DOE-ID NEPA CX DETERMINATION

CX Posting No.: DOE-ID-17-061

SECTION A. Project Title: Nanostructured Composite Alloys for Extreme Environments – University of New Mexico

SECTION B. Project Description

The University of New Mexico proposes to develop extreme performance nanocomposite alloys with engineered interfaces that can withstand irradiation doses up to 600 dpa at elevated temperatures (up to 700°C) for demanding nuclear environments such as fast reactor cladding applications. This will be accomplished by producing nanolayered (10-200 nm individual layer thickness) Cu/Nb and Zr/Nb composites using the Accumulative Roll Bonding (ARB) technique. The project will also investigate the mechanical behavior and thermal stability of these materials up to 700°C and correlate their radiation damage tolerance and thermomechanical stability to their specific interface structures. The selected alloys will be subjected to ion irradiations up to 600 dpa using 5-10 MeV Cu ions at 200-700°C. Microstructural investigation, nanoindentation and small-scale mechanical testing will be performed on irradiated alloys. ARB processed bulk nanocomposites are scalable at the commercial level and represent an innovative approach to designing materials with engineered interfaces that eliminate the trade-offs constraints in conventional alloy development. This work aims at taking lab-scale alloys at the scientific stage with great potential for enhanced performance in radiation environments into a higher technological level by producing bulk nanocomposites and examining their radiation damage resistance at very high doses and temperatures.

SECTION C. Environmental Aspects / Potential Sources of Impact

Chemical Use/Storage / Chemical Waste Disposal – Miniscule amounts of chemicals (methanol, isopropanol, acetone, etc.) will be used for sample preparation. Chemicals used for this project will be stored and disposed per UNM policy as designed and monitored by UNM's Safety and Risk Services.

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 aimed at investigating extreme performance nanocomposite alloys that can withstand high irradiation doses at elevated temperatures.

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 07/10/2017