MA 14: Poster Ib: Magnetic Materials (1-14); Micro Magnetism/Computational Mag. (15-17); Surface Magnetism (18-22); Spin Structures/Phase Transitions (23-25)

Time: Tuesday 10:15–13:00 Location: P1B

MA 14.1 Tue 10:15 P1B

$AgCuVO_4$: A quasi one-dimensional S = 1/2 compound — •Angela Möller[1], Timo Taetz[1], Miriam Schmitt[2], and Helge Rosner[2] — [1]Universität zu Köln, Institut für Anorganische Chemie, Greinstr. 6, 50939 Köln, Germany — [2]Max Planck Institut for Chemical Physics of Solids, Noethnizer Str. 40, 01187 Dresden, Germany

Recently, we have been able to synthesize the new copper-orthovanadate $AgCuVO_4$ [1]. The crystal structure was determined by single crystal x-ray diffraction. $AgCuVO_4$ comprises Cu^{2+} ions coordinated by oxygen in a square-planar fashion, similar to $LiCuVO_4$, which has been identified as a multiferroic material recently [2]. Whereas in $LiCuVO_4$ the square-planar $[CuO_4]$ units are connected via *edges* to form chains along the crystallographic b axis, the $[CuO_4]$ units in $AgCuVO_4$ are connected via *corners* resulting in Cu-O-Cu chains along the b-axis. The static magnetic susceptibility of $AgCuVO_4$ can be described quite well within a Bonner-Fisher spin-chain scenario.

In order to gain microscopic insight into the the electronic structure and the magnetic exchange interactions of $AgCuVO_4$, we performed LDA band structure calculations. To take the strong Coulomb repulsion at the Cu site into account, we mapped the LDA results onto a tight binding model and subsequently onto a Heisenberg model. In agreement with the experimental data, we find pronounced one-dimensional magnetic exchange along the b axis with small inter-chain couplings.

[1] A. Möller, J. Jainski, Z. Anorg. Allg. Chem. 634, 1669 (2008)
[2] M. Enderle *et al.*, Europhys. Lett. 70, 237 (2005)

MA 14.2 Tue 10:15 P1B

Hard X-ray Photoelectron Spectroscopy of Complex Materials — •Siham Ouardi, Andrei Gloskovskii, Benjamin Balke, Gerhard H. Fecher, and Claudia Felser — Institute of Inorganic and Analytical Chemistry, Johannes Gutenberg - University, 55099 Mainz

This work reports on Hard X-ray Photoelectron Spectroscopy of complex materials excited by photons of about 5.9 keV energy. The measurements were performed on Heusler thin films coated by MgO and SiO_x insulating interlayer with different thickness z from 1 nm to 20 nm. It is shown that the insulating layer does not affect the high energy spectra of the Heusler compound close to the Fermi energy. The spectra of the buried thin films agree well with previous measurements from bulk samples. The high resolution measurements of the valence band close to the Fermi energy indicate a very large inelastic electron mean free path of the electrons in the insulating layer.

The authors gratefully acknowledge financial support by the DfG (Research Unit 559).

MA 14.3 Tue 10:15 P1B

EBSD analysis of the microtexture of Ba-hexaferrite samples — •Anjela Koblischka-Veneva[1], Michael R. Koblischka[2], Jörg Schmauch[3], Yajie Chen[4], and Vincent G. Harris[4] — [1]Institute of Functional Materials, Saarland University, Campus C 6 3, D-66123 Saarbrücken, Germany — [2]Experimental Physics, Saarland University, Campus C 6 3, D-66123 Saarbrücken, Germany — [3]Technical Physics, Saarland University, Campus D 2 2, D-66123 Saarbrücken, Germany — [4]Department of Electrical and Computer Engineering, and the Center for Microwave Magnetic Materials and Integrated Circuits, Northeastern University, Boston, Massachusetts 02115, USA

The microtexture of differently prepared Ba-hexaferrite samples is investigated by means of electron backscatter diffraction (EBSD). Kikuchi patterns are obtained with a high image quality, enabling a spatial resolution of the EBSD maps of about 20 nm. The spatially highly resolved EBSD mappings provide additional information (individual grain orientation, misorientation angles, grain size distribution) as compared to the standard analysis techniques, which can contribute to an optimization of the growth process. Furthermore, as the crystallographic orientation of each grain is known, an exact analysis of the grain aspect ratio becomes possible which provides further insight to the microstructural dependence of the magnetic properties of ferrites.

