DOE-ID NEPA CX DETERMINATION

CX Posting No.: DOE-ID-21-045

SECTION A. Project Title: Assessment of Irradiated Microstructure and Mechanical Properties of FeCrAl Alloy Fabrication Routes – GE Research

SECTION B. Project Description

GE Research (GRC), in collaboration with the University of Michigan (UM) and Idaho National Laboratory (INL), proposes to determine how the FeCrAl alloy fabrication route determines the microstructure and mechanical properties following irradiation. FeCrAl alloys are fabricated through conventional melting/forging, additive manufacturing (AM), and traditional powder metallurgy (PM). Irradiation effects on microstructure (irradiation induced defects and precipitation) and the corresponding impact on mechanical properties (hardness and embrittlement) will be evaluated. The information obtained by this study will be combined with on-going corrosion and mechanical property studies on non-irradiated samples to help guide programmatic decisions on development of fabrication methods for commercial FeCrAl alloys for accident tolerant fuel cladding. This study will provide valuable data on the irradiation response of FeCrAl alloys with various microstructures using a systematic approach which is useful for machine learning models. This data will also be used to enhance collaborations with national lab and university modeling teams using Monte Carlo and Multiphysics codes (e.g., MOOSE/BISON) which can provide valuable input for machine learning models. This approach of combining modeling/machine learning with experiments allows for faster optimization of future commercial concepts developed by GRC. GE will encourage academic researchers to utilize these materials in the Nuclear Science User Facilities (NSUF) library.

SECTION C. Environmental Aspects / Potential Sources of Impact

The university and its research partners have 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 research institutions.

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 understand the process-microstructure-properties relationships of FeCrAl alloys with regards to irradiation response.

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 08/20/2021.