GEN IV International Forum
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Webinar Invite

Education and Training Working Group

Join us on December 18, 2023, 8:30 a.m. EST (UTC-5)

Characterization of U-233 for Thorium Fuel Cycle Safeguards

Renewed international interest in thorium-fueled advanced reactors has challenged the safeguards community to address future proliferation concerns. Thorium-based technology presents many benefits but does not eliminate the proliferation risks associated with producing and processing fissile material. A byproduct of thorium-fueled reactors is uranium-233, which is classified as a direct-use material. As a result, the development of new or improved methods to characterize and measure materials containing 233U must mirror the pace of development of reactors and facilities that produce such material. Research is underway to assess, develop, and test approaches for safeguarding nuclear materials within the thorium fuel cycle. Neutron signatures from the nondestructive assay (NDA) of materials containing 233U and 235U are being quantified to inform the potential characterization of these materials. Using a traditional neutron coincidence counter and a series of well-documented 233U oxide samples, initial measurements have been made to assess the feasibility of 233U characterization and discrimination from other uranium isotopes, primarily 235U, using a combination of measurement techniques and analysis methods. Data acquisition is performed in list mode, allowing for a variety of analyses to be performed on the raw data that is not available using traditional shift register technology. Measurements were performed with an Active Well Coincidence Counter (AWCC) in passive and active configurations to quantify the strength of signals and validate simulations to demonstrate feasibility of a novel characterization technique.

Free webcast!

December 18, 2023
8:30 am EST (UTC-5)

Register NOW at:

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Who should attend:
policymakers, managers, regulators, students, general public

Madeline Lockhart is a Ph.D. student in the Department of Nuclear Engineering at North Carolina State University and the winner of the ANS 2023 Pitch Your PhD Competition. Currently located in Ispra, Italy, she is spending six months as a visiting scientist at the European Commission Joint Research Centre (JRC). She was awarded a Nuclear Nonproliferation and International Safeguards (NNIS) fellowship by the National Nuclear Security Administration in 2021. As a part of a multi-university, multi-laboratory team, she is working to develop new neutron multiplicity counting methods to assay uranium-233 and -235 in mixed oxide nuclear fuel materials. Throughout her undergraduate and graduate studies, she has done research in the Nuclear Engineering and Nonproliferation Division at Los Alamos National Laboratory. Her experience includes modeling in MCNP, evaluation of dead time correction algorithms, coincidence and multiplicity counting for characterization of special nuclear material, californium-252 calibration methods, and testing of hardware and software utilized in neutron detection systems. In 2019, she was an intern at the Department of State in the Bureau of Arms Control, Verification, and Compliance. Madeline has a Bachelor of Science in Physics from Texas Tech University.

Upcoming Webinars

31 January 2024, Revolutionizing Nuclear Engineering Education: Developing Virtual Labs for Neutron Detection, Geiger-Counter, and Reactor-experiments, Dr. Jonah Lau, Purdue University, USA

February 2024, TBD

20 March 2024, Overview of Canadian R&D Capabilities to Support Advanced Reactors, Lori Walters, CNL, Canada