

DOE-ID NEPA CX DETERMINATION

SECTION A. Project Title: Mechanical Behavior of UO₂ at Sub-grain Length Scales: Quantification of Elastic, Plastic and Creep Properties via Microscale Testing– Arizona State University

SECTION B. Project Description

Arizona State University proposes to develop techniques to measure relevant properties at sub-grain scales using depleted uranium oxide samples with different grain sizes and oxygen stoichiometries. Grain size crystallography will be characterized using Scanning Electron Microscopy and Electron Backscattering Diffraction. Grains will then be carefully selected based on their crystallographic orientations to perform micromechanical experiments using samples machined via Focused Ion Beam, with emphasis on micro-pillar compression and micro-cantilever bending.

SECTION C. Environmental Aspects / Potential Sources of Impact

Radioactive Material Use – Depleted uranium oxide (made with U-238) will be used for mechanical testing. The amounts required will be fairly low, given the small volumes required by the experiments. The activity of one of the large scale experiments will be around 0.2 microCuries and even lower for the small scale volumes proposed. Samples are stored and prepared in gloveboxes. Shipping and receiving of these samples to and from collaborators is handled through the ASU Office of Radiation Safety.

Radioactive Waste Generation – The sample preparation process will require sectioning and polishing depleted uranium oxide, which will produce waste in the form of small pieces as well as polishing pads with small amounts of radioactive material (activities about 100 times lower than for a single sample). Paper towels and other cleaning supplies used for cleaning samples are typically considered solid radioactive waste. This low level radioactive waste is handled by the ASU Office of Radiation Safety.

Chemical Use/Storage – Small amounts of organic solvents (acetone, isopropanol) will be used to clean sample holders, tweezers, etc., will be used. The total amounts of these chemicals to be stored for this project range around 1-2 liters of each, with a few milliliters for each use. Small amounts of inorganic acids will be stored for etching and other procedures needed. The ASU Offices of Risk Management and of Environmental Health and Safety regulate use and disposal of these chemicals.

Chemical Waste Disposal – Some of the chemicals above will need to be disposed after use, using procedures regulated by the ASU Offices of Risk Management and of Environmental Health and Safety. Wastes are placed in labeled containers segregated according to chemical compatibilities and disposed following state and federal regulations.

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.

Justification: The activity consists of evaluating the mechanical behavior of uranium oxide for research purposes.

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

Approved by Jack Depperschmidt, DOE-ID NEPA Compliance Officer on 11/18/2013