

Master Thesis

Simulation of lattice structures

Description

The selective laser melting (SLM) is a manufacturing technique, which allows producing free-form metal parts, e.g. the lattice structure¹ (Figure 1). In the previous work of the lattice structure, we found out that its mechanical properties vary with the lattice cell size and the cell number. This phenomenon is called the size effect, which will be further studied.

The lattice structure studied here will be produced by selective laser melting (SLM) with aluminum alloy. Then, the relation of the size effect to the mechanical behavior under static and fatigue loadings will be investigated.



Figure 1 An example of a additively manufactured Meta-crystal, which contains different lattice structures to achieve best mechanical properties

Task

The target of this thesis is to analysis the experimental results from lattice structures' fatigue tests, and simulate the fatigue behavior with considering the size effect and the other relevant factors.

Requirement

To achieve this goal, the student should be:

- familiar with ABAQUS;
- familiar with MATLAB and/or Python;
- self-oriented.

Support

The student will receive an introduction in the beginning of the work, in order to start quickly. During the work, the student will be supervised by the research assistant in the IWM institute.

¹ Additive manufacturing reflects fundamental metallurgical principles to create a new family of materials: Meta-crystals, <https://www.sheffield.ac.uk/materials/news/meta-crystals-1.824841>

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