FePt films have recently attracted great interest as possible media for perpendicular magnetic recording, but also for fundamental studies of magnetism in reduced dimensions. As FePt it is very corrosion resistant it is ideal for ultrathin films, however, L10 ordering and thus high magnetocrystalline anisotropy are harder to achieve at small particle size. In the present study, 2 nm thick FePt films have been deposited by pulsed laser deposition on MgO(001) with a Cr/Pt buffer. The magnetic properties have been obtained by Hall measurements and measurements of the Kerr rotation. Without post annealing, the out-of-plane (op) hysteresis is controlled by shape anisotropy with an anisotropy field of 1.4 T. The easy axis lies in-plane and in the op hysteresis curve rotation of magnetization is observed. This is as expected for smooth ultrathin disordered FePt films. When post annealing is applied, a continuous decrease of the effective in-plane anisotropy field is observed with increased annealing time. After a post annealing time of 15 min, the easy axis lies op and the op hysteresis shows switching of magnetization and a larger coercivity. The reason is that ordering in the (001)-textured films leads to an increased magnetocrystalline anisotropy in the op direction that competes with shape anisotropy. Thus, in these ultrathin FePt films anisotropy can be continuously adjusted from pure shape anisotropy to magnetocrystalline anisotropy.

KR 10.49 Tue 10:45 Poster A

Design and preparation of substrates with perpendicular magnetic anisotropy for molecular magnets — •Jonathan Fetting[1], Jan-Philipp Grote[1], Michael Stocker[2], Michael Enzelsberger[2], Veronika Höke[3], Carl-Georg Frhr. v. Richthofen[3], Paul Müller[2], Thorsten Glaser[3], and Günter Reiss[1] — [1]Bielefeld University, Department of Thin Films and Physics of Nanostructures, Universitätsstr. 25, 33615 Bielefeld — [2]University Erlangen-Nürnberg Physikalisches Institut III, Erwin-Rommel-Str. 1, 91058 Erlangen — [3]Bielefeld University, Department of Inorganic Chemistry, Universitätsstr. 25, 33615 Bielefeld

In spintronics thin films with out of plane magnetization are highly desirable for, e.g., electrodes in tunnelling cells or substrates for molecular magnets. The goal of our work is to be able to define desired film properties and to tailor the thin films correspondingly. For our approach we have chosen $[CoPd]_X$ as hard magnetic and $[CoAu]_X$ as soft magnetic multilayers. Mixing those multilayer systems gives the possibility to design the material properties. The multilayer systems have been prepared using sputter deposition techniques and the resulting thin films have been investigated with AGM, STM and MFM. The measurements give an insight into the structural and magnetic properties of the tailored samples and improve the ability to property design.

KR 10.50 Tue 10:45 Poster A

Imaging of magnetic coupling in trilayerd microstructures — •Julia Kurde[1], Jorge Miguel[1], Daniela Bayer[2], Jaime Sánchez-Barriga[3], Logane Tati Bismaths[3], Martin Aeschlimann[2], Hermann A. Dürr[3], and Wolfgang Kuch[1] — [1]Freie Universität Berlin — [2]Technische Universität Kaiserslautern — [3]Helmholtz-Zentrum Berlin für Materialien und Energie

Magnetic properties of microstructures consisting of either an FeNi single layer or an FeNi/Cu/Co trilayered system were investigated by means of photoelectron emission microscopy. We performed stroboscopic pump-probe experiments to determine the precession frequencies and the effective field of the FeNi layer. From the comparison of these measurements to micromagnetic simulations, the coupling field in the trilayered systems could be extracted. This information can then be used to explain the observed domain wall (DW) configurations in the FeNi layer. The parallel coupling of the two magnetic layers via the non-magnetic spacer layer is dominated by Néel coupling. However, the strong stray field of the DWs in the Co layer forces the magnetization to align antiparallel in the two layers, and so to turn with opposite sense of rotation from domain to domain. In 180° walls, a left turn is symmetric to a right turn, but in 90° walls of the Co layer, this will lead to a 270° turn of the magnetization in the FeNi layer. Although this case is highly unfavorable with respect to the exchange interaction within the FeNi layer, it still occurs if the Cu spacer layer reduces sufficiently the Néel coupling to the Co layer.