MA 14.4 Tue 10:15 P1B

UHV Diffractometer for Soft X-Ray Scattering at PETRA III — •Christian Schüssler-Langeheine — II. Physikalisches Institut, Universität zu Köln

Resonant scattering in the soft x-ray range has recently shown to be a powerful technique to study nano-scale order phenomena like charge, orbital and spin order in strongly correlated electron systems as well as magnetic properties of thin films, multilayers and other nanostructures.

The XUV beamline of the new synchrotron-radiation source PETRA III in Hamburg with its energy range from 200 eV up to 3 keV will cover the most important resonances of $3d$, $4d$ and $4f$ systems. For this beamline an UHV diffractometer suited for resonant soft x-ray scattering experiments is presently being set up. The experimental possibilities provided by the instrument in particular for the investigation of magnetic systems will be presented.

Funded by the BMBF through project 05KS7PK1.

MA 14.5 Tue 10:15 P1B

Magnetic properties of the system Fe1-xCoxSi studied by Mössbauer spectroscopy — •Josefin Engelke[1], Dirk Menzel[1], Jan Kreitlow[1], Mathias Thede[1], Gregor Bransky[1], Joachim Schoenes[1], Jochen Litterst[1], Dalber Sanchez[2], Yutao Xing[2], and Elisa Baggio Saitovitch[2] — [1]IPKM, TU Braunschweig, Germany — [2]CBPF, Rio de Janeiro, Brazil

The system Fe1-xCoxSi has been studied since many years also using Mössbauer spectroscopy amongst others methods. From magnetization one can follow the development of magnetic ordered moments depending on Co concentration, from pure FeSi which is paramagnetic down to lowest temperatures, to very small ferromagnetic moments at intermediate concentrations with maximum ordering temperatures around 50 K, and finally diamagnetism in CoSi. This development is related to changes in the electronic band structure with rather narrow gaps. For low Co concentrations a helical structure of Co moments is derived which however is modified already in weak magnetic fields to a conical structure.

A long standing question concerns the moment at iron. In order to receive more reliable information on the magnetic state of iron in zero magnetic field we have performed Mössbauer spectroscopy on a series of Fe1-xCoxSi in the temperature range between 4 - 300K and also selected samples in applied external fields. Our data clearly show that there are indeed small ordered moments at iron in the concentration range between about x = 0.1 to 0.6 which are on the order of 0.2 uB.

MA 14.6 Tue 10:15 P1B

Magnetic excitations in R_2PdSi_3 studied by inelastic neutron scattering — Fei Tang[1], •Matthias Frontzek[1], Peter Link[2], Astrid Schneidewind[1,2], I. Mazilu[3], and Michael Loewenhaupt[1] — [1]IFP, TU Dresden, D-01062 Dresden, Germany — [2]FRM II, TU Munich, Lichtenbergstr. 1, 85747 Garching, Germany — [3]IFW Dresden, D-01069 Dresden, Germany

R_2PdSi_3 compounds have been found to exhibit rich magnetic phenomena arising from the interplay between RKKY interaction, crystal electric field effects and geometric frustration due to the derived hexagonal AlB_2 structure. The observed crystallographic superstructure further complicates the CEF level scheme.

Inelastic neutron scattering measurements on single crystals of Tm_2PdSi_3 and Er_2PdSi_3 have been performed at the cold triple axis spectrometer PANDA in FRM-II. Both compounds order antiferromagnetically at T_N = 7 K and 2.1 K respectively; Er_2PdSi_3 undergoes a second phase transition at T_2 = 2 K. Several low lying CEF excitations (below 10 meV) were observed. The intensity of the lowest excitation show strong directional dependence (in HK0 plane for Er_2PdSi_3 and in HHL plane for Tm_2PdSi_3), from which the details of the transitional matrix could be deduced. Measurements in magnetic fields up to 13 T show Zeeman splitting of the CEF excitations.

In this contribution we will present and discuss the results of the inelastic neutron scattering experiments and try to entangle the CEF level scheme.

MA 14.7 Tue 10:15 P1B

Magnetism of $La_{0.875}Sr_{0.125}MnO_3$ studied by means of magnetometry and XMCD — •K. Kuepper[1], M. Raekers[2], C. Taubitz[2], M. Prinz[2], M. Uhlarz[3], V.R. Galakhov[4], Ya. M.

