MICROSTRUCTURE EVOLUTION OF ALLOYS DURING ADDITIVE MANUFACTURING

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ABSTRACT

The microstructure of additively manufactured parts depends on the processing conditions and has strong influence on the resulting materials properties. The building process generates severe and directed thermal loads that induce phase transitions far from thermodynamic equilibrium. Due to extreme cooling to the base material, the solidification microstructure is extremely fine and reflects the directional solidification conditions. In order to understand microstructure evolution of alloys during additive manufacturing processes and the response of additively manufactured parts after the process, versatile models have to be developed. Hereby, the subsequent material addition, transient temperature gradients, remelting of previous layers, melt pool dynamics, grain selection and nucleation as well as solid phase transformations are challenging issues for the prediction of microstructure evolution under extreme thermodynamic non-equilibrium conditions.

This invited session aims to bring together scientists from different disciplines working on modeling the microstructure evolution of alloys and its effects on the materials properties in the context of additive manufacturing.