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# Texture Evolution during Selective Laser Melting: Experiments and Simulation

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## Abstract

Microstructural aspect of additive manufacturing has gained tremendous importance due to strong dependence of texture on mechanical properties. Additive manufacturing process closely associates with high energy welding processes and solidification, especially epitaxial growth, an understanding of these inter-twinned processes requires a clear understanding of structure, especially crystallographic texture. The knowledge of micro-texture as well as bulk crystallographic and associated mechanical performance is much needed. The solidification characteristics, namely cooling rates and temperature gradients, during SLM determines the microstructure and texture evolution. The present work unravels the above-mentioned aspects for additively manufactured materials, with specific examples of stainless steel 316L and IN718 and Cu-Ni-Sn systems. A Computational Fluid Dynamics process model coupled with heat transfer and solidification will be presented with specific example of 316L Stainless Steel. The scan strategy specifically: the effect of hatch rotation on texture evolution is demonstrated leading to anisotropic mechanical properties in the build. Strong  $\langle 100 \rangle$  —BD +  $\langle 110 \rangle$  —BD texture promotes slip and twin;  $\langle 110 \rangle$  —BD texture promotes only slip.

**Keywords:** Additive manufacturing, 316L, IN 718, Cu, Ni, Sn, EBSD, Texture.

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