MA 21: Magnetic Thin Films II

Time: Wednesday 14:00–18:45 Location: H 1012

MA 21.1 Wed 14:00 H 1012

Exchange interactions and critical temperature of ultrathin films MnSi/Si(001) — •Mahbube Hortamani[1,2], Leonid Sandratski[1], Peter Kratzer[3], Ingrid Mertig[1,2], and Matthias Scheffler[4] — [1]MPI für Mikrostrukturphysik Halle — [2]Martin-Luther-Universität Halle-Wittenberg — [3]Universitaet Duisburg-Essen — [4]FHI der MPG Berlin

Epitaxial growth of Mn on Si(001) has been recently studied in the context of spintronics, in order to investigate spin injection through a metal-semiconductor interface. Requirement for an efficient spin injection is to have a high spin polarization of carriers at the Fermi level which retains at room or higher temperature.

Earlier, we had shown that a well ordered layered structure of MnSi can be grown epitaxially on Si(001) substrate under Mn-rich conditions. These films were found to be ferromagnetic with the B2-type lattice structure. The spin moment of interfacial Mn atoms and the spin polarization at the Fermi level are considerable. In order to determine whether or not the thin films remain ferromagnetic above room temperature, we calculate the Curie temperature of ultrathin films MnSi/Si(001).

The Curie temperature is estimated within the multiple sublattice Heisenberg model, applying (i) a mean-field model and (ii) the random-phase approximation. The exchange coupling is obtained from energy differences of various collinear spin configurations. The calculations are performed using DFT with the GGA-PBE functional and the FP-APW+lo method, as implemented in the WIEN2k package.

MA 21.2 Wed 14:15 H 1012

Pulsed laser deposition of epitaxial $Co_2Mn_{1-x}Fe_xSi$ films — •Horst Schneider and Gerhard Jakob — Institut für Physik, Johannes Gutenberg-Universität Mainz

The Heusler compound Co_2MnSi has been predicted to be half-metallic, and recent experiments show a tunneling spin polarization of more than 90% at low temperatures. However, this value decreases rapidly at higher temperatures. It has been shown theoretically that replacing Mn with Fe will shift the Fermi energy of the compound away from the valence band into the center of the half metallic energy gap. This might reduce the temperature dependence of the spin polarization. We report the successful pulsed laser deposition of thin $Co_2Mn_{1-x}Fe_xSi$ films over the whole stoichiometry range $0 \leq x \leq 1$. The films were grown on MgO (100) with and without Cr buffer layer under UHV conditions. The investigated films grow epitaxially and possess the fully ordered $L2_1$ Heusler structure. Furthermore, we present results of bulk magnetometry experiments as well as investigations of the electronic transport of these samples. We discuss these results with respect to the electronic structure of the alloys.

MA 21.3 Wed 14:30 H 1012

Characterization and nanopatterning of Ni_2MnIn Heusler films — •Jan M. Scholtyssek, Jeannette Wulfhorst, Ulrich Merkt, and Guido Meier — Institut für Angewandte Physik und Zentrum für Mikrostrukturforschung, Universität Hamburg, Jungiusstr. 11, 20355 Hamburg

The Heusler alloy Ni_2MnIn is a promising material as spin injector because of its predicted half-metallicity at the interface to InAs. We grow thin films of this Heusler alloy by thermal coevaporation of Nickel and the alloy MnIn. The alloy is grown on Si_3N_4 membranes and amorphous carbon films for transmission-electron microscopy (TEM) as well as on Si and InAs. The degree of the transport spin polarization of the films grown on Si(100), InAs(100) and in-situ cleaved (110) surfaces of InAs is determined by point-contact Andreev reflection spectroscopy (PCAR) [1]. The almost perfect lattice match between InAs and Ni_2MnIn supports highly oriented growth, as we have proven by electron diffraction under grazing incidence [2]. Lateral spin valves with Heusler electrodes are lithographically defined. In view of the temperature-sensitivity of the optical and electron-beam resists, the samples are grown at substrate temperatures of 50 °C and annealed up to 400 °C afterwards. The post-growth annealing process is investigated in situ in the TEM using transmission-electron diffraction on structured samples grown on Si_3N_4 membranes.

