GEN IV International Forum
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Webinar Invite

Education and Training Working Group

Join us on July 26, 2023, 8:30 a.m. EDT (UTC-4)

Off-gas Xenon Detection and Management in Support of Molten Salt Reactors

Many molten salt reactor designs involve the circulation of a cover gas to remove evolved fission products and maintain an inert atmosphere. The cover gas leaving the reactor core is expected to contain noble and non-noble gases, aerosols, volatile species, tritium, and other radionuclides. To remove these radioactive gases, developing a robust off-gas system is necessary, along with novel sensors to monitor the gas stream and the treatment system performance. In recent years, a new class of functional materials known as metal–organic frameworks (MOFs) have been discovered using machine learning tools to identify key candidates for specific uses. In this study, a MOF was engineered for to capture of xenon, which is a major contributor to the off-gas source term. The engineered MOF column was tested with a residual gas analyzer (RGA) and laser-induced breakdown spectroscopy (LIBS) sensor for noble gas capture, separation, and monitoring. The RGA and LIBS sensor was used to monitor breakthrough tests with various Xe, Kr, and Ar mixtures to determine the Xe capacity, as well as the selectivity of the MOF. This study offers an initial demonstration of the feasibility of xenon separation (MOF) and monitoring using a LIBS sensor to aid in the development of new capture and sensor systems for molten salt reactors.

Free webcast!

July 26, 2023
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Who should attend:
policymakers, managers, regulators, students, general public

Dr. Hunter Andrews is an early career researcher in the Isotope Applications Research Group within the Radioisotopes Science and Technology Division, Oak Ridge National Laboratory. Having been at ORNL for the past 3 years, his research focus revolves around the development of in-situ, online monitoring tools for complex environments. His main expertise lies in optical spectroscopy, particularly laser-induced breakdown spectroscopy (LIBS), a rapid form of spectroscopy capable of elemental analysis regardless of sample form. Other research interests include chemometrics, machine learning, mass spectrometry, spectroelectrochemistry, and neutron imaging. He received his PhD in Mechanical and Nuclear Engineering from Virginia Commonwealth University, College of Engineering, USA

Dr. Praveen Thallapally is a chief scientist at PNNL for the past 17 years. He and his team developed a series of novel and transformational applications of porous organic and hybrid (metal organic frameworks, covalent organic frameworks, etc.) nanomaterials and membranes for separation of volatile radionuclides released from nuclear reprocessing and advanced reactors. He published large number of publications (>150) and several patents (>5) focused on materials and membranes for noble gas separation, carbon capture, iodine removal, adsorption chillers/heat pump and sensing with an H-index of 67 (Google Scholar). He is tailoring these advanced functional materials as surface acoustic wave sensors to detect and monitor the toxic gases. Other research interests include the development of “porous liquids” for applications in energy storage, catalysis, extraction of critical minerals from unconventional sources. His work was featured on large number of internal and external press. He received his PhD in Chemistry from the University of Hyderabad, India.

Upcoming Webinars

31 August 2023, Corrosion and Cracking of SCWR Materials, Prof. Lefu Zhang, Shanghai Jiao Tong University, China

27 September 2023, EPRI Virtual Reality Training, Mr. Bob Eller from EPRI, USA, USA

31 October 2023, The Nuclear Workforce of The Future – Opportunities And Needs For The International Nuclear Sector, Mr. Callum Thomas

02 November 2023, MOOK: The knowledge management method applied to a Gen IV project. The continuation of a successful story, Gilles Rodriguez, CEA, France