

<b>SECTION A. Project Title: Measuring Mechanical Properties of Select Layers and Layer Interfaces of TRISO Particles via Micromachining and In-Microscope Tensile Testing – Idaho State University</b>
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<b>SECTION B. Project Description</b>
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Idaho State University, in collaboration with the Idaho National Laboratory, proposes to 1) develop a capability for sum-micrometer scale strength characterization via focused ion beam micromachining and *in-situ* TEM tensile testing; 2) use this capability to determine strengths across unirradiated and irradiated TRISO-coated particle layers and layer interfaces, and 3) make this testing capability available to other researchers. Particles will be used from two previous studies under the Advanced Gas Reactor (AGR) Program (AGR-1 and AGR-2), which means no new particles production or irradiation is required as part of this project. Focused Ion Beam (FIB) micromachining will be used to prepare samples from the layers and interfaces of interest to this study. The major deliverables associated with this project are (1) Analyzed results of micromachining and in-microscope tensile testing if TRISO-coated particle layers from fuel surrogate particles; (2) Analyzed results of micromachining and in-microscope tensile testing if TRISO-coated particle layers from unirradiated fueled particles; (3) Analyzed results of micromachining and in-microscope tensile testing if TRISO-coated particle layers from irradiated fueled particles; (4) At least two peer-reviewed publications summarizing micromachining and in-microscope tensile testing technique, data collected and analysis of data; (5) At least one MS completed and 1 MS or PhD in progress during the term of the project; and (6) Quarterly and annual reporting to DOE. Existing laboratory facilities and equipment will be used.

<b>SECTION C. Environmental Aspects / Potential Sources of Impact</b>
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Radioactive Material Use/Radioactive Waste Generation – For the proposed study of the mechanical testing of HTGR TRISO fuels, small micron-sized irradiated SiC layers will be fabricated at the INL’s facility at the Materials Fuel Complex. Electron microscopy examination will occur for both irradiated and unirradiated SiC layers at the MACS facility at the Center for Advanced Energy Studies (CAES) under NRC license 11-27380-01.

<b>SECTION D. Determine the Level of Environmental Review (or Documentation) and Reference(s):</b> Identify the applicable categorical exclusion from 10 CFR 1021, Appendix B, give the appropriate justification, and the approval date.
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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 research activities to measure the mechanical properties of select layers, and the interfaces between them, in TRISO particles.

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 08/29/2019