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Hysteresis Design of Magnetic Materials for Efficient Energy Conversion

Tuesday, 11 April 2023, 9:00 s.t., UDE, via Zoom

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Imaging microstructural impact on magnetic behavior

Abstract:

Quantitative transmission electron microscopy imaging of magnetic systems in cross- section is a challenge that requires special attention to issues such as interdiffusion, interfacial and surface roughness. In this talk, the potential of the combined application of analytical high-resolution transmission electron microscopy (HRTEM) with differential phase contrast (DPC) detector and electron energy loss magnetic chiral dichroism (EMCD) will be demonstrated. Three model systems are used for discussion:

- Fantastic opportunities to study magnetic Fe/Co2FeSi/Fe multilayers, as both microstructure and chemical and magnetic properties can be correlated in situ.
- Investigation of the magnetic proximity effect in a V/Fe thin film system with the idea that DPC measures the presence of magnetic induction in V and EMCD indicates the corresponding magnetic moment.
- A simulation-guided interpretation of DPC on a series of nano-patterned Co70Fe30 thin film membranes. Direct magnetic imaging of nanopatterned Lorentz holes reveals the occurrence of regular magnetic domain patterns in these systems. We therefore conclude that micromagnetic simulations are not only useful for interpreting differential phase contrast data of magnetic samples, but can also be used to predict potentially interesting microstructures for future experiments on nanopatterned magnetic sensing systems.

About the speaker:

Andreas Hütten studied physics in Göttingen and received his PhD in 1989. He worked in the USA at UC Berkeley and Lawrence Berkeley National Laboratory. After further positions at the Leibniz Institute for Solid State and Materials Research in Dresden and at the Institute for Nanotechnology in Karlsruhe, he accepted a professorship for experimental physics at Bielefeld University in 2007. His research focuses on magnetic nanostructures, magnetoresistive sensors, magnetocaloric materials and electron microscopy of hard and soft matter.