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TMS 2026

155th Annual Meeting & Exhibition

March 15–19, 2026
San Diego Convention Center
and Hilton San Diego Bayfront
San Diego, California, USA
#TMSAnnualMeeting

SUBMIT AN ABSTRACT FOR THE FOLLOWING SYMPOSIUM

NUCLEAR MATERIALS

Solid-State Processing and Manufacturing for Nuclear Applications: Integrating Insights and Innovations

Nuclear energy plays a vital role in ensuring a sustainable and resilient energy future, necessitating the development of high-performance structural materials capable of withstanding extreme reactor environments. The need for materials that can endure radiation damage, high temperatures, and corrosive conditions has driven interest in novel processing techniques. Solid-state processing and manufacturing involve high shear stresses that create deformation and heat, plasticizing the material and resulting in significant grain refinement due to dynamic recrystallization. Thus, materials produced using this technology are expected to have enhanced radiation tolerance due to the high density of grain boundaries, which can act as sinks for radiation-induced defects. Despite increased interest, studies on the performance of materials fabricated by solid-state techniques for nuclear application remain limited.

This symposium invites talks focusing on alloys fabricated through novel solid-state processing and manufacturing technologies for nuclear applications and will feature invited and contributed talks in the following categories:

1. Candidate materials for nuclear/extreme applications that are processed and manufactured through a solid-state route.
2. Radiation tolerance of materials processed through solid-state technique including
   a) Different irradiations – neutron, proton, ion, electron, plasma, etc.
   b) Environment - corrosion resistance, stress corrosion cracking resistance, and high temperature oxidation resistance,
   c) Dosage, and
   d) Temperature.
3. Advanced characterization including
   a) Mechanical behavior – hardness, tensile, creep, fatigue, and creep-fatigue behavior, and
   b) Micromechanical behavior - heterogeneous damage, strain localization or deformation patterns in the micro-level, slip, and diffraction investigations,
   c) Microstructural characterization – radiation-induced defects like voids and void swelling, dislocation, and dislocation loops, radiation-induced precipitation, radiation-induced segregation, and He-embrittlement.
4. Discovery, development, and fabrication of new alloys that are difficult to fabricate by conventional methods including oxide dispersion strengthened (ODS) alloys, functionally graded materials, compositionally graded materials, coatings, multimaterials, metamaterials, and architectured materials.
5. Digital twinning of the process to optimize the parameters and train the machine learning models.

SPONSORED BY:
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ORGANIZED BY:

- **Shivakant Shukla,** Pacific Northwest National Laboratory
- **Priyanka Agrawal,** University of North Texas
- **Sergey Tsurkan,** Avalanche Energy
- **John Shelton,** Northern Illinois University
- **Soumita Mondal,** University of Illinois Urbana-Champaign
- **Paul Allison,** Baylor University

QUESTIONS?
Contact programming@tms.org