metamagnetic states lead to specific remanents states, namely metamagnetic band and bubble topological defects[2].

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MA 13.20 Tue 10:15 P1A

Micromagnetic analysis of magnetic nanosystems with competing anisotropies — •Andrei A. Leonov[1,2], Ulrich K. Rössler[1], and Alexei N. Bogdanov[1] — [1]IFW Dresden, P.O. Box 270116, D-01171 Dresden, Germany — [2]Donetsk Institute for Physics and Technology, 83114 Donetsk, Ukraine

The interplay between cubic and uniaxial magnetic anisotropies strongly influences magnetization processes in such novel classes of nanomagnetic systems as ferromagnet-antiferromagnet bilayers, thin epilayers of diluted magnetic semiconductors, Heusler alloys, magnetic nanowires or nanoparticles.We have extended and generalized a micromagnetic model to describe magnetization processes in systems with competing magnetic anisotropies and adopted them to investigate nanomagnetic systems (see [1] and bibliography in [1]). In this contribution we apply the results of [1] for detailed analysis of recent experimental results: (i) remarkable transformation of metastable magnetic states, reorientation effects, and magnetization reversal observed in Fe-Cu-B nanoparticles [2], in (Ga,Mn)As epilayers [3], and in magnetite [4] films. (ii) magnetic-field-driven evolution of magnetic domain walls in nanoconstrictions [5]. (iii) calculation of the parameters for multidomain patterns in (Ga,Mn)As films with perpendicular anisotropy [1].

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MA 13.21 Tue 10:15 P1A

Coercivity analysis in highly anisotropic $PrCo_7$ films — •Volker Neu[1], Ajit Kumar Patra[1], Stephen Collocott[2], Sebastian Fähler[1], and Ludwig Schultz[1] — [1]IFW Dresden, Institute for Metallic Materials, PO Box 270116, D-01171 Dresden, Germany — [2]CSIRO Materials Science and Engineering, PO Box 218, Lindfield NSW 2070, Australia

In order to tailor the response of a magnetic material to an external magnetic field a sound understanding of the underlying magnetization process is required. For permanent magnet materials this central question culminates in understanding the origin of coercivity. The known concepts of coercivity analysis, the micromagnetic model and the global or phenomenological model are applied to a permanent magnet film based on epitaxial $PrCo_7$. Such films possess a single orientation of the crystallographic c-axis within the film plane and a square shaped hysteresis with large coercivity. The temperature dependent coercivity is compared on one hand with the expected nucleation or depinning field based on the independently determined anisotropy constants and on the other hand is expressed as a thermally activated domain wall movement within a certain activation volume. For this, the fluctuation field as a function of temperature is extracted from magnetization relaxation and irreversible susceptibility measurements. A consistent description of the data is possible under the assumption of weak pinning. The analysis is however complicated by the spin reorientation from uniaxial anisotropy at high temperature to an easy-cone anisotropy below 110K.

MA 13.22 Tue 10:15 P1A

Electronic structure of a stabilized bulk-like α-Mn thick film on W(110) — •Elena Voloshina[1], Yuriy Dedkov[2], and Manuel Richter[3] — [1]Institut für Chemie und Biochemie - Physikalische und Theoretische Chemie, Freie Universität Berlin, Germany — [2]Fritz-Haber Institut, Berlin, Germany — [3]IFW Dresden, P. O. Box 270 116, 01171 Dresden, Germany

We report on the successful stabilization of thick bulk-like α-Mn films with (110) orientation on W(110) substrate. The observed (3×3) patterns are consistent with the presented growth model. Angle-resolved photoemission spectra show weak dispersions of the valence band electronic states. These PE data are analyzed on the basis of DFT calculations for non-magnetic bcc α-Mn. The observed weak dispersions are caused by the large number of inequivalent Mn atoms of the α-Mn structure.