Mukovskii[5], and M. Neumann[2] — [1]University of Ulm, Department of Solid State Physics, Albert-Einstein-Allee 11, D-89069 Ulm, Germany — [2]Department of Physics, University of Osnabrück, D-49069 Osnabrück, Germany — [3]FZ Dresden-Rossendorf, Bautzner Landstr. 128, 01328 Dresden, Germany — [4]Institute of Metal Physics, Russian Academy of Sciences, Ural Division, 620219 Yekaterinburg GSP-170, Russia — [5]Moscow State Steel and Alloy Institute, 117936 Moscow, Russia

The manganites $La_{1-x}Sr_xMnO_3$ exhibit a remarkable rich phase diagram as function of temperature, doping concentration and magnetic field, accompanied by attractive properties like colossal magneto resistance (CMR). Furthermore, $La_{0.875}Sr_{0.125}MnO_3$ shows an unusual ferromagnetic insulating (FMI) ground state which can not be explained by the conventional double exchange model. We studied the magnetic properties of a $La_{0.875}Sr_{0.125}MnO_3$ single crystal by means of temperature dependent magnetometry and applied x-ray circular magnetic dichroism (XMCD) at the Mn $L_{2,3}$ edges. In contrast to previous results reported [1] we do not find a significant Mn orbital moment, neither in the FMI phase ($T < 180$K) nor in the high temperature paramagnetic insulating phases ($T > 180$K).

[1] M. Platé et al., Phys. Rev. B **72**, 085102 (2005).

MA 14.8 Tue 10:15 P1B

Measurements of nanocrystalline ferromagnetic materials and their potential for use as core materials at low temperatures — •René Geithner[1], Alexander Steppke[2], Ralf Neubert[1], Wolfgang Vodel[1], and Paul Seidel[1] — [1]Institute of Solid State Physics, Friedrich Schiller University of Jena, Germany — [2]Max Planck Institute for Chemical Physics of Solids, Dresden, Germany

A low temperature SQUID-based measuring instrument, which employs the Cryogenic Current Comparator (CCC) principle, is used for high-precision, non-contact current measurements of particle beams. The CCC consists of a high-performance LTS DC SQUID system, a toroidal pick-up coil and a meander-shaped superconducting niobium shield. Theoretical investigations show that as external noise decreases, improvements in performance depend on the properties of the ferromagnetic core material, especially the relative permeability, embedded in the pick-up coil. Here we present the temperature and frequency dependence of several candidate ferromagnetic and nanocrystalline materials (Vitroperm by VAC Hanau and Nanoperm by Magnetec). Measurements of the magnetic losses and associated noise figures are presented in respect to the permeability.

MA 14.9 Tue 10:15 P1B

Rh_2MnGe: a Heusler compound with $4d$ valence electrons. — •Lubna Basit, Jan Thoene, Stanislav Chadov, Gerhard H. Fecher, and Claudia Felser — Institute of Inorganic and Analytical Chemistry, Johannes Gutenberg - University, 55099 Mainz

We report on the structural and magnetic properties of Rh_2MnGe Heusler alloy. Polycrystalline samples of Rh_2MnGe have been prepared and the bulk properties were charaterized by bulk techniques (X-ray diffraction and magnetization). Rh_2MnGe is $L2_1$ ordered. The magnetic properties of Rh_2MnGe were measured by means of SQUID magnetometry. Rh_2MnGe is a candidate for ferromagnetic alloys with a saturation moment of 3.6 μ_B in the primitive cell at 5 K. The magnetic moments are considerably more localized for Rh_2MnGe in comparison to the isoelectronic compound Co_2MnGe. In spite of the localization of the Mn moment, the Heisenberg model fails to describe the temperature dependence correctly, which might be due to the remaining itinerant character of the Rh moment. In addition, we have studied the electronic properties of Rh_2MnGe by *ab-initio* calculations using the fully-relativistic spin-polarized Korringa-Kohn-Rostoker (SPR-KKR) Green's function method. Computational results agree with experiment by predicting this compound as metallic with the low degree of the spin-polarization. However the calculated magnetic moment (4 μ_B) obeys the Slater-Pauling rule closely. The authors gratefully acknowledge financial support by the DfG (Research Unit 559).

