

boring Co and Fe layers can be recognized via intensity variations on the nuclear [Co/Cr/Fe/Cr] superlattice peaks which are different for odd and even orders. Interestingly, additional half-order peaks appear in the as-grown state indicating a new magnetic state. In this state an antiferromagnetic alignment between complete neighboring [Co/Cr/Fe/Cr] unit cells occurs suggesting a highly-ordered demagnetized state induced by dipolar interaction during growth. Applying a magnetic field destroys this state which also can not be recovered during field reversal. This project was supported by the DFG via SFB491.

DS 39.5 Fri 11:45 H 2032

Structural characterization and magnetization profile of CoFeB/MgO multilayers for Magnetic Tunnel Junctions —

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We present structural and magnetic results from the characterization

of CoFeB/MgO multilayers sputtered at different deposition pressures on Si/SiO₂ substrates. From X-ray scans we obtain the layer thicknesses and the interface roughnesses. Magnetic measurements show different results depending on the growth conditions. For all samples the magnetic anisotropy is negligible as intended by the growth of amorphous CoFeB layers. For smooth layers (lower Ar pressure) one finds a step-like hysteresis curve, whereas the curves are strongly rounded for the rougher system (higher Ar pressure). This could hint to a more decoupled vs. a stronger coupled remagnetization behavior, respectively. To shed more light on the behaviour of the alloy at the interface to the MgO layer, we have taken polarized neutron reflectivity data [1]. Similar to the FeCo/Al₂O₃ system [2] we observe for the multilayer with rough interfaces a loss of a ferromagnetic correlation at remanence, indicating that each CoFeB layer forms an uncorrelated domain structure. Financial support EU-RTN ULTRASMOOTH, SFB 491 and BMBF 03ZA6BC1 are acknowledged.

[1] M. Wolff, et al. Thin Solid Films 515, 5712 (2007)

[2] S. Bedanta, et al., PRB 74, 054426 (2006).

DS 40: Magnetism in Thin Films: Interaction Phenomena and Heterostructures

Time: Friday 12:15–14:15

Location: H 2032

Invited Talk

DS 40.1 Fri 12:15 H 2032

Influence of antiferromagnetic layers on the magnetization dynamics of exchange coupled thin films — •JEFFREY MCCORD — Institute for Metallic Materials, IFW Dresden, Germany

The strength of unidirectional and uniaxial anisotropy fields together with the effective damping parameter in different types of polycrystalline ferromagnet/antiferromagnet (F/AF; AF:NiO, IrMn) systems is investigated as a function of AF thickness and thermal history. It is shown that, independent of the occurrence of exchange bias, higher order exchange anisotropy terms can be induced. These findings are also compared to complementary magnetic domain studies. The role of the formation of an interfacial layer on coupling, anisotropy, and magnetic damping is discussed. The data implies that the spin structure inside the antiferromagnetic layer is responsible for exchange bias and the dominating contribution to coercivity, the interfacial structure for the overall coupling. The chemical F/AF boundary structure and the thermomagnetic history is relevant and can be used to tailor precessional frequency and magnetic damping of ferromagnetic layers over a wide range.

DS 40.2 Fri 12:45 H 2032

Epitaxial SmCo₅/Fe/SmCo₅ trilayers - a model system for exchange spring media — •VOLKER NEU, KATRIN HÄFNER, and LUDWIG SCHULTZ — IFW Dresden, P.O. Box 270116, 01171 Dresden, Germany

Exchange coupled hard / soft magnetic nanocomposites have recently found a renewed interest in data storage application as exchange spring media, also named exchange coupled composite (ECC). Developed formerly to improve the energy density of a hard magnetic material by an intimate, direct exchange coupling to a soft magnetic phase with high saturation polarization, as exchange spring media, the soft magnetic phase initiates the switching at moderate fields and thus enables the writability, whereas the high anisotropy of the hard phase guarantees the desired thermal stability in zero field [1]. Epitaxial SmCo₅/Fe bilayers and SmCo₅/Fe/SmCo₅ trilayers with tunable switching behaviour [2] constitute a well defined model system for studying of the above mentioned coupling phenomena. We present time dependent magnetization relaxation data measured at different reversal fields, which allow to compare thermal stability and switching fields for single hard layers and bilayers and trilayers with varying thickness of the soft layer.

