DOE-ID NEPA CX DETERMINATION

CX Posting No.: DOE-ID-18-068

SECTION A. Project Title: Radiolytic Dissolution Rate of Silicon Carbide – Notre Dame University

SECTION B. Project Description

Notre Dame University proposes to quickly develop a matrix of dissolution rates for high purity silicon carbide (SiC) material using intense electron beam irradiation to provide the radiation field, and measure the products of dissolution (silicic acid and carbon dioxide [CO_2] or CO]) in the water downstream of the irradiation zone. This method allows multiple measurements using the same SiC sample at various temperatures and with variable water conditions. A second method will be pursued in parallel, should the SiC dissolution rate prove too slow to be readily measured via the products. In this method, thin (submicron) films of SiC will be deposited on zircaloy substrates, and irradiated at high temperature with very high radiation field for most of a day.

SECTION C. Environmental Aspects / Potential Sources of Impact

Chemical Use/Storage – Some wet chemistry is involved; as a result, small amounts of chemical reagents will be used. Oxygen and hydrogen gases (from tanks) will be used to bubble into aqueous solutions. LiOH salt in very small amounts may be added for pH control. To investigate the radiolytic chemistry, scavengers may be added for the OH radical, like MeOH or NaBr. Generally, these dilute reagents pose no hazard to the environment and could be dumped down the drain. When this is not the case, the waste solutions will be kept for proper disposal following the Chemical Hygiene Plan of Notre Dame University.

Chemical Waste Disposal – To the extent that used chemical reagents need to be saved for proper disposal, they will be properly labeled as called for in the University Chemical Hygiene Plan and given over to the Waste Management organization of the University for proper disposal.

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 aimed at determining the rate SiC dissolution.

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 08/03/2018