

SECTION A. Project Title: Feasibility of Combined Ion-Neutron Irradiation for Accessing High Dose Levels – University of Michigan**SECTION B. Project Description**

The University of Michigan, in collaboration with the Oak Ridge National Laboratory (ORNL), proposes to assess the feasibility of re-irradiating existing neutron irradiated alloys 304SS and 316SS to high dose levels using ion irradiation, for the purpose of achieving microstructures that represent those from reactor irradiation to those doses. The irradiation stage for ion irradiation will be prepared in the hot cell. The irradiations will focus on self-ion (Ni^{++}) irradiation. Proton irradiation will be used for smaller dose increments.

SECTION C. Environmental Aspects / Potential Sources of Impact

Radioactive Material Use – The project will use annealed 304 stainless steel irradiated in the BOR-60 sodium fast reactor to 5.5, 10.2, and 47.5 dpa, and cold worked 316 stainless steel irradiated in the BOR-60 reactor to 5.5, 10.2, and 25 dpa. Samples were irradiated at 320°C at a damage rate of 9.4×10^{-7} dap/s ($E > 0.1$ MeV) calculated using the Norgett, Torrens, and Robinson (NRT) model, and corresponding to a neutron flux of $\sim 1.8 \times 10^{15}$ n/cm²s ($E > 0.1$ MeV). The BOR-60 irradiated samples are currently stored at the ORNL. Samples are of dimensions $\sim 5\text{mm} \times 3.5\text{mm} \times (0.8\text{-}1\text{mm})$ with low activity ($< 10\text{mR/h}$ at 30 cm).

Radioactive Waste Generation – Waste 304 and/or 316SS materials may be generated. Radioactive wastes will be handled under existing ORNL procedures.

Chemical Use/Storage / Chemical Waste Disposal – Typical electropolishing solution for stainless steels will be used for sample preparation. They will be prepared, used, and disposed at the LAMDA at ORNL.

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 university-scale research on ion-neutron irradiation of stainless steel alloys.

Approved by Jack Depperschmidt, DOE-ID NEPA Compliance Officer on 06/28/2016