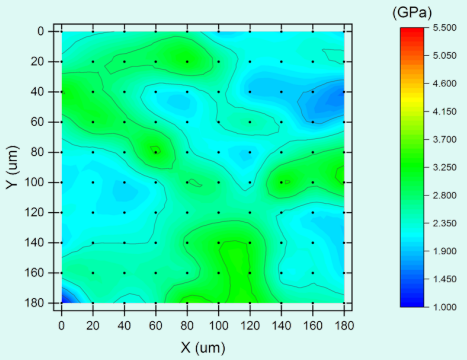
Dependence of nano-hardness on precipitate structure in Mg

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 addition to perfect bio-compatibility, Mg is known for significant anisotropy in mechanical properties coming from the symmetry of its hexagonal close-packed lattice. The level of anisotropy can be characterised by critical resolved shear stress (CRSS) necessary for activating different deformation mechanisms and controlled by alloying and thermo-mechanical processing. The latter may lead to solid-solution and/or various precipitate states leading to the change of CRSS. The combination of advanced characterisation techniques such as SEM-based imaging with EBSD analysis and Nano-indentation can allow revealing a correlation between precipitate state and CRSS. In this project, we will:

- Develop a method for simultaneous Nano-hardness testing, optical and SEM imaging and EBSD analysis on the same specimen area;
- Prepare samples from pure Mg and two model binary Mg alloys in various precipitate states and carry out the experiments;
- Analyse and report the dependence of CRSS for principal deformation mechanisms in Mg alloys of interest on their precipitate state.

Nano-hardness testing will be carried in the Division of Industrial Production, and the rest of work including EBSD analysis, sample preparation, etc will be done in the Division of Materials Engineering at LTH, LU 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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