

NOMATEN Hybrid Seminar

Location: NOMATEN seminar room

Time: 1 PM

gotomeeting room (for online): <https://meet.goto.com/NCBJmeetings/nomaten-seminar>

Seminar date: December 10th, 2024

Title: Phase Evolution in Uranium-10wt.% Molybdenum Fuel Subjected to Irradiation at Sub-eutectoid Temperatures

Speaker name: Dr. Maria Okuniewski

Speaker affiliation: Purdue University, West Lafayette, USA

Abstract: Uranium-10wt.% molybdenum (U-10Mo) fuels are currently under consideration for the conversion of high-enriched U to low-enriched U fuels within high-performance research and test reactors to minimize proliferation concerns. These fuels are also of interest for small modular reactors and fast reactors, which require differing fabrication techniques. In general, U-10Mo fuels exhibit stable irradiation, mechanical, and corrosion behavior. The irradiation stability is due to the existence of the metastable γ phase (body-centered cubic) that demonstrates isotropic swelling. However, since the equilibrium phases are the α and the γ' phases that exhibit anisotropic swelling, operation using these fuels at sub-eutectoid temperatures promotes phase decomposition of the γ phase, resulting in poor irradiation stability. Upon irradiation, the reversal of $\alpha + \gamma' \rightarrow \gamma$ phase can occur. In this talk the phase evolution will be discussed for varying fabrication techniques, irradiation temperatures, and doses using advanced characterization techniques, including transmission electron microscopy and synchrotron X-ray diffraction. Finally, the experimental work will be compared to molecular dynamics simulations.

Bio: Dr. Maria A. Okuniewski is an associate professor in the School of Materials Engineering at Purdue University in the United States (U.S.), where she also holds a courtesy appointment with the School of Nuclear Engineering. She received her B.S. in Marine Science/Biology from the University of Tampa and her M.S. and Ph.D. in Nuclear Engineering from the University of Illinois at Urbana-Champaign. Previous to joining Purdue in 2016, she spent approximately eight years at Idaho National Laboratory (INL) in the U.S. as a research and development scientist and engineer. She has conducted research on transmutation fuels, high-performance research and test reactor fuels, structural materials, and waste storage materials for over twenty years. Dr. Okuniewski's research focuses on the nexus of microstructural evolution, processing, mechanical properties, and irradiation performance to improve upon next generation fuels and materials, including minimizing proliferation. She has also been instrumental in developing new techniques and expanding the capabilities of existing techniques to apply to nuclear fuels and materials such as positron annihilation spectroscopy, nanoindentation, synchrotron X-ray diffraction and tomography, neutron diffraction, and focused ion beam/scanning electron microscopy applications. She has graduated 8 MS and PhD students. She has authored or co-authored 77 peer-reviewed journal articles or proceedings and over 100 conference presentation abstracts and has secured over \$7 million dollars in competitive external grants and contracts. Her work has been recognized by the U.S. Department of Energy, receiving numerous awards, including the Fuel Cycle Research and Development Excellence Award, the American Nuclear Society Mary Jane Oestmann Professional Women's Award, and the ORAU Ralph E. Powe Junior Faculty Enhancement Award. Dr. Okuniewski is active in the American Nuclear Society and The Minerals, Metals, and Materials Society. She currently serves as the Chair of the Nuclear Science User Facilities and the Technical Chair of the Materials in Nuclear Energy Systems (MiNES) conference.