MateriAlZ Seminar Series

Characterization and Modeling of AF9628 Steel Manufactured via Laser Powder-bed Fusion

Friday, December 4, 2020, 11 am (MST)

Abstract

Laser powder-bed fusion (L-PBF) is a method of additive manufacturing that is capable of creating high-strength parts with varied microstructures. The high-strength martensitic steel designated as AF9628 has been identified as an excellent candidate material for a variety of Army components and is readily printable via L-PBF. To better understand how AF9628 microstructure can be controlled by the L-PBF process, characterization and modeling tools must be developed and tuned to simulate the performance of AF9628 parts across various length scales. Prior austenite reconstruction provides a computational method of observing how the L-PBF process affects final part microstructure by observing the intermediate austenite structures formed during rapid cooling. Prior austenite reconstruction is accomplished by grouping martensite grains into their parent austenite grains using an orientation relationship. This method allows for the differentiation of various grain boundary types within the final room-temperature microstructure. Ultimately, subsequent microstructural and part-scale modeling of material plasticity will depend on such knowledge to improve the design and performance of Army parts made of AF9628 steel.

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Stephen Cluff is a postdoctoral researcher leading modeling efforts for the additive manufacturing group of the Manufacturing Science and Technology Branch at the Army Research Laboratory. Stephen received his Ph.D. in Mechanical engineering from Brigham Young University, focusing on the characterization and meso-scale modeling of steels utilizing kinetic Monte Carlo and finite element methods.

Zoom link: https://arizona.zoom.us/j/86492082454