UNIVERSITÉ DU LUXEMBOURG

Special Physics seminar

Tuesday 21st June 2011 at 16h15
(coffee at 16h00)

Limperstberg
Room BS 1.04

Talk by Prof. Andreas Berger
nanoGUNE's Research Director and Leader of the Nanomagnetism group

Magnetization Reversal in uniaxial Co-Films and Nanostructures

The process of magnetization reversal is a fundamental aspect of ferromagnetism. It is furthermore of crucial relevance in many technical applications, which explains why it is a very active area of research. We have studied the magnetization reversal behavior of uniaxial Co-films with particular emphasis on the field orientation dependence in relation to the magneto-crystalline easy axis of magnetization. Furthermore, we have investigated the behavior of magnetization reversal in nanostructures.

Epitaxial Co and Co-alloy films with uniaxial in-plane anisotropy have been grown by means of Ultra High Vacuum (UHV) sputter deposition. The specific magneto-crystalline anisotropy of the samples has been achieved by epitaxial growth onto single crystal Si(110) wafer substrates and the use of a suitable template layer sequence. Saturation magnetizations and Curie temperatures of our film samples were determined by means of Vibrating Sample Magnetometry (VSM), while the quality of the uniaxial in-plane orientation was determined through angular dependent measurements of the remanent magnetization. We routinely achieved orientation ratios (defined as the ratio of the easy axis magnetization to the hard axis magnetization in remanence) in excess of 50. The correspondingly good quality of the in-plane crystallographic orientation was furthermore corroborated by X-Ray Diffraction (XRD) measurements. In addition, we devised a pathway to controllably modify the crystalline quality of our films by partially interrupting the epitaxial growth. This allowed us to study the role of structural defects onto the magnetization reversal process in the vicinity of near perfect epitaxy, for which the films still show very strong uniaxial magneto-crystalline anisotropy.

We also studied, how nano-structurization alters the physics of the above magnetization reversal process due to simple geometric restrictions as well as due to the magnetostatic interaction that becomes relevant at the edges of such nano-structures. Hereby, we have explored the methods of electron beam lithography, Focused Ion Beam (FIB) material removal and electron beam induced deposition for the purpose of magnetic nano-structure fabrication.

Next Physics Seminars

- **Tuesday, 28th June 2011: Belval, 16:15** — **Prof. Dr. M. Farle, U Duisburg-Essen** "Influence of nanoparticle shapes and morphologies on magnetic hardness"