

Study of mechanical and corrosion properties of a biodegradable magnesium alloy manufactured by Powder Bed Fusion-Laser Beam

Introduction:

Additive manufacturing (AM), or 3D-printing, has opened up new possibilities from both a component design perspective and also for the development of new materials. The processing conditions of AM are very different to traditional manufacturing which allows for new microstructural combinations to be created. This is also true for biodegradable magnesium alloys, which in the past decade have been successfully 3D-printed. These types of alloys can allow for temporary fixation of for example bone fractures, eliminating the need for a second surgery to remove the implant. A degradable material also decreases the risk for infection over time, since bacteria attach to dead material, like implants. These aspects are very important to consider, bearing in mind the growing antibiotic resistance worldwide. In particular, for fracture fixation applications, adequate mechanical properties are crucial, and for degradable materials, the degradation rate needs to be adjusted to the growth rate of the patient's own tissue. A thorough understanding of how the processing route influences the microstructure, and thus the mechanical properties, is therefore of highest importance.

Project description:

In this project, we investigate the microstructural formation related to the additive manufacturing process and their connection to the resulting mechanical properties. We aim to study the influence of heat treatments on the 3D-printed material, and how this influences the degradation of the material. Furthermore, how the mechanical integrity of the material decreases over time will be studied. Work tasks in the research project involve mechanical testing and degradation studies of the printed material, as well as material preparation and data analysis. Previous experience, or a strong interest, in additive manufacturing of metals and degradation of magnesium is merited. Through this project we expect to provide new knowledge on the possibilities and limitations of 3D-printable magnesium-based alloys for biomedical applications.

Instructions for application:

Your application should include a personal letter where you briefly describe yourself and a CV/résumé (max 2 pages) as well as the names and contact information of two reference persons.

Starting date: January 2023 or as agreed.

Deadline for application: 15th November 2022

For further information about the position please contact: PhD student Lisa Larsson (lisa.m.larsson@uu.se) or Prof. Cecilia Persson (Cecilia.persson@angstrom.uu.se)