[1] Sues et al., Appl. Phys. Lett. 87, 012504 (2005). [2] Neu et al., J. Phys. D : Appl. Phys. 39 5116 (2006).

DS 40.3 Fri 13:00 H 2032

Magnetization reversal in laser-interference patterned Co/Pd multilayer films studied by full-field Kerr microscopy — •MIN-SANG LEE¹, JIE LI¹, BJÖRN REDEKER¹, PHILIPP LEUFKE^{2,3}, STEPHEN RIEDEL², PAUL LEIDERER², JOHANNES BONEBERG², MANFRED ALBRECHT², and THOMAS EIMÜLLER¹ — ¹Junior Research Group

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We investigate magnetization reversal processes in Co/Pd multilayer systems with strong perpendicular magnetic anisotropy which have been structured using direct laser interference patterning technique into a variety of shapes, e.g., stripes, squares, and asterisk-shaped dots. The intense laser irradiation at interference maxima causes chemical intermixing at the Co/Pd interfaces leading to the modification of magnetic properties such as the creation of pinning centres and the reduction in the strength of magnetic anisotropy. Due to this effect, different types of magnetization reversal process were observed in different sample area depending on the laser intensity at which the area was irradiated. The observation was done at our new laser Kerr microscopy setup, where a CCD camera with max. 30 fps was used for fast image acquisition. It enabled us to record motion pictures of magnetization reversals, which will be presented in this contribution. The financial support for this work has been provided by the DFG through SFB 491, SFB 513, and Emmy Noether Programme.

Invited Talk

DS 40.4 Fri 13:15 H 2032

Ion Beam Induced Magnetic Nanostructures — •PETER VARGA — Inst.f.Allgemeine Physik, TU Wien, Austria

For iron films with 5 to 10 layers epitaxially grown on Cu(100) stabilization of the face-centered cubic (fcc) γ -phase (which is non magnetic,) can be obtained above room temperature. This is in contrast to bulk iron for which the fcc phase is stable only above 1184 K, whereas below this temperature the body-centered cubic (bcc) α -phase (which is ferromagnetic) is thermodynamically stable. Films with more than 10 layers will exhibit a spontaneous structural transition to the bcc structure with in plane magnetization whereas below 5 layers a strained bcc structure shows an out of plane magnetic moment at room temperature[1]. We have shown by STM (Scanning tunneling microscopy) with atomic resolution and LEED (Low Energy Electron Diffraction) that this 5-10 ML thick fcc Fe films undergo a transition from fcc to bcc by ion beam irradiation. Since iron is ferromagnetic only if it is bcc or at least strained bcc but never if it is fcc[1] this gives the possibility to transform a nonmagnetic film into a ferromagnetic one directly by ion bombardment and especially to form magnetic nanostructures with a size determined by the diameter of the used ion beam only [2].

[1] A. Biedermann et al. Phys. Rev. Lett. 86 (2001), pp. 464*467 and 87 (2001) 86103 [2] W.Rupp, B.Kamenik, R.Ritter, A.Biedermann, Ch.Klein, E.Platzgummer, M.Schmid, and P.Varga, to be published

DS 40.5 Fri 13:45 H 2032

Magnetic texturing of ferromagnetic films by sputtering induced ripple formation — •HANS HOFSSÄSS¹, KUN ZHANG¹, MICHAEL UHRMÄCHER¹, and JOHANN KRAUSER² — ¹II. Physikalisches Institut, Universität Göttingen, 37077 Göttingen — ²Fachbereich Au-