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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

DATA-DRIVEN AND COMPUTATIONAL MATERIALS DESIGN

Verification, Calibration, and Validation Approaches in Modeling the Mechanical Performance of Metallic Materials

The qualification and certification of novel and improved material systems in industrial applications involves overcoming large cost barriers and long timelines imposed by substantial testing requirements, leading to a reluctance of industry and government to rapidly develop and integrate new technologies. Computational materials models offer a promising approach to reduce the test burden and accelerate acceptance of these material innovations. However, achieving this necessary level of confidence in the modeling and simulation of mechanical performance at the microstructural scale remains a critical challenge, requiring systematic verification, calibration, validation, and uncertainty quantification procedures as precursor technologies. The objective of this symposium is to use the field of mechanical modeling of metallic materials as a forum to explore the spectrum of challenges, complementary characterization experiments, successful integrated frameworks, and state-of-the-art tools for the verification, calibration, and validation of models.

Topics of interest include, but are not limited to:

- Calibration and validation methodologies for microstructure-informed mechanical performance models such as crystal plasticity, damage models, dislocation dynamics, data-driven structure-property models, etc.
- Uncertainty quantification techniques to account for the effects of experimental uncertainty, to enable calibration under uncertainty, and to propagate uncertainty across multiple length and time scales
- Identification of key mechanical performance metrics and statistical acceptance tests for the comparison of simulation and measurement
- Investigation of common pitfalls and widespread issues encountered in the calibration of complex or high-dimensional performance models
- Application of high-fidelity, innovative experimental datasets to provide one-to-one model comparison and isolate key measurements required for model validation
- Appropriate determination and understanding of boundary conditions for representative volume elements and across length scales
- Verification methods to ensure simulation accuracy within a domain of applicability

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