# Segmentation and analysis of 3D structures in x-ray, neutron imaging

MASTER THESIS PROJECT(30HP)

1. Background

Magnesium (Mg) alloys are the lightest structural metals having excellent potential in biomedical applications since their mechanical properties are some of the most similar to human bones among engineering materials. The Division of Materials Engineering at LTH works extensively on the development of Mg alloys for biomedical applications.
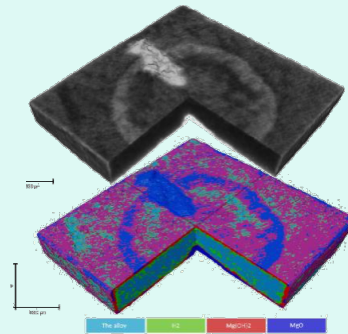
2. Challenge

In spite of the aforementioned advantages, it is still challenging to make medical implants from Mg alloys dissolving in the body fluids at a well-controlled rate. Therefore, we carry out 3D imaging experiments using synchrotron X-rays and Neutrons to understand the alloy microstructures in 3D and their effect on degradation kinetics in such materials. In this project, we need to elaborate tools for 3D segmentation, analysis and visualisation of microstructure in Mg alloys and the products of their degradation on the surfaces. These should be tailored and implemented for several case studies, which might also involve preparing and 3D optical imaging as well as laboratory-scale SEM imaging, EDS and EBSD analyses of some metallographic specimens. In this project, we will:

- Tailor the computational methods of 3D data segmentation and analysis for Mg alloys with various precipitate and surface structures;
- Execute the analysis and visualisation of initial and segmented datasets and if necessary, carry out additional imaging experiments;
- Analyse and report the dependence of processing and degradation kinetics in Mg alloys of interest on their chemical composition and microstructure states.

The work will be carried out in the Division of Materials Engineering in Lund.

3. Reporting

The work is suitable for 1-2 students from the M, F, K, N programs. The thesis shall be concluded with a written MSc thesis and oral presentation shall be given at LTH, LU.

4. Contacts

Dmytro Orlov, Professor
Div. Materials Engineering
☎ +46 46 - 222 9095;
✉ dmytro.orlov@material.lth.se