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ANAHEIM CONVENTION CENTER & ANAHEIM MARRIOTT
ANAHEIM, CALIFORNIA, USA
#TMSAnnualMeeting

SUBMIT AN ABSTRACT FOR THE FOLLOWING TMS2022 SYMPOSIUM:

NUCLEAR MATERIALS

Mechanical Behavior and Degradation of Advanced Nuclear Fuel and Structural Materials

Understanding the mechanical behavior and performance of nuclear fuel and structural materials in harsh environments in a mechanistic and predictable manner is vital to ensure the safety and regulate nuclear energy systems, from current light water reactors to future advanced reactor systems. It is desirable to reduce the uncertainties in the margins to failure to enhance performance for current reactor fleets to improve their economics, safety, and reliability. The lack of property data of existing materials in new operating regimes often limits the potential to optimize performance (e.g., extend fuel burnup).

For the next generation of reactors, novel nuclear fuels and materials need to be qualified and its irradiation performance needs to be assessed. The traditional new fuel qualification approach involves two to three iterations of irradiation and post irradiation examination, typically taking two to three decades to gather enough data for licensing. To meet the aggressive schedule for advanced reactor deployment within the next decade, the fuel qualification process needs to be expedited and requires a paradigm shift. Advanced testing methods and high throughput testing capabilities coupled with a mechanistic understanding from modelling and simulations (including machine learning and data analysis) are key to this shift.

To date, a significant amount of research effort has been directed to this field, but more is now necessary. It is time to bring together all the researchers from academia, national and international research institutes, and nuclear industry to share and discuss the most recent advances in mechanical testing for advanced material systems for nuclear energy.

Topics of interest include, but not limited to the mechanical behavior and properties of:

- Accident tolerant fuel and advanced technology fuel (ATF) systems (including both near term and advanced concepts – pellets and cladding)
- Materials produced by non-conventional and advanced manufacturing methods
- Novel alloy designs and metal composites (experimental and computational designs)
- Advanced ceramics and ceramic matrix composites concepts' properties and in-reactor behavior
- Environmental separate effects and coupled behavior such as irradiation and/or coupled with corrosion causing embrittlement, hardening, stress corrosion cracking etc.
- High throughput testing and rapid qualification methods including coupling to modelling methods
- Advanced testing methods including micromechanical testing, in-situ techniques coupled with x-ray, synchrotron, and neutron imaging and diffraction
- Improve understanding via modelling and simulations, machining learning and data analysis

ORGANIZERS
Dong Liu, University of Bristol
Peng Xu, Idaho National Laboratory
Simon C. Middleburgh, Bangor University
Christian Deck, General Atomics
Erofili Kardoulaki, Los Alamos National Laboratory
Robert O. Ritchie, University of California, Berkeley

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Contact programming@tms.org