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KR 10.51 Tue 10:45 Poster A

Magnetostrictive Strain Sensors Based on FeGa Thin Films — •Ahmed Fazir Thajudin, Dirk Meyners, and Eckhard Quandt — Chair for Inorganic Functional Materials, Institute for Materials Science, Faculty of Engineering, University of Kiel, Kaiserstr. 2, 24143 Kiel, Germany

Tunneling magnetoresistance junctions generally possess a symmetrical characteristic which reflects the switching fields of the soft and hard layers, respectively. This characteristic can be changed by a stress field if the soft magnetic layer is replaced by a suitable magnetostrictive layer. Application of mechanical stress results in a stress induced rotation of the magnetostrictive layer with respect to the reference layer accompanied by a resistance change due to the magnetoresistance effect. Highly sensitive strain sensors with CoFeB electrodes based on this concept were developed recently [1]. Further increase of sensitivity is expected by the introduction of highly magnetostrictive FeGa layers. The magnetic and magnetostrictive properties of magnetron sputtered FeGa thin films are discussed. Moreover, tunneling magnetoresistance stacks with FeGa sensing layers were prepared, patterned by optical lithography and investigated with respect to microstructure, effect amplitude and magnetic switching behavior.

[1] D. Meyners, T. von Hofe, M. Vieth, M. Rührig, S. Schmitt, and E. Quandt, J. Appl. Phys. 105, 07C914, 2009

KR 10.52 Tue 10:45 Poster A

Influence of strain on magnetic and electrical properties of La0.82Sr0.18CoO3 films — •Orkidia Bilani-Zeneli, Diana Rata, Andreas Herklotz, Ludwig Schultz, and Kathrin Dörr — IFW Dresden, Institute for Metallic Materials, Helmholtzstrasse 20, 01069 Dresden, Germany

Cobaltite perovskites La(1-x)Sr(x)CoO3 have received attention mainly due to the thermally driven spin state transitions of the Co ions. For different doping, these transitions have been shown to be sensitive towards pressure in bulk and epitaxial strain in thin films. La(1-x)Sr(x)CoO3 with x=0.18 is of particular interest because it is located near the boundary of the Metal-Insulator transition. We have grown epitaxial La0.82Sr0.18CoO3 (LSCO) thin films by pulsed laser deposition on different substrates (PMN-PT, LaAlO3, SrTiO3, LSAT) providing reversible and static strain. In this work the influence of biaxial strain on the magnetic and electrical transport properties of LSCO films will be presented. Thin films reveal significant differences in magnetic behaviour with respect to bulk, e.g. the coercive fields are strongly enhanced. On the other hand tensile strain strongly suppresses the electrical conduction stabilizing thus an insulator state.

KR 10.53 Tue 10:45 Poster A

Specular and off-specular scattering of neutrons from Si-Fe multilayers — •Anke Teichert, Thomas Krist, Jan E. Hoffmann, Amitesh Paul, and Roland Steitz — Helmholtz Zentrum Berlin, Hahn-Meitner-Platz 1, 14109 Berlin, Germany

Multilayers (ML) are used as neutron optical devices. These applications require high quality MLs with low interface layer thickness, roughness and high remanence as characterized by a high reflectivity and high polarization efficiency. Here, we want to produce high quality stress-free Si-Fe MLs on Si and glass substrate. All samples (10(10nm Si+10nm Fe)+10nm Si) were produced in a triode sputter machine at p=0.065Pa and Bias voltages from 10 to 65V. Stress and reflectivity measurements were performed at a profilometer and X-ray reflectometer (XRR). Using polarized neutron reflectometry (PNR) and a positive sensitive detector (PSD) at the reflectometer V6 we measured simultaneously specular and off-specular scattering of neutrons. We find a raise in voltage leads to linear decrease of tensile stress with a slope of 5.5MPa/V. At about 60V the samples are nearly stress-free. The grain size decreased with higher Bias voltage. The off-specular data show large diffuse scattering from all samples at low applied magnetic fields (200G, 20G) as well as for samples with high compressive stress at 1030G. It appears as streaks perpendicular to specular reflectivity at Bragg peak positions. They can be interpreted as originating from vertically correlated in-plane magnetic domains. Associated longitudinal fluctuations produce additional diffuse streaks along Bragg peak positions which are independent of the stress within the samples.

KR 10.54 Tue 10:45 Poster A

Soft x-ray magnetic dichroism of undoped, hole-doped and electron-doped $LaCoO_3$: Anisotropies and valence-dependent magnetism — •Michael Merz[1], Christian Pinta[1,2], Andrei Samartsev[1,2], Markus Wissinger[1,2], Hilbert von Löhneysen[1,2], Andrea Assmann[1,2], Stephan Uebe[1,2], Dirk Fuchs[1], Peter Nagel[1], and Stefan Schuppler[1] — [1]Karlsruhe Institute of Technology, Institut für Festkörperphysik, Germany — [2]Karlsruhe Institute