[1] L. Bocklage, J.M. Scholtyssek, U. Merkt, and G. Meier, J. Appl. Phys. **101** 09J512 (2007). [2] J.M. Scholtyssek, L. Bocklage, R. Anton, U. Merkt, and G. Meier, J. Magn. Magn. Mat. **316**, e923 (2007).

MA 21.4 Wed 14:45 H 1012

Temperature Dependence of Magnetic Order in Fe/(Ga,Mn)As studied by Monte Carlo Simulations — •Svitlana Polesya[1], Jan Minar[1], Hubert Ebert[1], and Christian Back[2] — [1]LMU München, Dept. Chemie und Biochemie/Phys. Chemie, Butenandtstrasse 11, D-81377 München, Deutschland — [2]Institut für Experimentelle Physik, Univ. Regensburg, Deutschland

The magnetic order of the heterogeneous interface system (GaMn)As/Fe at finite temperatures has been studied by Monte Carlo simulations. The ground state magnetic properties were determined within ab initio electronic structure calculations using the SPR-TB-KKR Green's function method. All calculations have been performed for the semi-infinite system of (GaMn)As with 5 % Mn covered by a 7 ML Fe film. The temperature dependent properties of this system (with and without external magnetic field) have been studied using MC simulation. The exchange coupling within the Fe and (GaMn)As subsystems were found to be dominantly long-range ferromagnetic whereas the coupling of Fe and Mn moments close to the interface is strongly antiferromagnetic. The Monte Carlo simulations lead to a Curie temperature of about 1000 K for the Fe film. Within the (GaMn)As subsystem due to the polarisation induced by the Fe film the average magnetisation at room temperature is still about 70 % of its $T = 0$ value for several layers close to the interface. These results are in full agreement with recent experimental findings.

MA 21.5 Wed 15:00 H 1012

Interface magnetic properties of Al/Heusler films investigated by XAS and XMCD — •Michael Kallmayer[1], Kerstin Hild[1], Tobias Eichhorn[1], Horst Schneider[1], Gerhard Jakob[1], Andres Conca[1], Martin Jourdan[1], Hans-Joachim Elmers[1], Andrei Gloskovskii[2], Stefan Schuppler[3], and Peter Nagel[3] — [1]Johannes Gutenberg-Universität Mainz, Institut für Physik, D-55099 Mainz — [2]Johannes Gutenberg-Universität Mainz, Institut für Anorganische und Analytische Chemie, D-55099 Mainz — [3]Forschungszentrum Karlsruhe, Institut für Festkörperphysik, D-76021 Karlsruhe

The magnetic interface properties of Heusler alloys often deviate from bulk properties, but they greatly determine the functionality of Heusler films in devices. We have investigated magnetic interface properties of $Co_2Cr_{0.6}Fe_{0.4}Al$, Co_2FeSi and Ni_2MnGa films that are capped by an Al layer. X-ray absorption spectroscopy (XAS) reveals a considerable interdiffusion of Al into the Heusler film at elevated temperatures and even at rough interfaces at 320 K. This explains a decreased interface magnetization as observed by x-ray magnetic circular dichroism (XMCD) [1]. Microspectroscopy using photoemission electron microscopy reveals that the reaction proceeds inhomogeneously with reaction nuclei separated on a micron length scale [2].

[1] M.Kallmayer et al., J.Phys.D: Appl.Phys. 40 (2007) 1552.
[2] M.Kallmayer et al., Appl.Phys.Lett. 91 (2007) 192501.

