Additive Manufacturing: Connecting Process to Structure, PSED Cluster 2015-2016

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Academic Disciplines:
MECHANICAL ENGINEERING
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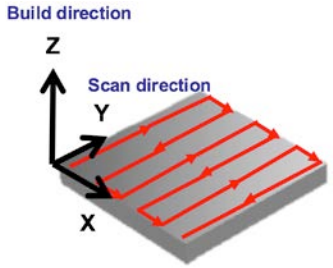
RESEARCH OBJECTIVE

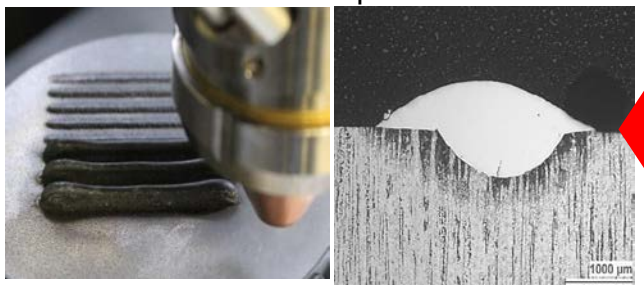
The focus of this study is the characterization of the directed energy deposition process through a combined computational-experimental modeling framework. This study aims to understand the physics-based mechanisms that link the process parameter to the microstructure evolution and dimensional variations seen throughout the additive manufacturing production process. By establishing the relationship between process parameters and resulting microstructural and dimensional variations, we can begin to control process parameters to produce the desired final product quality.

Experimental Observations

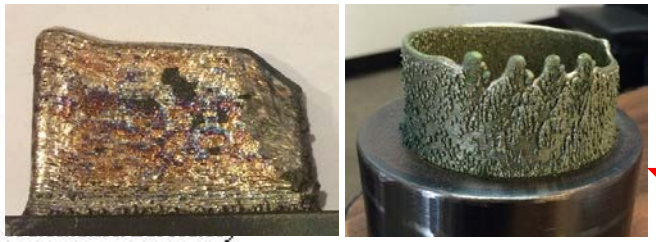


Input Process Parameters

Non-uniform Powder Deposition

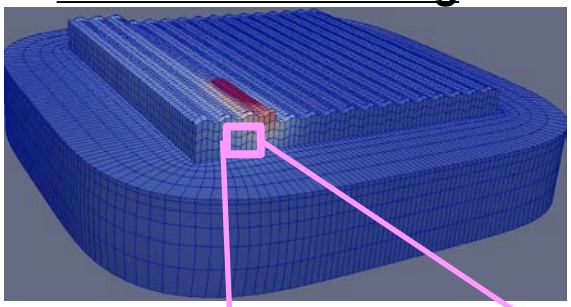


Surface-tension Induced Rippling

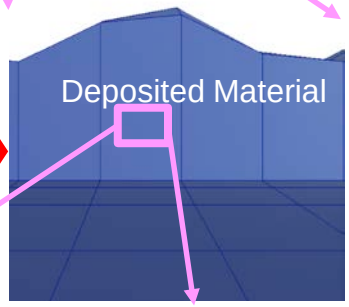


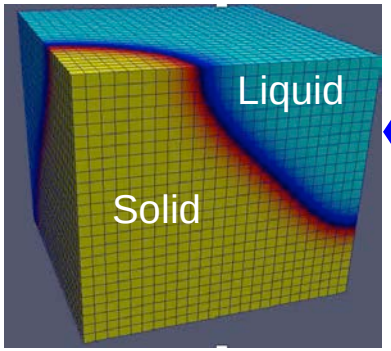
Top down: Manipulate driving forces to control quality

Predictive Modeling



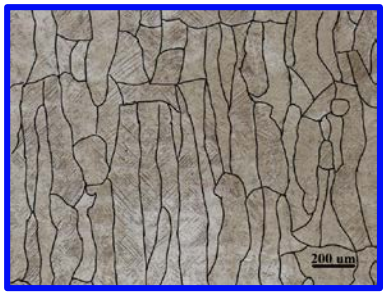
Reproduce physical phenomena



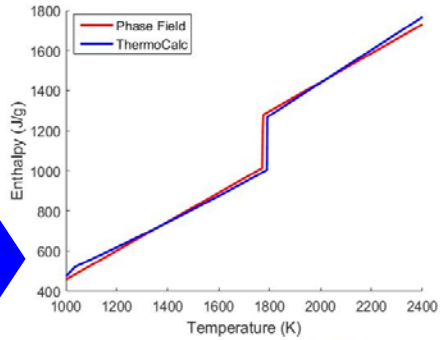


Bottom up: Understand underlying physics

Materials Science



ThermoCalc



Calibrate with ThermoCalc database

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