AlSi10Mg lattice structures processed by selective laser melting: influence of the geometry and the heat treatments on the microstructure

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(Student oral for symposium "Additive Manufacturing of Metals: Establishing Location-Specific Processing-Microstructure-Property Relationships")

Lattices structures are lightweight materials widely used in the aeronautical fields for their high mechanical performances. More and more optimized thanks to the new additive manufacturing technologies, the lattice properties are strongly influenced by their process, geometry and post treatment.

The objective of this project is to compare the macro and microstructure of AlSi10Mg lattice and bulk materials. Both structures are created by selective laser melting with similar parameters. Due to the fineness of the lattice parts and their 35.5° orientation during the process, a specific thermal history appears in the lattice, inducing heterogeneities in microstructure and hardness. More specifically, an heterogeneity in the dendrite arm spacing between the top and bottom of the strut is observed. EBSD analyses also highlight the specific crystallographic orientation of both geometries.

In addition, the influence of heat treatment performed at different temperatures reveals that microstructure heterogeneities are erased in these samples.