

MODELING AND SIMULATION OF ADVANCED MANUFACTURING PROCESSES FOR METALS

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Various advanced manufacturing techniques for metallic materials have been developed to produce complex near net-shaped parts. Representative examples include solid state joining (e.g. friction stir and ultrasonic additive manufacturing), powder bed fusion additive manufacturing (e.g. laser and electron beam-based), wire-based additive manufacturing (e.g. laser and wire-arc DED), and hybrid methods that include both additive and subtractive modalities in an integrated manner. Efficient process optimization for these advanced manufacturing methods often requires the use of multi-scale and multi-physics computational models. This symposium seeks to provide a forum for discussion of the latest methods and developments in the modeling and simulation community as applied to process modeling and optimization for advanced manufacturing of metals. Contributions on process modeling of any advanced manufacturing method for metallic materials are welcome. Topics of interest include, but are not limited to:

- Thermo-mechanical modeling of advanced manufacturing processes to predict residual stress and distortion.
- Multi-scale and multi-physics modeling approaches.
- Establishing microstructure-property linkages through computational homogenization.
- Simulation guided process and/or topology optimization, especially through machine learning approaches.
- Model verification and validation and uncertainty quantification.
- Adaptive spatio-temporal discretization strategies.
- Data-driven and reduced-order modeling.
- Functionally and/or compositionally graded materials processing.
- Microstructure and defect predictions and their influence on material properties.