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Gegründet im Jahre 1869 von H. Hlasiwetz,
J. Loschmidt, J. Petzval und J. Stefan

EINLADUNG

zum Vortrag
von

Univ.Prof. Dr. Josef Fidler
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über

Exchange-coupled Magnets: Challenges and limits

am

Dienstag, 2. Dezember 2008, um 17.30 Uhr

Ort: Großer Hörsaal der Experimentalphysik, Universität Wien,
1090 Wien, Strudlhofgasse 4 / Boltzmanngasse 5, 1. Stock

Abstract:
The magnetic hysteresis properties of modern hard magnetic materials are primarily controlled by the microstructure which is defined by the type, the structure and the number of phases, by the size, shape and the topological arrangement of the individual phase regions and their interfaces, and by the type, structure and geometry of lattice defects. Exchange interactions between neighbouring soft and hard grains lead to remanence enhancement of isotropically oriented grains in nanocrystalline composite magnets. Hard magnetic thin films as magnetic data storage media layer are based on hard magnetic CoPt, FePt, CoPd alloys with a high magnetocrystalline anisotropy. Hard disk drives for ultra-high storage densities require grain sizes in the order of several nanometres to fulfil the requirements for high signal to noise ratios. In order to avoid the superparamagnetic effect of the spontaneous switching of the magnetization the anisotropy value has to be increased considerably. Such a high anisotropy will ensure thermal stability at small grain sizes leading to an areal density in the Tbit/in^2 regime. However, conventional recording systems based on highly coercive grains require a write field that is higher than the field provided by conventional single pole heads. In order to overcome the problem of the insufficient write field new concepts based on exchange spring media, consisting of a hard layer and one or several soft layers have been developed. The theory predicts a coercive field of a bilayer system consisting of a hard layer which is exchange coupled to a soft layer, in the order of 1/4 of the anisotropy field of the hard layer. For multilayer structures (graded media) with gradually decreasing anisotropy in each layer the coercive field can be decreased even further. Besides the reduction of coercive field the energy barrier for thermal switching is close to the value which is determined by the anisotropy of the hard layer. On the basis of numerical micromagnetics the optimization and the limits of the switching properties on nm and ns length and time scales, respectively, will be shown.