
Bachelor / Master Thesis

Additive manufacturing of functionally graded anisotropic lattice structures by means of PBF with AlSi10Mg

Für Herrn / Frau
XXX (Matrikel-Nr. XXX)



Problem

Selective laser melting SLM is a powder bed-based layer-additive manufacturing process. In principle, SLM offers the designer a high degree of design freedom, which promises significant potential, especially in lightweight design. Cellular structures, such as honeycombs or lattice structures, are finding increasing use in manufacturing.

In order to exploit the lightweight potential of cellular structures to its greatest extent, a functional grading shall be investigated considering stiffness mismatch, stress shielding, load bearing capacity and implantation failure.



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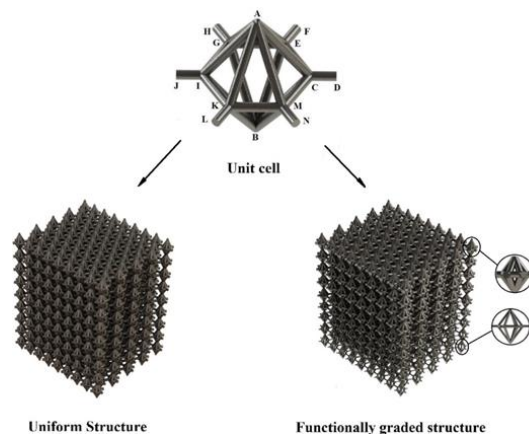


Fig. 1: Proposed unit cell

Exemplarily, the elastic behaviour of regular and functionally graded lattice structures made by a double pyramid dodecahedron unit cell (Fig. 1) shall be investigated, where one of the main challenge is the manufacturing of the horizontal struts.

Tasks

This work aims at a qualitative and quantitative assessment of the proposed lattice structure based on the RVE without grading for several aspect ratios.

The key tasks are as follows:

- Literature research on the state of the art- Design and manufacturing of lattice structures with several aspect ratios without grading
- Master Thesis: analytical and numerical investigation of the proposed lattice structure
- Optional: Determination of a process window
- Conduction of compression tests and graphical depiction of experimental results
- Creation of micrographs for different process settings and interpretation of the results regarding imperfections such as geometrical discrepancies or porosity in order to discuss the melt pool behaviour
- Optional: μ -CT pictures
- Proposal for a grading distribution strategy
- Critical appraisal and discussion of all results and deduction of further research needs in this area

Supervisors:

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- Dr. Masoud Asgari, Associate Professor, Faculty of Mechanical Engineering, K.N. Toosi University of Technology, Tehran, Iran.

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German Title

Zur additiven Fertigung von funktionellen gradierten Gitterstruktur anhand PBF für AlSi10Mg
