MECHANICAL RESPONSE TO SEVERE PLASTIC DEFORMATION OF AN ALUMINUM ALLOY OBTAINED BY ADDITIVE MANUFACTURING

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ABSTRACT

Write This research presents the microstructural evolution and mechanical properties in a hypoeutectic AlSi11Cu alloy obtained through laser powder bed fusion (L-PBF) and subsequent severe plastic deformation. Initially, the printed alloy demonstrated a structure formed by an Al matrix surrounded by a Si-enriched spiderweb-like network. The mechanical properties indicated a maximum strength of 550 MPa and elongation to fracture lower than 5% for the as-printed material. After subjecting the alloy to severe plastic deformation (SPD) using high-pressure torsion (HPT), the material strength reached 600 MPa, accompanied by an improvement in ductility with elongation to fracture around 11%. This behaviour demonstrates that the Al alloy obtained by additive manufacturing (AM) does not follow the same trend as conventional materials after (SPD) processing breaking through the strength-ductility trade-off dilemma.