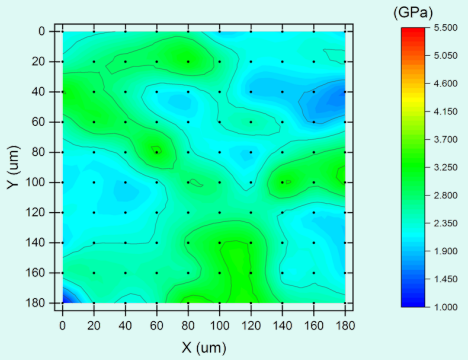
Dependence of nano-hardness on crystallographic orientation in Mg

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. Such anisotropy can be controlled through alloying and thermo-mechanical processing. Understanding and designing of respective technologies require the development of accurate crystal-plasticity models that relate structural properties of metals to their microstructure and texture. These, in turn, require accurate determination of elastic and plastic deformation parameters depending on crystallographic orientation of grains in the material. The combination of advanced characterisation techniques such as SEM-based EBSD analysis and Nano-indentation can allow revealing such a correlation. In this project, we will:

- Develop a method for simultaneous Nano-hardness testing and EBSD analysis on the same specimen area;
- Prepare samples from three model Mg alloys and carry out the experiments;
- Analyse and report correlation between grain-resolved crystallite orientations in the model Mg alloys and their elastic and plastic behaviour in nano-indentation.

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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