MA 14.10 Tue 10:15 P1B

Hard X-ray photoelectron spectroscopy of Heusler materials — •Andrei Gloskovskii, Siham Ouardi, Xeniya Kozina, Gregory Stryganyuk, Gerhard H. Fecher, and Claudia Felser — Institute of Inorganic and Analytical Chemistry, Johannes Gutenberg - University, 55099 Mainz

Hard X-Ray photoemission spectroscopy (HAXPES) is an unique technique that makes feasible studies of the electronic properties of deeply buried layers. If needed, the surface sensitivity of the conventional XPS can be reached in HAXPES by changing the experiment geometry. This work reports on the HAXPES of Heusler thin films and bulk materials. The experiments were performed at the beamlines BL15XU and BL47XU of SPring-8. The maximal thickness of the insulating layer that is still transparent for the photoemission signal from underlying layer was estimated experimentally for different insulating materials.

This work is supported by the DFG (project P7 in research unit FOR 559) by BMBF 05KS7UM1 and by JST-DfG (Project FE 633/6-1).

MA 14.11 Tue 10:15 P1B

Adiabatic temperature change in giant magnetocaloric effect compounds — Julia Lyubina, •Philipp Rosendahl, Jian Liu, Ludwig Schultz, and Oliver Gutfleisch — IFW Dresden, Institute for Metallic Materials, Helmholtzstr. 20, 01069 Dresden, Germany

The magnetic refrigeration based on the magnetocaloric effect (MCE) is becoming a promising technology to replace the conventional gas-compression/expansion technique. The two parameters, the adiabatic temperature change, ΔT_{ad}, and the magnetic entropy change, ΔS_M, are used for the evaluation of the MCE [1,2]. Most of the MCE studies are performed by indirect methods, among which the ΔS_M calculation using the Maxwell relation is the most widespread. Here, we report on direct adiabatic temperature change ΔT_{ad} measurements in giant MCE materials, $La(Fe,Si)_{13}$- and Ni-Mn-In Heusler-type alloys. ΔT_{ad} was measured using a direct contact with a thermocouple in magnetic fields up to 1.93 T produced by a permanent magnet assembly (Halbach cylinder). In $Ni_{50}Mn_{34}In_{16}$, the maximum ΔT_{ad} of 2 K is observed around the Curie temperature of the austenite (317 K), whereas ${\Delta T_{ad}}^{max}$ is -1.3 K near the martensite-austenite transition (181 K). On cooling, i.e. during the austenite-martensite transition, ${\Delta T_{ad}}^{max}$ reduces to about -0.5 K. In $LaFe_{12}Si_1$, the maximum ΔT_{ad} reaches -5.4 K at 184 K. The contribution of the latent heat to the adiabatic temperature change during first-order phase transitions is discussed.

[1] J. Lyubina et al., J. Magn. Magn. Mater. 320 (2008) 2252; [2] J. Lyubina et al., Phys. Rev. Lett. 101 (2008) 177203.

MA 14.12 Tue 10:15 P1B

Electrodeposition of thin soft-magnetic layers in magnetic gradient fields — •Kristina Tschulik, Jakub Koza, Margitta Uhlemann, Annett Gebert, and Ludwig Schultz — Leibniz Institute for Solid State and Materials Research Dresden, P.O. Box 270016, D-01171 Dresden, Germany

Thin soft magnetic layers are of interest as sensor layers or as write head component in magnetic data storage devices. Due to the fact, that in these fields of applications high saturation magnetization in combination with low coercivity is desired, deposits based on iron and cobalt are favorable. As it has already been shown, externally applied homogeneous magnetic fields can significantly influence the deposition process as well as morphology, texture and magnetic properties of deposits. Hence, influencing these deposit properties should be possible by tailoring the magnetic field distribution applied during the deposition process, which in turn can be generated via different arrangements of magnets. Therefore electrochemical measurements in various magnetic gradient fields have been performed and the resulting deposits have been characterized via optical microscopy, SEM, AFM, MFM, XRD and MOKE.

MA 14.13 Tue 10:15 P1B

Magnetic field effect on the anodic behaviour of a ferromagnetic electrode in acidic solutions — •Ralph Sueptitz, Jakub Koza, Margitta Uhlemann, Annett Gebert, and Ludwig Schultz — IFW Dresden, Helmholtzstraße 20, 01069 Dresden

The magnetization of a ferromagnetic electrode in an external homogeneous magnetic field leads to a stray field in front of the electrode. This stray and its gradients can alter the anodic behaviour of the electrode significantly. Potentiodynamic polarisation measurements of an iron wire in two acidic electrolytes without and with applied magnetic fields up to 0.6 T in different orientations to the electrode surface were performed. In sulfuric acid solution an increase of the diffusion-limited dissolution current density and a shift of the active-passive transition potential to more noble potentials was observed when the magnetic field was applied parallel to the electrode surface. In contrast, in perpendicular field configuration the diffusion-limited current density is lowered and the active-passive transition potential is shifted to less noble values. In phthalate buffer a shift of the active-passive transition to less noble potentials occurred irrespective of the magnetic field config-

uration. The observed effects of a superimposed magnetic field on the anodic behaviour of iron are discussed with respect to an increase of the mass transport due to the magnetohydrodynamic (MHD) effect, the magnetic field gradient force and its interaction with the paramagnetic iron ions. The results show that the effect of the field gradient force can become very important due to the high magnetic field gradient at ferromagnetic electrodes.