MA 21.6 Wed 15:15 H 1012

Mößbauer study of epitaxial $Co_2Cr_{0.6}Fe_{0.4}Al$ thin films. — •Vadim Ksenofontov[1], Christian Herbort[2], Martin Jourdan[2], and Claudia Felser[1] — [1]Institute of Inorganic and Analytical Chemistry, Johannes Gutenberg - University, 55099 Mainz — [2]Institute of Physics, Johannes Gutenberg - University, 55099 Mainz

Epitaxial thin films of the promising for spintronic applications Heusler half-metallic compound $Co_2Cr_{0.6}Fe_{0.4}Al$ (CCFA) were investigated using conversion electron Mößssbauer spectroscopy (CEMS) in order to get insight into the structural and magnetic properties. Thin films of 100 nm thickness were deposited by rf magnetron sputtering on MgO substrates without and with 10 nm Fe buffer layer. We discuss a correlation between the annealing temperature and the structural disorder and hyperfine fields on Fe atoms measured by Mößbauer spectroscopy. Samples prepared at the optimum annealing temperature as determined by tunneling magnetoresistance measurements show the optimum degree of order on the Fe sites as determined by CEMS. Additionally, we observed evidence for a diffusion of Cr atoms from the CCFA thin film into the Fe buffer layer and the related diffusion of Fe atoms from the buffer into the CCFA film. Thus the thermal treat-

ment changes the Fe to Cr ratio of the Heusler compound additional to influencing the degree of disorder on the Fe/Cr sites.

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MA 21.7 Wed 15:30 H 1012

Magnetic and Transport Properties of doped EuO Thin Films — •S. Altendorf[1], R. Sutarto[1], M. Moretti[2], T. Haupricht[1], and L. H. Tjeng[1] — [1]II. Physikalisches Institut, Universität zu Köln, Germany — [2]Dipartimento di Fisica, Politecnico di Milano, Italy

Europiumoxide (EuO) is a ferromagnetic semiconductor with a bandgap of 1.12 eV at room temperature and a Curie temperature of 69 K. In slightly Eu-rich EuO, the magnetic transition is accompanied by a metal-insulator transition with an unprecedented large change in resistivity up to 13 orders of magnitude. Spin-polarized electron spectroscopies revealed that the charge cariers are moving in an essentially fully spin-polarized band [1]. Eu-rich EuO also exhibits an increase of T_C up to 150 K [2]. Similarly, in Gd-doped EuO thin films, T_C can be enhanced up to 170 K with Gd concentration of about 4 % [3]. However, as to whether a MIT occurs in Gd-doped EuO is still an open question [2,4].
We report our results of *in situ* measurements of the magnetic and transport properties of EuO thin films prepared by means of molecular beam epitaxy technique in a distillation method [1,3] which allows a precise control and tuning of the stoichiometry. The connection between the magnetic order and metal-insulator transition of Eu-rich and Gd-doped EuO thin films was investigated.
[1] P. G. Steeneken *et al.*, Phys. Rev Lett. **88** 047201 (2002) [2] T. Matsumoto, *et al.*, J. Phys.: Condens. Matter **16**, 6017 (2004) [3] H. Ott, *et al.*, Phys. Rev. B **73**, 094407 (2006) [4] J. Schoenes *et al.*, Phys. Rev B **9**. 3097 (1974)

MA 21.8 Wed 15:45 H 1012

Temperature dependent anisotropy in epitaxial $PrCo_7$ films — •Ajit Patra[1], Michael Eisterer[2], Steffen Wirth[3], Konstantin Nenkov[1], Sebastian Fähler[1], Ludwig Schultz[1], and Volker Neu[1] — [1]IFW Dresden, P.O. Box 270116, D-01171 Dresden, Germany — [2]Atomic Institute of the Austrian Universities, Stadionallee 2, A-1020 Vienna, Austria — [3]MPI for Chemical Physics of Solids, Nöthnitzer Straße 40, 01187, Germany

Research on RE-Co magnets with a $TbCu_7$ structure has been intensified in recent years because of their potential as permanent magnets for high temperature applications. $RECo_7$ magnets display a unique combination of intrinsic properties such as a high saturation polarization, a high Curie temperature and a room temperature uniaxial anisotropy. In order to tailor the extrinsic properties of these magnets, a better understanding of the intrinsic properties is necessary. In this work, the temperature dependence of the anisotropy constants for an epitaxial $PrCo_7$ film is investigated. Magnetization curves have been measured with field applied along different angles with respect to the easy axis (which is the crystallographic c-axis) at various temperatures. A full range fitting procedure to simulated magnetization loops leads to the determination of the first and second uniaxial anisotropy constants (K_1 and K_2) as a function of the temperature. The spin reorientation transition from uniaxial anisotropy to an easy cone anisotropy is described as a sign reversal of K_1 and the spin reorientation angle is determined.

