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MS 01
Modeling and simulation of metal additive manufacturing processes

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Additive Manufacturing (AM) of metals aims at the production of high-performance functional parts with mechanical properties comparable to those obtained by processes such as casting, milling, or forging. As compared to these classical processes, however, AM offers highest production flexibility, almost unlimited freedom of design, which enables the generation of highly complex geometries or substructures (e.g., lattice-based, honeycomb-like, biomimetic designs), and the potential for tailored microstructures. However, a sub-optimal choice of process parameters often leads to high residual stresses, dimensional warping, porosity, undesirable microstructures, or even failure of the part during the production process. The complexity of these processes prohibits the identification of optimal process parameters via trial and error, resulting in the inevitable need for predictive process simulation. The purpose of this minisymposium is to provide a forum for discussion in the modeling and simulation community as applied to AM of metals. Contributions on the modeling of any relevant process (e.g., powder bed fusion, directed energy deposition, material jetting, binder jetting, etc.) are welcome. Topics of interest include, but are not limited to:

- Part-scale thermomechanical modeling
- Melt pool modeling
- Microstructure modeling
- Modeling of powder feedstock deposition processes
- Multiscale approaches considering several of the relevant time and length scales
- Inverse approaches, e.g., for compensation of part distortion
- Coupled process-part optimization for the design of functionally tailored/lightweight parts
- Modeling of novel materials and their behaviors (e.g., functionally graded materials, electrical circuits built in-situ)