MA 14.14 Tue 10:15 P1B

Local resolved ferromagnetic resonance measurments — •Sven Stienen, Ralf Meckenstock, Jürgen Lindner, and Michael Farle — Universität Duisburg-Essen, Duisburg, Deutschland

A scanning thermal microscope (SThM) was designed to measure local resolved ferromagnetic resonance (FMR). To realize the required stability for slow thermal scans in combination with high magnetic fields an AFM (XE-70) is used. This guarantees a lateral stability of 10 nm during a 200 mT variation of the field. For this a specially shaped magnet was developed, which emits only a small stray field towards the microscope. A non magnetic tip holder was also developed. Due to the use of the magnet, the conventional XE-70 had to be modified. Using a modulated constant-current source in combination with a lock-in technique, the sensitivity of the thermal measurements could be improved by a factor of 10 compared to an old SThM setup. With the new setup, a lateral resolution of less then 100 nm is achieved. The new setup of the scanning thermal microscope has proven to characterize thermal and magnetic properties of nanostructured systems. The thermal resolution limit of the setup was demonstrated as low as 0,2 mK by a thermal characterizations of single-crystalline silver wire. For the first time a local thermal FMR spectrum was received with a resolution of less then 100 nm on a single Py wire. This spectrum was compared to a conventionally detected FMR signal of whole Py wire array. In addition, a thermal image of a single Py wire was taken during resonance.

MA 14.15 Tue 10:15 P1B

TetraMag - A general-purpose finite-element micromagnetic simulation package — •Riccardo Hertel and Attila Kakay — Institut für Festkörperforschung, Elektronische Eigenschaften, Forschungszentrum Jülich GmbH

In the past years, the investigation of micromagnetic structures and dynamic magnetization processes on the nanoscale has greatly benefited from the availability of various free and commercial micromagnetic simulation packages. These programs have allowed a very large number of scientific groups to perform studies on countless systems, thereby obtaining a broad knowledge on this topic. Almost all of these publicly available codes have similar structures and are based on finite-difference formulations. Finite-element algorithms, on the contrary, are rather rare. Despite a number of advantageous features, micromagnetic studies with finite element codes are quite seldom, partly because such codes are often considered to be too complicated to develop and to use. The main plus of finite element algorithms is their geometric flexibility, which allows the modeling of three-dimensional objects of arbitrary shape with smooth boundaries. Our finite-element code TetraMag has several attractive features, such as easy implementation and usage, full parallelization, and the possibility of considering electric currents, surface anisotropies and the magnetostatic interaction of spatially separated nanomagnets. In this poster the structure of the program, the basics of the numerical formulation and the main features of the simulation package will presented. The release of the first public-domain version of TetraMag is planned for the first quarter of 2009

MA 14.16 Tue 10:15 P1B

High resolution large-scale micromagnetic simulations with hierarchical matrices — •Attila Kákay and Riccardo Hertel — Institute for Solid State Research, Research Center Jülich GmbH, 52428 Jülich, Germany

The hybrid finite element/boundary element method (FEM/BEM) [1] is a powerful, high precision method in micromagnetic simulations. The BEM is used to map the open boundary conditions of the magnetostatic potential at infinity on equivalent boundary conditions at the surface of the magnetic region. However, the calculation of the magnetostatic potential involves a densely populated matrix which for large problems can become of considerable size (up to several TBytes), since it is proportional to the square of the number of boundary nodes. The hierarchical matrices or H-matrix technique [2] can be used to drastically reduce the size of the dense matrix, without significant loss in accuracy. We present applications of this technique to micromagnetic problems of such size and complexity what could not be addressed before. The examples include the cross-tie domain wall structure and its field-pulse induced dynamics in a long Permalloy stripe (1 um) and a study on the fine details of the magnetic structure in a large (5 um) Permalloy disk. These magnetic structures involve three different length scales: domain size, domain wall width and vortex core width. The calculated domain configuration for both examples is in very good agreement with experiments.[1] D.R. Fredkin and T.R. Koehler, J. Appl. Phys. 63, 3385 (1988) [2] S. Boerm and L. Grasedyck, HLib - A library for H - and H2 - atrices,1999,http://www.hlib.org/

