

# *In vitro* study of bio-degradation in Mg alloys by isothermal calorimetry

MASTER THESIS PROJECT<sup>(30HP)</sup>

## 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

Apart from perfect bio-compatibility from the toxicity perspective, it is still challenging to make medical implants from Mg alloys dissolving in the body fluids at a well-controlled rate. The existing methods for assessing Mg alloy bio-degradation (or corrosion) do not allow understanding this process in sufficient details. Therefore, in collaboration with the Division of Building Materials we develop a new *in vitro* testing method based on isothermal calorimetry. The combination of such an advanced characterisation method with SEM-based imaging, EDS and EBSD analyses can allow revealing a correlation between structure-degradation. In this project, we will:

- Further elaborate the isothermal calorimetry (heat measurements) technique for studying Mg alloys including specimen and working media preparation and exchange as well as pressure and pH level measurements during testing;
- Prepare samples from pure Mg and model Mg alloys in various microstructure states and carry out the experiments including optical and SEM imaging along with EDS and EBSD analyses;
- Analyse and report the dependence of degradation dynamics in Mg alloys of interest on their chemical composition and microstructure states as well as environmental factors such as pH and composition of working media.

The dominant majority of work including isothermal calorimetry, imaging, analysis and sample preparation, will be done 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

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