Effect of high-productivity Laser Powder Bed Fusion processing on microstructure of manufactured components

Background

Laser powder bed fusion (LPBF) is one of the most common metal additive manufacturing (AM) technologies for high performance components. A rise in industrial application leads to a growing interest in raising the productivity of LPBF by increasing the layer thickness. However, some components or areas of components require high detail resolution which in turn requires smaller layer thicknesses. Therefore, one way to optimize the manufacturing process of a component is to determine required layer thickness by part section.

In order to be able to predict material behavior, it is important to understand and evaluate the material microstructure of the intersection of such regions. A difference in applied process parameters leads to a difference in heat input among other things and has a significant influence on the local microstructure. It is important to investigate such transition regions in addition to the material produced by different layer thickness in its entirety.

The purpose of this study is to investigate LPBF parts produced with varying layer thicknesses and analyze the microstructure of the transition areas using light optical microscopy (LOM) and scanning electron microscopy (SEM). The manufacture of the material will be monitored using optical tomography (OT) which will add to the investigation of the critical regions. The analysis of the OT data requires basic programming skills (e.g. MATLAB).

The LPBF samples will be manufactured and be studied at Chalmers using advanced microscopy tools.

Requirements:

We are looking for a master student with a profile towards material science. A solid background in additive manufacturing is an advantage. Experience in programming using MATLAB, Python for image analysis is a plus.

Extent and time plan:

- Period (January-June 2020)
- Number of credits 30 ECTS/högskolepoäng (hp).
- The thesis is intended for one student

More information:

Contact supervisors for more information about the project. Apply with your CV, academic transcripts and a cover letter in English. Welcome to apply!

Supervisors and examiners:

Supervisors:	Dr Fiona Schulz (sfiona@chalmers.se)
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