CHALMERS | CAM²

Feasibility of Co-free Maraging Steels for Additive Manufacturing

Background

The number of high strength ferrous alloys that are currently available within additive manufacturing (AM) remains limited. The reason is that conventional ferrous alloys rely on carbon for their strength, which can cause problems during AM processing like cracking and porosity development. To by-pass these issues alternative high strength ferrous alloys have been developed for AM that do not rely on carbon for strength. Amongst these are the Maraging steels. These steels get their strength from secondary heat treatments where hardening phases can precipitate out into a relatively ductile matrix. However, the drawback of using Maraging steels is their high cobalt content. Cobalt is known to cause several health problems and was recently classified as a possible cancerogenic by the International Agency for Research on Cancer. Additionally, cobalt is very expensive and is considered a Conflict Mineral due to the problematic mining of the element in the Democratic Republic of Congo.

To deal with these issues Höganäs AB has used CALPHAD modelling to design a number of Co-free Maraging steels that now need to be evaluated within the Laser Based Powder Bed Fusion (LB-PBF) process. The work in this MSc thesis will involve an evaluation of how printing parameters (laser power, scan speed and hatch spacing) influence the printed density. Furthermore, it will be of interest to compare the performance of the AM produced Maraging steel to that of a conventional Maraging steel (e.g. 1.2709) in terms of both printability and mechanical performance.

Requirements:

We are looking for a master student with a profile towards material science. A solid background in additive manufacturing is an advantage.

Extent and time plan:

- Period (January-June 2021)
- 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!

Financial compensation is possible.

Supervisors and examiners:

Supervisors: Dmitri Riabov (riabov@chalmers.se)

Examiner and co-supervisor: Adj. Prof Sven Bengtsson (Sven.Bengtsson@hoganas.com)