

MA 17: Invited Talks Rellinghaus / Antoniak

Time: Tuesday 14:00–15:00

Location: EB 301

Invited Talk MA 17.1 Tue 14:00 EB 301
FePt nanomagnets from the gas phase — ●BERND RELLINGHAUS, ELIAS MOHN, UTE QUEITSCH, and LUDWIG SCHULTZ — IFW Dresden, P.O. Box 270116, D-01171 Dresden, Germany

Unlike other approaches, the gas phase preparation of nanoparticles provides the advantage to thermally anneal such particles prior to their deposition onto a substrate. Control of the in-flight annealing conditions thereby allows to either thermally equilibrate likewise prepared nanosized materials or to adjust metastable phases on them. The potential and the challenges of this approach for the preparation of metallic nanomagnets which may be used as future materials in high density magnetic data storage media will be reviewed.

FePt is still among the most intensively studied materials when it comes to pushing the superparamagnetic limit towards minimum particle sizes. It will be demonstrated that gas phase synthesis allows for the preparation of L1₀ ordered FePt nanoparticles without any post-deposition thermal treatment. Along with the formation of the L1₀ phase goes a significant increase of the switching fields to above 1T even at room temperature. The effect of varying annealing times and temperatures on the particles' structure provides substantial insight into the ordering mechanism. Pre-conditioned substrates may be used to initiate a regular arrangement of gas-phase prepared nanomagnets via self-assembly. Although these findings are promising in view of applications, obstacles such as the widening of the particle size distribution as a consequence of the in-flight annealing or a still limited degree of L1₀ order in the annealed particles are yet to be overcome.

Invited Talk MA 17.2 Tue 14:30 EB 301
Influence of composition inhomogeneities and symmetry reduction on the magnetism of FePt nanoparticles — ●CAROLIN ANTONIAK — Fachbereich Physik and Center for Nanointegration, Universität Duisburg-Essen, Lotharstr. 1, 47048 Duisburg

The magnetic properties of nanoparticles may differ significantly from those of the corresponding bulk material. In the case of bimetallic alloys, not only the break of symmetry at the surface but also local deviations from the averaged composition should be taken into account for data interpretation. For wet-chemically synthesised, oxide-free FePt nanoparticles, the break of symmetry at the surface, changes in the crystal symmetry [1] and the inhomogeneous composition [2] influence the magnetic properties, yielding reduced effective spin magnetic moments and an enhanced orbital magnetism at the Fe sites with respect to the bulk material. The experimental results presented in this talk will also be discussed in terms of lattice relaxations [3] and recent results of ab-initio calculations concerning the energetics of different stable and metastable particle morphologies [4].

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- [1] C. Antoniak et al., Phys. Rev. Lett. 97, 117201 (2006)
- [2] C. Antoniak, M. Farle, Mod. Phys. Lett. B 21, 1111 (2007)
- [3] R. M. Wang et. al., Phys. Rev. Lett., accepted
- [4] M. E. Gruner et al., Phys. Rev. Lett., submitted