MA 14.17 Tue 10:15 P1B

Investigation of the Dynamic Behaviour of Thin Magnetic Layers under the Influence of Magnetic Particles — •Alexander Weddemann, Camelia Albon, and Andreas Hütten — Bielefeld University, Universitätsstraße 25, D-33615 Bielefeld, Germany

Magnetic particles on the micro- or nanoscale have a growing number of different applications in many different physical, chemical or medical fields, e.g. as contrast agents or drug carriers. Because of their magnetic stray field such particles interact with thin magnetic layers, making it possible to detect them with the help of GMR- or TMR-sensor arrays. However, the obtained signals strongly depend on the particle size, the distance from the sensor as well as the number of particles above the sensor. Also material properties, especially, if superparamagnetic or ferromagnetic particles are to be detected, have a strong influence on the results. The different dependencies are investigated systematically. Furthermore, dynamic measurements of particles moving close to the sensors are discussed.

Micromagnetic simulations solving Landau-Lifschitz-Gilbert and Brown equation for thin films are compared to experimental results.

MA 14.18 Tue 10:15 P1B

An interface between two non-magnetic metals turns magnetic: The case of YCo_2(111)/Cu(111) — •Josef Redinger and Peter Mohn — Dept. General Physics/CMS, Vienna University of Technology, Austria

Thin films of a material with a magnetic surface and a non-magnetic bulk are natural magnetic multi-layers with a perfect matching of the electronic potentials at the magnetic/nonmagnetic interface. Using full-potential DFT calculations the existence of a stable magnetic (111) surface of the nonmagnetic bulk inter-metallic compound YCo_2 was predicted, with large magnetic moments in the topmost Co layer for both Y- and Co-terminated (111) surfaces [1] und subsequently verified experimentally [2]. In the present contribution we focus on the interface between YCo_2(111) and Cu(111). An almost perfect lateral match facilitates the growth of magnetically dead Cu cap or spacer layers. Our DFT studies predict that, despite a stable Y termination of the YCo_2(111) surface, a Co/Cu interface with sizeable Co moments (averaged 0.8-0.9 μ_B) at the interface is formed, while Y floats on top. For YCo_2/Cu(111) multilayers a similar magnetic behavior is predicted.
[1] S. Khmelevskyi, P. Mohn, J. Redinger, and M. Weinert, Phys. Rev. Lett. 94,146403 (2005)
[2] Yu. S. Dedkov, C. Laubschat, S. Khmelevskyi, J. Redinger, P. Mohn, and M. Weinert, Phys. Rev. Lett. 99,047204 (2007)

MA 14.19 Tue 10:15 P1B

Delayed phase transition from fcc(111) to bcc(110) for Fe on vicinal Au(111) — •Tobias Allmers and Markus Donath — Physikalisches Institut, Universität Münster, 48149 Münster

Vicinal surfaces offer the opportunity for the fabrication of a regular array of nanostructures and for studying the influence of a reduced symmetry. The morphology and the magnetism of Fe films on flat Au(111) were already thoroughly investigated by various groups [1,2]. At a certain film thickness a phase transition from Fe fcc(111) to bcc(110) was identified, accompanied by a spin reorientation transition from out-of-plane to in-plane. We used Fe on vicinal Au(111), in our case Au(23 25 25), to study the influence of the modified substrate topography on the growth mode and the resulting magnetic properties. For thicknesses beyond the phase transition, the pseudomorphic growth of Fe is disrupted and rectangular structures appear. The orientation and development of these structures is different on the flat and the vicinal surface. Our results obtained with scanning tunneling microscopy (STM), low energy electron diffraction (LEED) and magneto-optical Kerr effect provide a consistent picture. Different from Fe on flat

Au(111), the phase transition from fcc(111) to bcc(110) occurs at a higher Fe coverage on vicinal Au(111). We present a structural model for the phase transition of Fe on Au(23 25 25), which explains the observed differences in the development and orientation of the rectangular structures as observed in STM and LEED.

