Modeling and Simulation for Additive Manufacturing

Various additive manufacturing (AM) techniques including 3D printing have been developed to manufacture complex-shaped components with well-controlled precision. The sophisticated AM techniques often require systematic modeling and simulation efforts during the design stage and for the purpose of part qualification/certification. The main objective of this minisymposium is to provide a platform to discuss recently developed modeling and simulation techniques for AM, including experimental calibration and validation efforts for the process. The topics include (but are not limited to):

- Part-scale and multiscale simulation of the manufacturing process to predict residual stress/distortion, surface topology, and microstructure including defects
- Modeling of materials considering effects of printing direction related to microstructure anisotropy
- Topology optimization for multi-functional design for AM
- Modeling and simulation of functionally graded materials, tissue engineering scaffolds, bioinspired composites, bi-material joints, etc
- Feedback control methods and process maps for minimizing defects and residual stress in as-built structures
- Prediction of mechanical responses of AM products via an integrated computational materials engineering approach considering phase changes
- Materials powder design and component post-heat treatment simulation

Typically, computational modeling and simulation for any AM processes (e.g. laser sintering/melting, electron beam melting, form deposition modeling, stereolithography, binder jetting) and materials (e.g. metals, plastics, ceramics and their composites as well as biological materials) are welcome.