PURDUE UNIVERSITY

SCHOOL OF AERONAUTICS AND ASTRONAUTICS
& SCHOOL OF NUCLEAR ENGINEERING

The AAE Spring 2017 Colloquium Series

Presents

“The Stored Energy Fingerprints of Radiation Damage”

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Abstract

The current unit of radiation damage, the displacements per atom (DPA), is a calculated exposure parameter that does not directly yield the defect populations responsible for irradiation-induced material properties. Were an 'a posteriori' measure of radiation damage to exist, it would help to answer numerous, lingering questions about the nature and effects of irradiation. We propose the use of stored energy fingerprints as this new, more descriptive unit of radiation damage. They can be measured after irradiation, and they are hypothesized to yield information about the resulting defect populations. We present a combination of time-accelerated molecular dynamics (MD) simulations and nanoscale differential scanning calorimetry (nanoDSC) measurements, which together paint a more measurable picture of the multiscale nature of radiation damage. Potential applications range from settling the question of neutron/ion irradiation equivalency, to quantitatively understanding dose rate effects, to verification of historical uranium enrichment.

Bio

Professor Michael Short joined the faculty in the Department of Nuclear Science and Engineering in July, 2013. He brings 15 years of research experience in the field of nuclear materials, microstructural characterization, and alloy development. His group's research is a mixture of large-scale experiments, micro/nanoscale characterization, and multiphysics modeling & simulation. The main areas of Prof. Short's research focus on 1) Non-contact, non-destructive measurement of irradiated material properties using transient grating spectroscopy (TGS), 2) Preventing the deposition of deleterious phases, such as CRUD in nuclear reactors, as fouling deposits in energy systems, and 3) Quantification of radiation damage by stored energy fingerprints. This last project was recently selected for an NSF CAREER award. For more information on the Short Lab, please visit http://web.mit.edu/shortlab/.