Understanding and Predicting Phase Transformations During Metal Additive Manufacturing

Organizers: Fan Zhang (NIST) and Greta Lindwall (KTH)

Abstract:

Metal additive manufacturing (AM) features rapid heating, cooling, and repeated thermal cycles. These complex thermal conditions influence phase transformations and microstructure evolution in ways that remain challenging to predict. Understanding and predicting these phase transformations are foundational to controlling the microstructure of AM alloys and optimizing their processing and properties.

This invited session will bring together experimental and computational experts to discuss recent advances in understanding phase formation and transformation during metal AM. Topics will include modeling of solidification, solid-state phase transformations, precipitation kinetics, and in situ characterization. This session will particularly emphasize integrating time-resolved experimental measurements with physics-based and data-driven models to elucidate transformation mechanisms, validate models, and improve their predictive capabilities.