
Microscopic Fuel Particles Produced by Self-Assembly of Actinide Nanoclusters on Carbon Nanomaterials

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ABSTRACT

Many consider further development of nuclear power to be essential for sustained development of society; however, the fuel forms currently used are expensive to recycle. We seek to create the knowledge and knowhow that are needed to produce nanocomposite materials by directly depositing uranium nanoclusters on networks of carbon-based nanomaterials. The objectives of the proposed work are to (1) determine the control of uranium nanocluster surface chemistry on nanocomposite formation, (2) determine the control of carbon nanomaterial surface chemistry on nanocomposite formation, and (3) develop protocols for synthesizing uranium-carbon nanomaterials. The expected results include the mechanisms, conditions, and protocols to prepare uranium-carbon nanocomposite materials with a range of uranium loadings per unit mass of carbon nanomaterials and with uranium at different oxidation states, which will in turn offer flexibility in the design of modular reactors for a variety of purposes, including generating wholesale electricity, driving vessels and vehicles onboard, and providing power for households.