[1] Strosio *et al.*, J. Vac. Sci. and Technol. A **10**, 1981 (1992)
[2] Lugert *et al.*, J. Magn. Magn. Mater. **121**, 498 (1993)

MA 14.20 Tue 10:15 P1B

Influence of chiral interactions on vortex states in magnetic nanodisks — •A.B. Butenko[1,2], A.A. Leonov[1,2], U.K. Rössler[1], and A.N. Bogdanov[1] — [1]IFW Dresden — [2]DIPT Donetsk

Magnetic circular nanostructures exhibit curling vortices which have a sense of rotation and an up/down polarity of the core magnetization. Broken mirror symmetry at surface/interfaces of nanosystems induces chiral Dzyaloshinskii-Moriya interactions, which should strongly affect their magnetic properties [1,2]. In particular, these chiral couplings energetically favour one sense of rotation in a vortex state and suppresses vortices with the opposite chirality [3]. Using a micromagnetic approach, we investigate the influence of these Dzyaloshinskii-Moriya interactions on vortex states in magnetic nanodisks. From numerical solutions for (metastable) equilibrium states with cylindrical symmetry, we calculate shapes and sizes of the vortices as functions of a bias magnetic field and the material and geometrical parameters. These solutions correspond to core structure of vortices in thin film elements with Dzyaloshinskii-Moriya interactions. Calculated magnetic phase diagrams display existence regions for vortices with different chirality and magnetic polarization. As a result, under the influence of the chiral magnetic interactions vortices of opposite chirality should have different sizes. We provide detailed numerical analysis of this effect, which can be applied to measure the strength of the induced Dzyaloshinskii-Moriya coupling. — [1] A. Bogdanov, U.K. Rößler, Phys. Rev. Lett. **87**, 037203 (2001). [2] M.Bode et. al., Nature **447**, 190 (2007). [3] A. Bogdanov, A. Hubert, J. Magn. Magn. Mater. **195**, 185 (1999).

MA 14.21 Tue 10:15 P1B

Influence of Atomic Protrusions on a Nanolead Spin Structure — •Benjamin W. Heinrich[1], Mircea V. Rastei[1], Cristian Iacovita[1], Pavel A. Ignatiev[2], Valeri S. Stepanyuk[2], Patrick Bruno[2], Laurent Limot[1], and Jean-Pierre Bucher[1] — [1]Institut de Physique et Chimie des Matériaux de Strasbourg UMR 7504, Université Louis Pasteur, F-67034 Strasbourg, France — [2]Max-Planck-Institut für Mikrostrukturphysik, Weinberg 2, D-06120 Halle/Saale, Germany

Single Ni, Co and Cu atoms deposited in the center of cobalt nanoislands grown on Cu(111) are investigated by low-temperature scanning tunneling spectroscopy. Atomic protrusions profoundly modify the surface states of this model magnetic nanolead, *ab initio* calculations predicting the existence of atomic-like and surface-induced states. Contrary to the first, the second contribution is predicted by calculations to favor a change in sign of the spin polarization with respect to the pristine lead [1].

[1] B.W. Heinrich, C. Iacovita, M.V. Rastei, L. Limot, J.P. Bucher, P.A. Ignatiev, V.S. Stepanyuk, P. Bruno, submitted

MA 14.22 Tue 10:15 P1B

Bcc Co/Fe(110) measured by spin-polarized scanning tunneling spectroscopy — •Torsten Methfessel and Hans-Joachim Elmers — Johannes Gutenberg-Universität Mainz, Institut für Physik, Staudingerweg 7, D-55099 Mainz

Highly spin polarized metals are of great interest e.g. for the application in spin-valves. Recently observed large tunneling magnetoresistance (TMR) effect values of 410 % at room temperature for Co/Fe(100) electrodes indicate a high spin-polarization at the Fermi energy of bcc Co [1]. Using STM and STS we have recently shown that two monolayer of undistorted bcc Co grow on Fe(110) [2]. By covering the STM tip with 5 ML Fe we perfom spin-polarized scanning tunneling microscopy on the Co(110) surface. The magnetization of the Co layers follow the magnetization of the Fe buffer layer with an easy axis along the the $[1\bar{1}0]$ axis. Spin-polarized spectroscopy reveals an asymmetry of the differential conductivity for the first Co layer with a maximum value of 5 % at 0.1 eV below E_F in close agreement with the data measured for the Fe(110) surface. The second layer shows a maximum of ca. 4 % of the opposite sign at 0.1 eV above E_F. The experimental results are compared with theoretical calculations.

[1] S. Yuasa et. al., Appl.Phys.Lett. 89 (2006) 042505.
[2] T. Methfessel, and H.J. Elmers, Surf.Sci. (accepted).

