

**SECTION A. Project Title: Investigation of Novel Nickel-Based Alloys for Molten Chloride Fast Reactor Structural Applications****SECTION B. Project Description**

The University of Cincinnati proposes to design and develop alloys with superior thermomechanical, corrosion, and irradiation properties for high temperature structural applications in molten chloride salt fast reactors (MCFR). Thermodynamic modeling will be utilized to ascertain phase equilibria and help select suitable compositions, followed by processing using casting and forging/rolling to produce bulk materials with optimized microstructure for testing and characterization. The micro-structure of the alloys will be characterized using powerful electron microscopy and diffraction tools and the mechanical properties, including yield/tensile strength, ductility, creep strength, fatigue, creep-fatigue and fracture behavior will be evaluated over a range of temperatures up to 1000°C. The performance of the baseline alloys will be evaluated for their response to the other important challenges facing MCFR structural alloys: (a) irradiation, (b) He embrittlement, and (c) corrosion in the chloride salt under appropriate conditions of salt chemistry and temperature. Post-test samples will be characterized to ascertain damage modes and failure mechanisms.

**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 permitted 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). 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.

B3.10 Siting, construction, modification, operation, and decommissioning of particle accelerators, including electron beam accelerators, with primary beam energy less than approximately 100 million electron volts (MeV) and average beam power less than approximately 250 kilowatts (kW), and associated beamlines, storage rings, colliders, and detectors, for research and medical purposes (such as proton therapy), and isotope production, within or contiguous to a previously disturbed or developed area (where active utilities and currently used roads are readily accessible), or internal modification of any accelerator facility regardless of energy, that does not increase primary beam energy or current. In cases where the beam energy exceeds 100MeV, the average beam power must be less than 250 kW, so as not to exceed an average current of 2.5 milliamperes (mA).

Justification: The activity consists of university-scale research activities to develop alloys with superior thermomechanical, corrosion, and irradiation properties for high temperature structural applications in molten chloride salt fast reactors.

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 8/6/2020