

Characterization of a Hypoeutectic Al Alloy Obtained by Selective Laser Melting

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Abstract : In this investigation, a hypoeutectic AlSi11Cu alloy was printed. This alloy was obtained in powder form with an average particle size of 40 μm . Bars 20 mm in diameter and 100 mm in length were printed with the building direction parallel to the bars' longitudinal direction. The microstructural characterization demonstrated an Al matrix surrounded by a Si network forming a coral-like pattern. The microstructure of the alloy showed a heterogeneous behavior with a mixture of columnar and equiaxed grains. Likewise, the texture indicated that the columnar grains were preferentially oriented towards the building direction, while the equiaxed followed a texture dominated by the cube component. On the other hand, the as-printed material strength showed higher values than those obtained in the same alloy using conventional processes such as casting. In addition, strength and ductility differences were found in the printed material, depending on the measurement direction. The highest values were obtained in the radial direction (565 MPa maximum strength and 4.8% elongation to failure). The lowest values corresponded to the transverse direction (508 MPa maximum strength and 3.2 elongation to failure), which corroborate the material anisotropy.

Keywords : additive manufacturing, aluminium alloy, melting pools, tensile test

Conference Title : ICAMMT 2020 : International Conference on Advanced Materials, Methods and Technologies

Conference Location : Dublin, Ireland

Conference Dates : December 21-22, 2020