Rapid Screening of NiTi Laser Powder Bed Fusion Additive Manufacturing Parameters and Alloy Compositions Using Metal Powder Binning

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Abstract

As part of this study, a material binning approach is used to demonstrate rapid screening of both NiTi composition and additive manufacturing deposition parameters within a single laser powder bed fusion (LPBF) build. Within individual material tracks, several variations of laser power and speed are employed while layer thickness, hatch spacing, and other parameters are held constant. Between material tracks, compositional ratios of Ni-Ti varied about a 50-50 starting point. Microhardness testing, microstructure characterization via optical microscopy, and mechanical tensile testing results are presented. Performance weighting of these material characteristics is used to suggest optimal combinations of deposition parameters for different potential shape memory alloy applications.

Biography of Presenter

My name is Naiyer Shokri. I graduated from Sahand University of Technology, Iran, in 2016 with a BSc in Materials Engineering – Extractive Metallurgy. Continuing my education as a graduate student in the field of Metallic Materials Selection & Characterization at the Sahand University of Technology and working on the "Synthesis of Hydroxyapatite Nano-Particles and Coating of NiTi Shape Memory Alloy by HA Coating Using Spin Coating Method" as the subject of my thesis allowed me to learn more about this specialty. After graduation, I successfully published a paper titled "Enhanced corrosion protection of NiTi orthopedic implants by highly crystalline hydroxyapatite deposited by spin coating" in the Journal of Materials Chemistry and Physics.

Now I am a Ph.D. fellow at the University of Louisville with Berfield Research Group at the AMIST lab, where I study the mechanical properties and characterization of additively manufactured NiTi implants.