



Department of Materials Science and Engineering

Candidacy Examination

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Bossone 302

Methods for Characterization of Microstructure Evolution in Additive Manufacturing

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Abstract

Additive manufacturing methods are known to have great potential in cost and materials savings during fabrication of complex components. However, these methods often result in unreliable or undesirable microstructures and, therefore, mechanical properties. High temperature gradients and fast, directional cooling rates result in dendritic and anisotropic structures when using laser methods, while binder concentration differences and powder morphologies can lead to low density parts fabricated by binder jet printing. There have been great advances in recent years in the characterization of microstructure and the influence of fabrication method on its evolution. Microscopy methods including SEM-EBSD as well as neutron and X-ray diffraction have made observation of microstructure as a result of processing technique accessible. Notably, in-situ fabrication and modeling environments have been developed to be used by researchers in an attempt to observe evolution of component structure in real time during fabrication. This talk will include basic information about additive manufacturing processes and typical structures before discussing recent advancements and future directions regarding microstructure evolution in these fabrication methods.