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**Big 10+ Network for the Study of Nuclear Materials at the Microscale (BTN<sup>2</sup>M<sup>2</sup>)**

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Revitalization

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**ABSTRACT:**

We propose to establish a Big 10+ Network for the Study of Nuclear Materials at the Microscale (BTN<sup>2</sup>M<sup>2</sup>) and create a dedicated Nuclear Materials Micro-Fabrication Facility to advance nuclear materials research and education by exploiting state-of-the-art micro- and nano-scale characterization techniques. The key behind this truly transformational effort is the establishment of a dual beam Scanning Electron Microscope (SEM) and Focused Ion Beam (FIB) capable of creating microscopic samples from highly radioactive materials for further study and characterization. Traditional methods to evaluate materials' behavior at high radiation doses require post-irradiation examinations using expensive instruments and facilities dedicated to radiological work. By conducting nuclear materials research at the micro-scale, the dose and radiological risk associated with samples is decreased to an extent that allows these materials to be studied in conventional laboratories with equipment not specifically dedicated to radiological



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work. This dramatically reduces the required resources needed for studies, including those costs normally associated with the disposal of radioactive wastes. By reducing the overall barriers to nuclear materials research, the research community will benefit from increased access to state-of-the-art instrumentation, while a new class of faculty and students will enjoy new opportunities to engage in this area of study. Many state-of-the-art instruments can also be operated remotely to probe the structural, chemical, and atomic characteristics of nuclear materials. Our multi-institutional team will leverage this fact to collectively share existing curriculum through distance learning and create a new course offering based upon an advanced educational platform that will support effective, distributed, experiential learning in a hybrid environment. This platform will reach previously untapped student pools at Minority Serving Institutions and introduce them to the exciting opportunities of nuclear science and engineering.