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**PROCEEDINGS**

# Anisotropic Mechanical Behaviors of Alsi10Mg Alloy Fabricated by Additive Manufacturing: Experiments and Modeling

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**ABSTRACT**

In recent years, metal additive manufacturing (AM) has gained increasing attention from various industries. However, there are few studies on the thermal deformation behavior of additively manufactured metallic components, which is vital to pushing its applications' boundary. In this work, we first experimentally investigate the mechanical behavior of AlSi10Mg produced by laser powder bed fusion under different temperatures and strain rates. A crystal plasticity finite element model is adopted to provide insights into the intrinsic deformation mechanisms. The model is validated by comparing it with the flow behaviors and dislocation evolutions observed in experiments at different conditions. The strain distributions at different temperatures and strain rates are analyzed, and the softening effect of AlSi10Mg is revealed. In addition, by using the samples built in different directions, the anisotropic behaviors of additively manufactured AlSi10Mg parts are investigated. The results demonstrate that the microstructure presents 'fiber texture' due to the preferred orientation of grains, and grains with <100> direction parallel to the load direction have large plastic deformation and the stress concentration along their <110> direction.

**KEYWORDS**

Additive manufacturing; AlSi10Mg; crystal plasticity finite element; anisotropic

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