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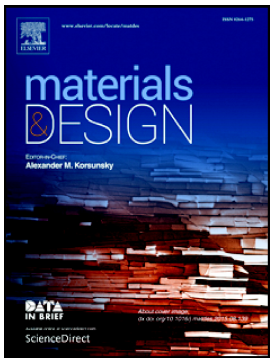

Salt-metal feedstocks for the creation of stochastic cellular structures with controlled relative density by powder bed fabrication

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Salt-metal feedstocks for the creation of stochastic cellular structures with controlled relative density by powder bed fabrication

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Abstract

A novel type of metallic feedstock material for powder-bed additive manufacturing (AM) processes is proposed that enables the manufacture of cellular structures without the time consuming and computationally intensive step of digitally representing the internal geometry of a part. The feedstock is a blend of metal and salt particles and, following Selective Laser Melting (SLM) processing, the salt is dissolved to leave a metallic, cellular structure. The conditions for succesfully processing the feedstock are first demonstrated, followed by an investigation into how the feedstock composition can be used to control the relative density of the cellular material. Mechanical testing reveals that the strength and stiffness of the cellular structures can be tuned through control of feedstock composition, and hence, relative density. This presents a significant enhancement to the state-of-the-art for materials preparation for AM since, for the first time, cellular structures can be created with specific properties without explicitly defining or analysing the unit cell geometry.

Keywords

Additive manufacturing, selective laser melting, cellular structures, porous structures