MA 21.9 Wed 16:00 H 1012

Nanocrystalline epitaxial $SmCo_5$ films with perpendicular anisotropy — •Marietta Seifert, Volker Neu, and Ludwig Schultz — IFW Dresden, P.O. Box 270116, 01171 Dresden, Germany

Hard magnetic thin films find important applications in nano and micro electromagnetic systems (NEMS, MEMS) and magnetic recording. $SmCo_5$ is a material with a high uniaxial magnetic anisotropy and therefore has the potential to be used as a high density recording media. Thus, in the last years, research focusses on the preparation of Sm-Co films with perpendicular anisotropy. Based on our experience on epitaxial growth of high anisotropic $SmCo_5$ with in-plane texture we developed epitaxial $SmCo_5$ films with strong perpendicular anisotropy by pulsed laser deposition on Ru buffered $Al_2O_3(0001)$ substrates. The deposition temperature was systematically varied in a range between 550°C and 800°C. X-ray diffractometry shows that the $SmCo_5$ phase develops at 550°C and is best formed at 700°C. Texture measurements of the (10-11) $SmCo_5$ pole prove the perpendicular orientation of the c-axis and reveal the epitaxial growth with two different in plane orientations of the hexagonal unit cell. VSM measurements demonstrate the magnetic anisotropy with the easy axis out of plane. The sample prepared at 700°C possesses a square shaped hysteresis loop (squareness = 0.81) with a coercivity of $\mu_0 H_c = 1.0$ T. All films grow in a granular fashion with grain sizes of 100 to 300 nm. The nanocrystalline microstructure together with the local epitaxy provides the combination of highly anisotropic and well textured $SmCo_5$ grains with good coercivity.

15 Min. Session Break

MA 21.10 Wed 16:30 H 1012

Uniaxial magnetic anisotropy of $Fe_{1-x}Co_x$(110) /GaAs(110) and $Fe_{1-x}Co_x$(001)/GaAs(001) — •Björn Muermann, Florian Nitsch, and Günther Bayreuther — Universität Regensburg, Germany

The tailoring of the magnetic properties of ferromagnets on semiconductors is of prime importance to the field of spintronics. In this contribution we have compared the magnetic anisotropy of epitaxial $Fe_{1-x}Co_x(110)$ and $Fe_{1-x}Co_x(001)$ ($0 \leq x \leq 0.8$) films grown by MBE on GaAs. The samples were studied by means of AGM and FMR spectroscopy. The angular dependent energy density observed can be explained by two main contributions to the magnetic anisotropy: an effective fourth order anisotropy, $K_1^{\mathrm{eff}}(t)$, and an effective second order anisotropy, $K_U^{\mathrm{eff}}(t)$. The fourth order term originates from the cubic symmetry of the bcc FeCo lattice. The thickness dependence of K_1 is in good agreement with the prediction for the sign reversal according to Néel's pair energy model [1].

The uniaxial anisotropy of FeCo alloys on GaAs(001) has been found to be independent of composition and to be a pure interface phenomenon arising from the bonding mechanism of the Fe/Co atoms to the As atoms [2]. For (110)-oriented films one observes an opposite sign of K_U for Fe-rich and Co-rich alloys exactly as for K_1. It is concluded that for (110)-oriented FeCo films the uniaxial anisotropy is mainly of magneto elastic origin.

