PURDUE UNIVERSITY | School of Nuclear Engineering

Nuclear Engineering Seminar

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3:30 pm | WTHR 200

Real-Time Fuel Accountability and Material Surveillance for Optimized Fueling in Pebble Bed Reactors

Abstract

Realizing the market potential for advanced reactors across the wide breadth of
proposed end-use applications will require a paradigm shift in fuel accountability and reactor monitoring and control. In this talk, I will present new concepts for reactor monitoring and accountability of nuclear fuel, with particular emphasis on tristructuralisotropic (TRISO) pebbles, as employed in pebble-bed reactors (PBRs). These nondestructive examination (NDE) methods can improve fuel accountability and management during reactor operation and at the back end of the fuel cycle. Three nondestructive assay (NDA) methods for TRISO-fueled pebble characterization, namely neutron multiplicity counting, X-ray computed tomography, and gamma-ray spectroscopy, will be presented. Based on these three NDE methods, an accurate pebble characterization at the single-pebble level can be achieved in a few minutes to meet the operational constraints of PBRs.
When combined with advanced pebble tracking strategies, they can also provide further insights into reactor operation and help maximize fuel utilization.

Prof. Angela Di Fulvio is an Associate Professor and Donald Biggar Willett Faculty Scholar in the Department of Nuclear, Plasma and Radiological Engineering at the University of Illinois Urbana–Champaign. She directs the Nuclear Measurement Laboratory and leads the Program in Arms Control & Domestic and International Security (ACDIS). Her research spans radiation detection and measurements, neutron and gamma-ray instrumentation, nuclear safeguards and non-proliferation, and medical applications.

She serves as Senior Associate Editor of Radiation Measurements and is a member of the editorial board of Scientific Reports.

She is engaged in professional leadership, serving as Chair of the ANS Nuclear Nonproliferation Policy Division (NNPD), Chair of the APS Group on Instrumentation and Measurement Science (GIMS), and Co-Chair of the IEEE Nuclear and Plasma Sciences Society (NPSS) Chapters Committee. Through these roles, she contributes to shaping the field, supporting its growth, and upholding long-standing traditions of excellence in radiation instrumentation and measurement science.