of Technology, Physikalisches Institut, Germany

Epitaxial thin films of undoped $LaCoO_3$, of electron-doped (La,Ce)CoO_3, and of hole-doped (La,Sr)CoO_3 exhibit ferromagnetic order with optimum transition temperatures of 80 K, 30 K, and 240 K, respectively. The spin-state structure for these compounds was studied by soft x-ray absorption and magnetic circular dichroism at the Co $L_{2,3}$ and O K edges. It turns out that for epitaxial $LaCoO_3$, strain imposed by the substrate preserves a higher spin state of the Co^{3+} ions at low temperature and prevents a non-magnetic ground state. For (La,Ce)CoO_3, the Co^{3+} ions are predominantly in a low-spin (S = 0) state and thus magnetically inactive, and the ferromagnetism is determined by the Co^{2+} species. For (La,Sr)CoO_3, on the other hand, the magnetism originates from higher spin states of Co^{3+} (S = 2) and Co^{4+} (S = 3/2) ions. The data show that ferromagnetism has a different origin in $LaCoO_3$ (superexchange), (La,Ce)CoO_3 (spin blockade), and (La,Sr)CoO_3 (double exchange). Moreover, a strong magnetic anisotropy is observed for all systems, with the spin and the orbital moments essentially lying within the substrate plane.

KR 10.55 Tue 10:45 Poster A

Soft x-ray magnetic dichroism of (Ca,Sr)RuO_3: Evidence for strain-dependent magnetism — •Andrea Assmann[1,2], Stephan Uebe[1,2], Michael Merz[1], Markus Wissinger[1,2], Hilbert von Löhneysen[1,2], Dirk Fuchs[1], Peter Nagel[1], and Stefan Schuppler[1] — [1]Karlsruhe Institute of Technology, Institut für Festkörperphysik, Germany — [2]Karlsruhe Institute of Technology, Physikalisches Institut, Germany

The 4d transition metal oxide $Ca_{1-x}Sr_xRuO_3$ exhibits ferromagnetic order in the doping range $0.4 \lesssim x \lesssim 1$ while it is a paramagnetic metal for $x \lesssim 0.4$. Since $Ca_{1-x}Sr_xRuO_3$ remains essentially isostructural and has a similar electronic configuration throughout the doping series, the differences in the magnetic properties might be caused by chemical pressure or magnetic dilution. To verify a possible dependence of the magnetic moments on pressure, (Ca,Sr)RuO_3 films were deposited on different substrates (LSAT, STO, $DyScO_3$=DSO), with the lattice mismatch imposing a specific strain on the epitaxial films that increases when going from LSAT to STO and DSO. The magnetic and electronic structure of the strained samples was studied by soft x-ray absorption and magnetic circular dichroism at the Ru $M_{2,3}$ and O K edges. It turns out that at 20 K, the magnetic moments strongly depend on the strain: while the spin moment of samples on LSAT almost vanishes, a distinct moment is found for (Ca,Sr)RuO_3 films deposited on STO and DSO. Furthermore, a significant magnetic anisotropy is observed, with the spin moments mainly oriented perpendicular to the substrate plane. Implications will be discussed.

KR 10.56 Tue 10:45 Poster A

Vector MOKE analysis on ultrathin ferromagnetic films — •Timo Kuschel[1], Hauke Bardenhagen[1], Robin Schubert[1], Henrik Wilkens[1], Daniel Bruns[1], Martin Suendorf[1], Bernd Zimmermann[1], Florian Bertram[2], and Joachim Wollschläger[1] — [1]Fachbereich Physik, Universität Osnabrück, Barbarastr. 7, 49069 Osnabrück, Germany — [2]HASYLAB at DESY, Notkestr. 85, 22607 Hamburg, Germany

In order to study the magnetic reversal and the magnetic anisotropy of ultrathin ferromagnetic films, Fe layers of different thicknesses are assembled on MgO(001) substrates by Molecular Beam Epitaxy (MBE) under UHV conditions. The films are capped by amorphous silicon to avoid oxidation after leaving the UHV chamber. The structural characterization including X-Ray Reflectivity (XRR) and X-Ray Diffraction (XRD) measurements are performed at HASYLAB (DESY, Hamburg).

The vector MOKE analysis is based on measurements using parallel and perpendicular polarized light as well as external magnetic fields parallel and perpendicular to the incident plane of light to optain the components of the magnetization vector. A self-programmed tool is used for analyzing the magnetization curves and calculating the magnetization vector for the reversal process of different sample directions.

The results reveal a 180° reversal with a domain splitting involved for the external magnetic field parallel to one of the magnetic easy axis of the sample. The data for the magnetic hard axis show a rotation of the magnetization vector into the magnetic easy axis followed by a 90° reversal and subsequent rotation into the magnetic hard axis back.

