



Additive Manufacturing of Functional Materials and Sensor Devices for Nuclear Energy Applications

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PROJECT SUMMARY:

The goal of the proposal is to procure an aerosol jet printer in order to establish additive manufacturing capability to fabricate functional materials and sensor devices for nuclear energy applications. Additive manufacturing is a key enabling technology to realize seamless transition from functional materials to new sensor devices of significantly enhanced functionality, complexity, flexibility, and cost effectiveness. Additive manufacturing combined with novel ink synthesis and sintering techniques can result in a highly scalable fabrication route for integrated sensor systems, including sensors, power harvesters and wireless transceivers. Procuring a versatile aerosol jet printer that can directly print functional semiconductors, metals, insulators, and other sensor materials will enable engineers to make 3D conformal sensors directly printed onto parts such as fuel rods, fuel cladding materials, pipes, and spent fuel containers. The equipment will have broad impact on sensor research and development activities in various areas of importance to DOE including research associated with the Advanced Test Reactor, the Transient Reactor Test Facility restart, Light Water Reactor, and spent nuclear fuel storage.

The proposed equipment will support several ongoing DOE projects on advanced sensors and instrumentations led by the proposed project PI and Co-PIs. Project researchers intend to leverage the research infrastructure investment to develop a disruptive manufacturing technology for large-scale and low-cost sensor devices, which can significantly expand nuclear facility monitoring. It will also benefit existing collaborations with a number of other institutions including Texas A&M University, the University of Wisconsin, the University of Florida, the University of Illinois, Pacific Northwest National Laboratory, Savannah River National Laboratory, Nuclear Fuel Industries, Ltd., and Electric Power Research Institute.

In addition to the potential value to nuclear science and engineering research and development, this project will provide significant educational and training opportunity to graduate and undergraduate students in additive manufacturing and its applications in nuclear science and engineering.