

A Constitutive Material Model for Simulating Texture Evolution and Anisotropy Effects in Cold Spray.

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Cold spray has seen rapid advancement since its inception and has shown significant potential as a method of additive manufacturing. However, the large plastic deformation and repeated heating/cooling cycles that the material undergoes during the cold spray process can result in gradients in material structure and large residual stresses. The purpose of this study is to extend the existing EMMI material model to include anisotropic material response through the use of orientation distribution functions to more accurately predict residual stresses and anisotropy resulting from cold spray and similar additive manufacturing processes. The deformation induced anisotropy will first be validated through comparison of a Finite Element simulation of a Taylor impact test with experimental data for Tantalum from Maudlin, et al (1999). The material parameters for the EMMI model were determined from the stress strain and yield surface data and used in the prediction of the of the observed anisotropic footprint of the impacted cylinder. Other validation simulations are also discussed.