MA 13.23 Tue 10:15 P1A

Magneto-elastic coupling in $LaCoO_3$ thin films — •Erhan Arac[1,2], Dirk Fuchs[1], Fadi El-Hallak[3], Rudolf Schneider[1], and Hilbert von Löhneysen[1,2] — [1]Forschungszentrum Karlsruhe, Institut für Festkörperphysik, 76021 Karlsruhe, Germany — [2]Physikalisches Institut, Universität Karlsruhe, 76128 Karlsruhe, Germany — [3]1. Physikalisches Institut, Universität Stuttgart, 70550 Stuttgart, German

The magnetization of epitaxial $LaCoO_3$ thin films with respect to magnitude and orientation of the strain is investigated. The magnitude of the epitaxial tensile strain is varied by the growth of thin films on (001) oriented $SrLaAlO_4$, $SrLaGa_4$, $(LaAlO_3)_0.3(Sr_2AlTaO_6)_0.7$ (LSAT) and $SrTiO_3$ single crystal substrates while the orientation is changed by the growth on (001),(110) and (111) oriented LSAT substrates by pulsed laser deposition (PLD). The magneto-elastic constant B_1 is determined by "area method". The negative sign implies that in-plane magnetization is favoured which is convenient with obtained in-plane hysteresis loops of (001) samples. Moreover, magnetic anisotropy measurements of (001) and (110) samples revealed 4-fold and 2-fold symmetry. The uniaxial magnetic anisotropy in (110) film can be explained by the dominance of the stress anisotropy over magneto-crystalline anisotropy effects.

MA 13.24 Tue 10:15 P1A

Geometry and magnetic structure of uranium along the tetragonal epitaxial Bain path — •Stephan Schönecker, Manuel Richter, Klaus Koepernik, and Helmut Eschrig — IFW Dresden, Helmholtzstrasse 20, 01069 Dresden, Germany

Epitaxially manufactured structures grown pseudomorphically on suitable substrates provide a way to stabilise non-equilibrium structures of materials. This includes grown films which posses a large lattice misfit between substrate and film material under equilibrium conditions, but also if the structure grown differs from the equilibrium structure of the bulk film material. Large misfits do not necessarily mean large lateral stress. Theory can help to predict e.g. geometry, stresses and magnetic properties of pseudomorphically grown metal films. In this work, we considered the epitaxial Bain path (e.g. [1]) of elemental uranium, which provides a reasonable description of tetragonally distorted films on substrates. We employed density functional calculation in the implementation of the full potential local orbital program package FPLO [2]. We found three meta-stable tetragonal phases, in addition a ferromagnetic state close to the fcc phase.

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MA 13.25 Tue 10:15 P1A

The strained epitaxial Nd-Fe-B films by mechanical elongation — •Ah-Ram Kwon[1], Volker Neu[1], Vlakimir Matias[2], Jens Hänisch[1,2], Ruben Hühne[1], Bernhard Holzapfel[1], Ludwig Schultz[1], and Sebastian Fähler[1] — [1]IFW Dresden, P.O. Box 270116 D-01171 Dresden — [2]Los Alamos National Laboratory, Mail Stop T004, Los Alamos NM 8545 USA

Though it is well known that a variation of lattice constants strongly influences the functional properties of materials, most of the experiments are limited to hydrostatic pressure or biaxial stress. Here we present an approach, which impresses a large uniaxial strain on epitaxially grown films in order to tune their functional properties. A ductile Hastelloy substrate covered with a (001) oriented ion beam assisted MgO layer is used. Conventional mechanical elongation after deposition breaks the symmetry within the substrate plane compared to the as-deposited state. Consequences are exemplarily examined for an epitaxial hard magnetic Nd2Fe14B film strained by 2%. Though magnetostriction is usually considered to be negligible in this material exhibiting a high magnetocrystalline anisotropy, the uniaxial strain results in an elliptical distortion of the in-plane anisotropy below the spin-reorientation temperature. Our approach is versatile to study the influence of large strain on various materials, as the used MgO (001) layer is a common substrate for epitaxial growth.

MA 13.26 Tue 10:15 P1A

Thin film growth and shape memory in the Heusler compound Mn2NiGa — •Catherine Jenkins[1,2], Tobias Eichhorn[2], Ramamoorthy Ramesh[1], and Gerhard Jakob[2] — [1]UC Berkeley, Berkeley, 94720, USA — [2]University Mainz, 55122 Mainz, Germany