[1] G. Bayreuther et al., J. Appl. Phys. 93 (2003) 8230,
[2] M. Dumm et al., J. Appl. Phys. 91 (2002) 8763

MA 21.11 Wed 16:45 H 1012

Magnetic Excitations in Gd/Y and Dy/Y superlattices investigated with Inelastic Neutron Scattering — •Alexander Grünwald[1,2], Elena Tartakovskaya[3], Andrew Wildes[2], Wolfgang Schmidt[4], Katharina Theis-Bröhl[5], Peter Link[6], Roger Ward[7], and Andreas Schreyer[1] — [1]GKSS-Research Centre Geesthacht, Germany — [2]Institut Laue-Langevin, France — [3]Institute for Magnetism, Ukraine — [4]Jülich Centre for Neutron Science, Germany — [5]Ruhr-Universität Bochum, Germany — [6]TU München, Germany — [7]University of Oxford, UK

Investigations of spin waves in magnetic superlattices are of great interest to understand fundamental properties of magnetism in confined structures. Inelastic neutron scattering is the most versatile technique to study magnetic excitations. The theory predicts discrete energy levels and Brillouin zone folding effects for spin waves propagating along the surface normal in rare earth superlattices. To compare with these calculations, we have investigated a number of Gd/Y and Dy/Y superlattices. Here we present inelastic neutron scattering measurements of low energy excitations. Clear dispersive modes from magnetic excitations and indications on discrete energy levels have been found in both superlattice compounds. The modes have a marked field dependence, particularly for the Gd/Y samples in which a spin wave gap is observed in moderate fields. The observations are in broad agreement with the theory.

MA 21.12 Wed 17:00 H 1012

A Neutron Scattering Study on the Antiferromagnet in an exchange biased systems — •Danica Solina[1], Dieter Lott[1], Wolfgang Schmidt[2], Yu-Chang Wu[3], Jochen Fenske[1], Chih-Huang Lai[3], and Andreas Schreyer[1] — [1]Institute of Materials Research, GKSS Research Centre, Geesthacht, Germany — [2]Institut-Laue-Langevin, Grenoble, France — [3]Department of Materials Science and Engineering, National Tsing Hua University, HsinChu, Taiwan

The magnetic structure of single crystal antiferromagnetic PtMn that biases CoFe has been studied using neutron scattering. Polarized neutron reflection (PNR) was used to determine the switching behaviour of the ferromagnetic layer and polarized neutron diffraction (PND) to probe the magnetic configuration of the anti-ferromagnetic layer. PNR suggests a combination of rotation and domain formation. Changes

were observed in the PND patterns taken at points around the hysteresis loop. The diffraction data has been simulated with a 'twisting' of part of the anti-ferromagnetic layer as the ferromagnetic layer changes.

MA 21.13 Wed 17:15 H 1012

Influence of argon-ion milling on perpendicular anisotropy of Co/Pt multilayer — •Norbert Franz, Matthias Jacobi, Leonid Lichtenstein, Hendrik Spahr, Hannes Zechlin, Holger Stillrich, and Hans Peter Oepen — Institut für Angewandte Physik, Universität Hamburg, Jungiusstr.11, 20355 Hamburg, Germany

For the fabrication of magnetic nanodots we use self- assembling masks built from micelles, which are copied into a ferromagnetic multilayer via ion milling. A prerequisite to successfully perfom these experiments is the investigation of the influence of sputtering on the magnetic properties of the films. Co/Pt multilayers (uncovered) with an easy perpendicular axis are made via magnetron/ion sputtering techniques. When bombarding the multilayers with 2 keV Ar^+ we find a spin reorientation at small doses. For 500 eV ions, however, the multilayers stay vertical as long as they exhibit remanence. The magnetic anisotropy decreases almost instantly on bombardment with 500 eV Ar^+ while the saturation signal stays constant. In the talk we will present the detailed evaluation of the saturation signal and the magnetic anisotropy as function of ion dose for 500 eV Ar^+. We will discuss and compare results for a single and double Co/Pt bilayer.

