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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.

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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-