

DOE-ID NEPA CX DETERMINATION

SECTION A. Project Title: Gallium Oxide Schottky Diode Detectors for Measurement of Actinide Concentrations from Measured Alpha Activities in Molten Salts – Ohio State University

SECTION B. Project Description

Ohio State University (OSU) proposes to develop and test at high temperatures a Schottky diode alpha particle detector that is based upon the ultra-wide band gap (UWBG) semiconductor material gallium oxide (Ga_2O_3). These materials offer the potential to detect alpha particles at high temperatures with better resolution than previous wide band gap (WBG) materials. The gallium oxide detector offers the potential for real-time, or near real-time, monitoring of alpha emitter concentrations in molten salt reactor (MSR) fuel and pyro-chemical fuel processing streams. An alpha source at high temperature will be used in a bell jar to determine the detector's energy resolution.

SECTION C. Environmental Aspects / Potential Sources of Impact

Radioactive Material Use / Radioactive Waste Generation – A low activity alpha-emitting disc source (on the order of up to tens of microcurie activity) will be used to test the performance of the diode detectors. The irradiation will occur in a bell jar facility in a Laboratory in Scott Lab on the OSU campus that has already been approved for the use of radioactive materials by the Radiation Safety Section of Environmental Health and Safety at OSU. The irradiations that are to take place at the OSU Nuclear Reactor lab are similar to irradiations that have been performed previously for SiC diode detectors. A procedure exists for the irradiation of Si C diode detectors. Another procedure exists for the irradiation of gallium oxide diodes. These two procedures will be updated to create a procedure that is appropriate for our testing of the gallium oxide diode detectors. Radioisotopes will be produced in small quantities in the reactor irradiation at the OSU Nuclear Reactor Lab.

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 an investigation into ultra-wide band gap semiconductor materials for use in alpha particle detectors.

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