MA 14.23 Tue 10:15 P1B

Domain Effects, Giant Magnetoresistance and Quantum Phase Transitions in NbFe2 — •William Duncan[1], Philipp Niklowitz[1], Carsten Albrecht[1], Dennis Moroni[1], Manuel Brando[2], and Malte Grosche[3] — [1]Department of Physics, Royal Holloway, Egham, TW20 0EX, UK — [2]Max-Planck-Institute CPfS, 01187 Dresden, Germany — [3]Cavendish Laboratory, University of Cambridge, Cambridge CB3 0HE, UK

The C14 Laves phase NbFe2 offers an intriguing perspective on ferromagnetic quantum criticality in clean transition metal compounds. Slightly (1%) iron-rich samples of NbFe2 are low-temperature band ferromagnets. On approaching stoichiometry, an unidentified modulated magnetic state with a high uniform susceptibility (Stoner enhancement factor ˜ 150) replaces ferromagnetism. This modulated, possibly long-wavelength spiral order eventually disappears in slightly niobium-rich samples, giving rise to a quantum critical point (QCP).

Numerous polycrystals of varying stoichiometries have been prepared and their respective magnetic and transport properties have been investigated. There are several intriguing phenomena present, these include quantum critical behaviour near the QCP (see other poster, [1]), GMR approaching 40% coupled with strong domain effects near the region of the ferromagnetic to modulated state change and robust non-Fermi liquid behaviour. Hydrostatic pressure has been used to reproduce the effects of changing composition, suggesting that disorder and impurity effects play a minor role in doped samples.

[1] M. Brando et al, Phys. Rev. Lett. 101, 026401 (2008)

MA 14.24 Tue 10:15 P1B

Magnetic excitations and ordering in azurite — •Clare Gibson[1], Kirrily Rule[1], Stefan Süllow[2], Alan Tennant[1], Jens-Uwe Hoffmann[1], and Mark Telling[3] — [1]Helmholtz-Zentrum Berlin für Materialien und Energie, D-14109 Berlin, Germany — [2]Institut für Physik der Kondensierten Materie, TU Braunschweig, D-38106 Braunschweig, Germany — [3]ISIS, Chilton, Oxfordshire, UK

Azurite, Cu3(CO3)2(OH)2 realises a distorted diamond chain with a 1/3-magnetisation phase. A combination of time-of-flight spectroscopy and polarized neutron scattering has been used to elucidate the excitation spectrum in the sub-plateau phase. Not only does the excitation spectrum prove the dynamics of the system to be one-dimensional but also reveals a highly unusual interplay of excitations. A lower mode comprises unconventional continua and an upper mode consists of dimer excitations combined with spinons. In addition to the study of the dynamics, we propose a magnetic structure for the ordered phase below T=1.86K.

MA 14.25 Tue 10:15 P1B

Magnetic correlations in half-doped manganates — •Holger Ulbrich[1], Olaf Schumann[1], Daniel Senff[1], Yvan Sidis[2], Klaudia Hradil[3], Wolfgang Schmidt[4], and Markus Braden[1] — [1]Universität zu Köln, Zülpicher Str. 77, 50937 Köln — [2]Laboratoire Léon Brillouin, CE-Saclay — [3]FRMII TU-München — [4]Institut Laue-Langevin, 38042 Grenoble

The coupled ordering of charge orbital and spin degrees of freedom in the manganates constitutes a key element to understand the mechanism of colossal magneto resistivity, which consists in switching from the antiferromagnetically ordered insulating state into the ferromagnetic metallic phase. Starting with the half doped layered material La0.5Sr1.5MnO4 [1,2] we have analysed the magnon dispersion as well as the temperature dependence of the magnetic correlations in several compounds with a Mn4+:Mn3+ ratio close to half doping. In slightly over-doped La0.4Sr1.6MnO4 we find a coupling of incommensurate ordering of orbitals, charges and Mn3+ spins combined with commensurate ordering of Mn4+ spins. We further discus the magnetic correlations in Pr0.5Ca1.5MnO4 and in Nd0.5Sr0.5MnO3.

[1] D. Senff, F. Krüger, S. Scheidl, M. Benomar, Y. Sidis, F. Demmel, and M. Braden, Phys. Rev. Lett. 96, 257201 (2006) [2] D. Senff, O. Schumann, M. Benomar, M. Kriener, T. Lorenz, Y. Sidis, K. Habicht, P. Link, and M. Braden, Phys. Rev. B 77, 184413 (2008).