MA 21.14 Wed 17:30 H 1012

Spin reorientation transistion and canted magnetization of Co/Pt multilayers — •Holger Stillrich and Hans Peter Oepen — Institut für Angewandte Physik, Universität Hamburg, Jungiusstr. 11, 20355 Hamburg, Germany

The spin reorientation transition of Co/Pt multilayers from perpendicular easy axis to easy plane is analyzed. The spin reorientation is driven by the thickness of either the cobalt or the platinum layer. The behavior of $(Co/Pt)_8$ multilayers and single cobalt layers on platinum will be discussed. The films are grown by magnetron sputter deposition and the magnetic properties are investigated via the magneto-optic Kerr effect.

The spin reorientation occurs via a state of canted magnetization. In the spin reorientation transition the polar Kerr hysteresis exhibits a shape which is associated with a domain decay [1]. The in-plane magnetization shows a partial switching of the magnetization which is explained by the switching between canted states with opposite in-plane magnetization components. The uniaxial anisotropy constants in first and second order approximation are examined in the whole thickness range of Co and Pt layers. In the thickness range of spin reorientation a negative first and positive second order uniaxial anisotropy constant K_1 and K_2 are found, indicating canting. We find a similar behavior for both $(Co/Pt)_8$ multilayers and single cobalt layers.

[1] W. B. Zeper et al, J. Appl. Phys. **65**, 4971 (1989); J. E. Davies et al, Phys. Rev. B **70**, 224434 (2004).

MA 21.15 Wed 17:45 H 1012

Direct observation of field and temperature induced domain replication in dipolar coupled perpendicular anisotropy films — Thomas Hauet[1], •Christian M Günther[2], Bastian Pfau[2], Stefan Eisebitt[2], Peter Fischer[3], Ramon L Rick[4,5], Jan-Ullrich Thiele[1], Bruce Terris[1], and Olav Hellwig[1] — [1]Hitachi GST, San Jose, CA 95135, USA — [2]BESSY, 12489 Berlin, Germany — [3]CXRO, LBNL, Berkeley CA 94720, USA — [4]Applied Physics, Stanford University, Stanford CA 94305-4090, USA — [5]SSRL, SLAC, Menlo Park CA 94295, USA

Studies on the dipolar interactions in magnetic multilayers with perpendicular anisotropy have recently attracted increasing attention in order to improve the reliability of magneto-electronic devices [1] and for applications in multilevel magnetic recording [2]. Particularly, replication of non-uniform magnetic configurations such as domains or bit-patterns in hard/soft bilayers induced by stray fields has been investigated. Combining magnetometry and dichroism in soft X-ray microscopy [3] and holography [4], we directly reveal dipolar interactions in a hard/soft [Co/Pd]_n/Pd/[CoNi/Pd]_m bilayer system. With sub 100 nm resolution, we image domain replication from the hard to the soft magnetic layer. In addition, by tuning the Curie temperature Tc in the CoNi/Pd multilayers, we demonstrate thermally activated domain replication at room temperature in remanence. [1] B. Rodmacq, et al., Phys. Rev. B 73, 92405 (2006). [2] T. Ohta, et al., J. Magn. Magn. Mater. 242, 108 (2002). [3] D.-H. Kim, et al., J. Appl. Phys. 99, 08H303 (2006). [4] S. Eisebitt et al., Nature, 432, 885 (2004).

MA 21.16 Wed 18:00 H 1012

Study of the correlation between nanostructures and nanomagnetism in bcc Co thinfilms on Au(001) investigated by XMCD/STM — •toshio miyamachi[1], shin imada[1], takeshi kawagoe[2], masanori tsunekawa[1], hidenori fujiwara[1], fan-hsiu chang[3], hong-ji lin[3], c.t chen[3], keiki fukumoto[4], hitoshi osawa[4], tetsuya nakamura[4], and shigemasa suga[1] — [1]Graduate School of Engineering Science,Osaka University Osaka 560-8531, Japan — [2]Division of Natural Science, Osaka Kyoiku University Osaka 582-8582, Japan — [3]NSRRC Hsinchu 30076, Taiwan — [4]SPring-8 Hyogo 679-5198, Japan