KR 10.57 Tue 10:45 Poster A

Quadrupol-Magnetometer für breitbandige Magneto-Optische-Kerr-Spektroskopie — •Marc Tesch[1], Markus Gilbert[1], Hans-Christoph Mertins[1], Roman Adam[2], Herbert Feilbach[2] und Claus Michael Schneider[2] — [1]FH Münster, Stegerwaldstr. 39, 48565 Steinfurt — [2]FZ Jülich, IFF-9, 52425 Jülich

Üblicherweise nutzen Polarimetrieexperimente Laserlicht mit wenigen festen Wellenlängen. Die vorgestellte Polarimetrie-Anlage arbeitet mit einer Entladungsbogenlampe im Spektralbereich von 230nm - 1000nm. Sie ermöglicht Messungen des Faraday- und des Kerr-Effekts wobei ein neuartiges mit FeNdB Permanentmagneten arbeitendes Quadrupol-Magnetometer homogene Magnetfelder von bis zu 570mT in longitudinaler oder transversaler Geometrie erzeugt. Eine Wasserkühlung des inzwischen zum Patent angemeldeten Gerätes ist nicht erforderlich, was einen leichteren Einsatz im UHV ermöglicht. Die Funktionalität der Anlage wird anhand von Reflexions- und Polarisationsmessungen an dünnen Co Einfach- und Mehrfachschichtsystemen demonstriert und eine Verstärkung des Kerr-Effektes durch Interferenzeffekte diskutiert.

KR 10.58 Tue 10:45 Poster A

Magnetically Induced Optical Nonlinearity in the Centrosymmetric Ferromagnetic Semiconductor EuO — •Masakazu Matsubara[1], Andreas Schmehl[2], Jochen Mannhart[2], Darrell Schlom[3], and Manfred Fiebig[1] — [1]HISKP, Universität Bonn, Germany — [2]Institut für Physik, Universität Augsburg, Germany — [3]Department of Materials Science and Engineering, Pennsylvania State University, USA

EuO is a magnetic semiconductor, which undergoes a ferromagnetic transition at the Curie temperature (T_C) of 69 K. This material exhibits some extreme properties such as a huge colossal magnetoresistance (CMR) effect, the largest magneto-optical effect for any material, and nearly 100% spin polarization of the charge carriers in the ferromagnetic state. These outstanding properties make EuO a very attractive candidate for the basic and applied science of spintronics.

Here we report about the linear and nonlinear optical properties in epitaxial EuO, into which oxygen vacancies are introduced, grown on a $YAlO_3$ substrate. Even though EuO has a centrosymmetric crystal structure, second-harmonic generation (SHG) was observed below T_C at the two-photon transition energies from the 4f to the 5d states of Eu^{2+}. The results of the temperature and magnetic field dependent measurements suggest a close correlation between SHG and magnetization. The symmetry analysis provides access to the microscopic origin of this magnetically induced SHG signal.

This work was supported by the Alexander von Humboldt Foundation.

KR 10.59 Tue 10:45 Poster A

Interaction of surface acoustic waves with magnetization dynamics — •Rupert Huber[1], Mathias Weiler[2], Sebastian T.B. Goennenwein[2], Sebastian Neusser[1], and Dirk Grundler[1] — [1]Lehrstuhl für Physik funktionaler Schichtsysteme, Technische Universität München, Physik Department, James-Franck-Str. 1, 85747 Garching b. München, Germany — [2]Walther-Meissner-Institut, Bayerische Akademie der Wissenschaften, Walther-Meissner-Strasse 8, 85748 Garching b. München, Germany

The authors investigate the transmission of surface acoustic waves (SAWs) in the GHz regime through thin ferromagnetic films (FM) deposited on a $LiNbO_3$ substrate. We use e.g. Co and FeCoV. When applying an in-plane magnetic field $\vec{H}$ under different orientations we find characteristic angular dependencies of the SAW's amplitude and phase on $\vec{H}$. We discuss our observation in terms of the magnetic field dependent change of elastic properties of the FM/$LiNbO_3$ hybrid systems. The dependencies are investigated in detail by comparing FeCoV and Co. FeCoV is magnetically isotropic, whereas Co shows a pronounced magnetic anisotropy. We find a significant difference for the SAW transmission characteristics. The work has been supported by the German Excellence Cluster "Nanosystems Initiative Munich".

KR 10.60 Tue 10:45 Poster A

Phenomenology of the magnetic shape memory effect in modulated and non-modulated Ni-Mn-Ga and FePd alloys — •Aristide T. Onisan and Ulrich K. Rössler — IFW Dresden

Large magnetic shape memory effects in ferromagnetic martensites are observed only in modulated phases, but recently such effects are also demonstrated in the non-modulated (NM) phase of Ni-Mn-Ga with tetragonal crystal structure and $c/a > 1$. The modulated structures have been identified with adaptive, ultra-finely twinned martensite structures of the same tetragonal structure [1]. We develop a phenomenological theory of magnetic martensites based on geometric con-