effort and continuing to the conclusion of the proposed effort. Samples of the proposed waste forms would be evaluated using the facilities and methods developed within the DOE National Laboratory complex.

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(UP TO 2 YEARS AND $400,000)

FC-1.3b: Salt Waste Recycle and Immobilization

Some advanced reactors and fuel cycles generate alkali- and alkaline-earth halide-based salt waste streams. These streams contain fission products and some actinides and must be treated to immobilize the radioactive components. The national laboratories are developing a method to dehalogenate the salt waste using phosphate compounds. This process generates a phosphate liquid containing fission products and trace concentrations of actinides. Durable phosphate-based waste glasses may be used to immobilize the resulting molten phosphate-based streams.

Proposals are requested to develop a highly durable and easily processable phosphate-based waste glass. The waste form should be developed to be processed efficiently in existing waste glass melter technologies and result in acceptable glass when slow cooled in full scale waste glass canisters.

The proposed effort should include the production of multiple, 20 gram monolithic waste form test samples that would be provided to the DOE National Laboratories for testing beginning ***no later than*** 15 months into the effort and continuing to the conclusion of the proposed effort. Samples of the proposed waste forms would be evaluated using the facilities and methods developed within the DOE National Laboratory complex.

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