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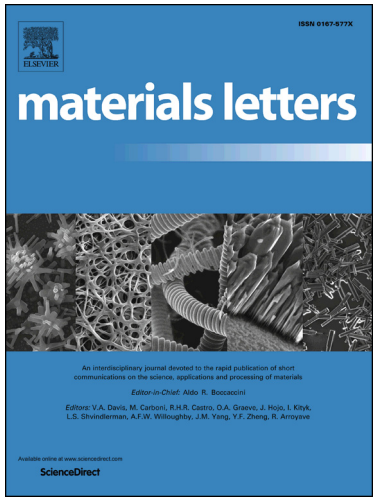

Printability and microstructure of the CoCrFeMnNi high-entropy alloy fabricated by laser powder bed fusion

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Printability and microstructure of the CoCrFeMnNi high-entropy alloy fabricated by laser powder bed fusion

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Abstract

The CoCrFeMnNi high-entropy alloy is a promising candidate for metal additive manufacturing. In this study, single-layer and multi-layer builds were produced by laser powder bed fusion to study microstructure formation in rapid cooling and its evolution during repeated metal deposition. CoCrFeMnNi showed good printability with high consolidation and uniform high hardness. It is shown that microstructure in the printed alloy is governed by epitaxial growth and competitive grain growth. As a consequence, a bi-directional scanning pattern without rotation in subsequent layers generates a dominant alternating sequence of two crystal orientations.

Keywords: high-entropy alloys, additive manufacturing, laser powder bed fusion, rapid solidification, competitive growth, epitaxial growth.

1. Introduction

High-entropy alloys (HEAs) are a unique class of alloys that contain five or more principal elements in near-equiatomic concentrations[1]. The equiatomic CoCrFeMnNi high-entropy alloy first introduced by Cantor *et al.*[2] exhibits a single-phase face-centred cubic (FCC) solid solution, and was selected for the current work as it possesses characteristics that are believed to make it