THE WORLD COMES HERE.

TMS 2025

154th Annual Meeting & Exhibition

March 23–27, 2025
MGM Grand Las Vegas
Hotel & Casino
Las Vegas, Nevada, USA
#TMSAnnualMeeting

SUBMIT AN ABSTRACT FOR THE FOLLOWING TMS2025 SYMPOSIUM:

MECHANICS OF MATERIALS

Spatially Tailored Materials: Processing-Structure-Properties

Recent advances in fabrication enable the local control of microstructures, compositions, and phases across various length scales in a monolithic material. This is particularly relevant for extreme conditions – such as those found in the energy, transportation, and space sectors – where materials are subject to complex thermomechanical loading and environmental degradation. Desired site-specific material properties can now be achieved through advances in manufacturing, allowing graded compositions and/or microstructures across one or more spatial dimensions. However, challenges persist in understanding the formation and evolution of metastable interfaces during far-from-equilibrium processing, making it difficult to identify the relationships between processing, microstructures, and local properties. Before these materials can be implemented, they must overcome difficulties in controlling manufacturing pathways, harnessing nano- to mesoscale interfaces, adapting characterization techniques, and predicting behavior a priori. A mechanistic understanding of the design, fabrication, and performance of interface evolution is crucial for developing the next generation of engineering materials. These novel material systems redefine our perception of the relationships between processing, microstructures, and properties, necessitating the exploration of high-throughput methods to accelerate our understanding. This symposium will bring together worldwide researchers who are pioneering spatially tailored material design, synthesis, characterization, and optimization of location-specific properties. This proposed 2025 TMS symposium will be organized into four sessions, conducted over two full days. Additionally, a poster session will be held to supplement oral presentations and encourage student involvement.

Specific topics of interest may include, but are not limited to:

- Processing methods, including thin films, spark plasma sintering, additive manufacturing, thermal spray, etc.
- Accelerated material discovery, design space mapping, and rapid identification of processing-structure-property relationships
- Understanding nano-, micro-, and mesoscale interface formation and evolution, including new methods and techniques for high-throughput characterization
- Mechanical behavior and environmental degradation of spatially tailored interfaces under extremes
- Computational and experimental design of functionally graded materials

This symposium represents a new endeavor at TMS, addressing the growing research in areas like functionally graded materials, additive manufacturing, and rapid material characterization and discovery. What sets it apart from other symposia on these general topics is its concentrated focus on the intricate relationships between processing, structure, and properties specific to functionally graded materials.

ORGANIZERS

Gianna Valentino, University of Maryland**; Marie Charpagne,** University of Illinois**; Ian Mccue,** Northwestern University**; J.C. Stinville,** University of Illinois Urbana-Champaign

SYMPOSIUM SPONSORS

TMS Structural Materials Division; TMS Additive Manufacturing Committee; TMS Advanced Characterization, Testing, and Simulation Committee; TMS Mechanical Behavior of Materials Committee

www.tms.org/TMS2025

QUESTIONS?
Contact programming@tms.org