Development in MBE techniques enables one to fabricate magnetic bits whose size can be down to nm scale. To realize much higher data density for information storage and understand the magnetism of bits, careful consideration of a relationship between nanostructures and nanomagnetism is essential. We performed STM/STS and XMCD measurements of bcc Co ultrathinfilms. From STM/STS measurements, it is found that Co nanostructures are formed by post-annealing without alloying. Furthermore, by applying XMCD sum rule to obtained XMCD data, orbital magnetic moments turned out to increase as the size of nanostructures decrease for post-annealed bcc Co films. We conclude that this result is due to the increase of the ratio of edge atoms, which play an important role for out-of-plane magnetization likewise the case of Co/Pt(111).[1]

[1] S. Rusponi et al.,Nature Mater.,546 (2003)

MA 21.17 Wed 18:15 H 1012

Influence of ligand states on the relationship between orbital moment and magneto-crystalline anisotropy — Cecilia Andersson[1], Biplab Sanyal[1], Olle Eriksson[1], Lars Nordstrom[1], Olof Karis[1], •Dimitri Arvanitis[1], Takehisa Konishi[2], Elizabeta Holub-Krappe[3], and Jonathan Hunter Dunn[4] — [1]Uppsala University, Uppsala, Sweden — [2]Chiba University, Chiba, Japan — [3]Hahn-Meitner Institut, Berlin, Germany — [4]MAX-lab, Lund University, Lund, Sweden

We investigate the spin reorientation in Au/Co/Au trilayers, grown on a W(110) single crystal, using X-ray magnetic circular dichroism (XMCD) in situ. We investigate also an ex situ grown Au/Co/Au sample where the spin reorientation is induced upon cooling. The spin and orbital moments of these Au/Co/Au trilayers are obtained by means of the XMCD sum rules both for an in- and an out-of-plane magnetization. Our findings suggest that the orbital moment of Co does not obtain a maximum value along the easy axis, in contrast to previous experience. This is attributed to the large spin-orbit interaction within the Au caps. Both second order perturbation theory and first principles calculations show that the magneto-crystalline anisotropy (MCA) is influenced by this effect, and that this can lead to that the orbital moment anisotropy is not proportional to the MCA [1]. [1] C. Andersson *et al.*, Phys. Rev. Lett. **99**, 177207 (2007).

MA 21.18 Wed 18:30 H 1012

Co L-edge EXAFS analysis of Au/Co/Au/W(110) magnetic thin films — •Masako Sakamaki[1], Cecilia Andersson[2], Takehisa Konishi[1], Takashi Fujikawa[1], Elizabeta Holub-Krappe[3], Hermann Rossner[3], Olof Karis[2], Andreas Persson[2], and Dimitri Arvanitis[2] — [1]Chiba University, Chiba, Japan — [2]Uppsala University, Uppsala, Sweden — [3]Hahn-Meitner Institut, Berlin, Germany

Ultrathin Au/Co/Au is known as a prototypical system which shows perpendicular magnetic anisotropy. Our recent XMCD study of in-situ prepared Au/Co/Au/W(110) showed that, contrary to the widely accepted picture, there is no increase of the Co perpendicular orbital moment that accompanies the in-plane to out-of-plane spin reorientaton transition(SRT)[1]. We performed an in-situ Co L-edge Extended X-ray Absorption Fine Structure (EXAFS) study of the local structure on the same samples whose magnetic properties were characterized using XMCD and X-ray resonant reflectivity. We applied the Bayes-Turchin approach developed by Krappe and Rossner[2, 3] in analyzing the EXAFS spectra. From this analysis, we obtain quantitative information about the structural strain and disorder of the Co layers. We discuss the role of the local structural modifications among the mechanisms responsible for the occurence of the SRT. [1] C. Andersson *et al.*, Phys. Rev. Lett. **99**, 177207 (2007). [2] H. J. Krappe and H. H. Rossner, Phys. Rev. B **70**, 104102 (2004). [3] H. H. Rossner, D. Schmitz, P. Imperia, H. J. Krappe, J. J. Rehr, Phys. Rev. B **74**, 134107(2006).