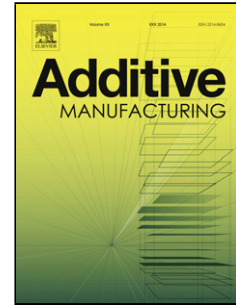


Accepted Manuscript

Title: Effective Mechanical Properties of Lattice Material Fabricated by Material Extrusion Additive Manufacturing

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PII: S2214-8604(14)00004-9
DOI: <http://dx.doi.org/doi:10.1016/j.addma.2014.07.002>
Reference: ADDMA 3

To appear in:

Received date: 25-4-2014
Revised date: 2-6-2014
Accepted date: 9-7-2014

Please cite this article as: Park S-I, Rosen DW, Choi S-k, Duty CE, Effective Mechanical Properties of Lattice Material Fabricated by Material Extrusion Additive Manufacturing, *Addit Manuf* (2014), <http://dx.doi.org/10.1016/j.addma.2014.07.002>

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EFFECTIVE MECHANICAL PROPERTIES OF LATTICE MATERIAL FABRICATED BY MATERIAL EXTRUSION ADDITIVE MANUFACTURING

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Abstract

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In this paper, a two-step homogenization method is proposed and implemented for evaluating effective mechanical properties of lattice structured material fabricated by the material extrusion additive manufacturing process. In order to consider the characteristics of the additive manufacturing process in estimation procedures, the levels of scale for homogenization are divided into three stages – the levels of layer deposition, structural element, and lattice structure. The method consists of two transformations among stages. In the first step, the transformation between layer deposition and structural element levels is proposed to find the geometrical and material effective properties of structural elements in the lattice structure. In the second step, the method to estimate effective mechanical properties of lattice material is presented, which uses a unit cell and is based on the discretized homogenization method for periodic structure. The method is implemented for cubic lattice structure and compared to experimental results for validation purposes.

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Keywords: effective mechanical properties; homogenization; additive manufacturing; lattice structure

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