

Title:

Impact of Thermal Pre-processing of 410 and 430 Stainless-steel Powder upon Microstructural and Mechanical Properties

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Abstract:

Gas-atomization is a widely used technique to produce metallic feedstock powders for additive manufacturing processes such as cold spray. Powder properties can be controlled by manipulating the chemistry and internal microstructure. Heat treatments drive these microstructural changes, allowing for the control of microstructural constituents that can aid with the deposition process (as well as resultant in enhanced deposit properties and performance). Understanding the pre-processing effects upon powder properties is critical for optimal cold spray processing parameter identification for depositing fully dense, high strength, and ductile consolidations. This work characterizes the microstructural and mechanical properties of as-atomized and heat-treated 4xx series stainless-steel powders to understand their impact on cold spray deposition for target applications. The as-atomized and heat-treated powders were obtained from and processed by Solvus Global. The preliminary results exhibit similar powder morphology, internal microstructure, and particle size distribution (PSD) across powder types and processing methods. In addition, the thermal treatment decreased moisture content in 410L and 430L stainless steel powders while increasing hardness compared to the as-atomized counterparts. Future work includes additional feedstock powder characterization before bulk cold spray deposits are consolidated for coating characterization.