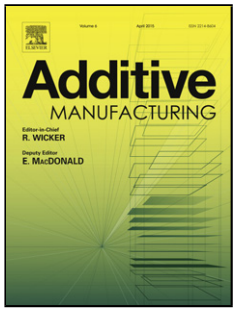

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Structural evolutions in 3D-printed Fe-based metallic glass fabricated by selective laser melting

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Highlights:

- The microstructural evolution of a Fe-based metallic glass fabricated by selective laser melting is investigated.
- High energy density results in the reduction of amorphous phase.
- A mathematical model is established to illustrate the relationship between amorphous phase fraction and process parameters.

Abstract

The mechanisms of microstructural evolution in amorphous alloys during the selective laser melting process are crucial for modulating the properties of 3D-printed parts. Here, a map is constructed that illustrates the effect of laser energy density on structural evolution. Experiments combined with finite element method simulations reveal that high energy density leads to substantial crystallization. A mathematical model based on the phase transformation curves has been put forward to roughly predict the amorphous content in 3D-printed bulk metallic glasses (BMGs) under various process parameters. The present results provide guidance to optimize the process parameters to achieve desirable microstructures and

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