O 14: Surface or Interface Magnetism

Time: Monday 15:15–16:45 Location: MA 043

O 14.1 Mon 15:15 MA 043

Structure and magnetism in nanoscale FeCo alloys — •Stefanos Tzivanakis, Alejandro Diaz-Ortiz, and Helmut Dosch — Max-Planck-Institut für Metallforschung, Stuttgart, Germany

The interplay between dimensionality, ordering and magnetism has been investigated on two-dimensional Fe-Co alloys. Our first-principles density-functional calculations on free-standing and Mo supported alloys show a linear dependence of the magnetic moment with atomic concentration and lattice constant. Lattice strain and charge transfer play a fundamental role in determining the magnetism and phase stability of two-dimensional Fe-Co alloys. Cluster expansions for the energy and the magnetic moment were used to exhaustively search ground-state and large-magnetic-moment configurations.

O 14.2 Mon 15:30 MA 043

Spin-resolved photoemission from antiferromagnets: Cr films on Fe(110) — •Peter Bose[1], Peter Zahn[1], Jürgen Henk[2], and Ingrid Mertig[1] — [1]Martin Luther University Halle-Wittenberg, Halle, Germany — [2]Max Planck Institute of Microstructure Physics, Halle, Germany

Layer-wise antiferromagnetic films grown on ferromagnets are well-suited systems for investigating exchange coupling, especially for studying exchange bias. Mn and Cr films have a profound effect on the spin-dependent transport in magnetic tunnel junctions, leading in particular to magnetoresistance oscillations with a period of 2 ML (e. g. [1]). Another recent example are 2-ML oscillations of the spin polarization in spin- and angle-resolved photoemission from Cr films on Fe(110) [2].

To understand the origin of the oscillations in Cr/Fe(110) we performed first-principles relativistic electronic structure and photoemission calculations. In particular the Cr-thickness dependence of the spin polarization at normal emission will be addressed and compared with experiment [2]. Further, magnetic linear dichroism will be discussed.

[1] P. Bose, I. Mertig, J. Henk, Phys. Rev. B **75** (2007) 100402(R).
[2] Yu. S. Dedkov, Eur. Phys. J. B **57** (2007) 15.

O 14.3 Mon 15:45 MA 043

A possible source of spin-polarized electrons: The inert graphene/Ni(111) system — •Yury Dedkov[1], Mikhail Fonin[2], and Clemens Laubschat[1] — [1]Institut für Festkörperphysik, Technische Universität Dresden, Germany — [2]Fachbereich Physik, Universität Konstanz, Germany

We report on an investigation of spin-polarized secondary electron emission from the chemically inert system: graphene/Ni(111). An ordered passivated graphene layer (monolayer of graphite, MG) was formed on Ni(111) surface via cracking of propylene gas. The spin-polarization of the secondary electrons obtained from this system upon photoemission is only slightly lower than the one from the clean Ni surface, but does not change upon large oxygen exposure. These results suggest to use such passivated Ni(111) surface as a source of spin-polarized electrons which is stable against adsorption of reactive gases.

O 14.4 Mon 16:00 MA 043

Morphology and magnetism of compact 3d-metal nanoclusters on surfaces — •Violetta Sessi[1], Jian Zhang[1], Klaus Kuhnke[1], Axel Enders[2], Jan Honolka[1], and Klaus Kern[1] — [1]Max-Planck Institut für Festkörperforschung - Stuttgart — [2]Dept. of Physics and Astronomy - University of Nebraska - Lincoln

Systems of isolated 3d-metal clusters with nanometer size are known to behave as a superparamagnetic ensemble in which each cluster is a ferromagnetic entity. Only below a certain temperature (blocking temperature TB) thermal fluctuations are suppressed and cluster spins are aligned on the time scale of an experiment. Blocking can be enhanced either by increasing the surface induced magnetic anisotropy energy or by cluster-cluster interactions e.g. RKKY type interactions mediated through the substrate.

In order to study these effects we fabricated small, compact metal clusters by buffer layer assisted growth (BLAG [1]). Using this method the cluster formation takes place on a surface-supported noble gas buffer layer and the cluster growth is totally independent of the substrate.

We analyzed Co and Fe clusters supported on Ag(111) and Pt(111) by STM and by XMCD. The sample preparation using the same BLAG procedure lead to very different magnetic properties for unstrained 3D nano-clusters on Pt(111) and Ag(111) substrates, which can be attributed to the strong spin-orbit coupling of the Pt with respect to Ag. The results will be compared to ab initio calculations.

[1] J.H. Weaver, G.D. Waddill, Science 251, 1444 (1991)

O 14.5 Mon 16:15 MA 043

Bottom-up creation and adsorption of hybrid organic-inorganic magnetic molecules on metal substrates — •Daniel Wegner[1], Mark Pederson[2], Ryan Yamachika[1], Yayu Wang[1], Bart M. Bartlett[3], Jeffrey R. Long[3], and Michael F. Crommie[1] — [1]Department of Physics, University of California, Berkeley, and Materials Science Division, Lawrence Berkeley National Laboratory, Berkeley, CA, USA — [2]Center for Computational Materials Science, Naval Research Laboratory, Washington, DC, USA — [3]Department of Chemistry, University of California, Berkeley, CA, USA

Charge-transfer compounds of the type M[TCNE]$_x$ (M: transition-metal, TCNE: tetracyanoethylene) form an important group of molecule-based ferromagnets with potential applications due to their high Curie temperatures. Despite extensive studies the origin of magnetic coupling is not well understood due to a lack of sufficient structural characterization, largely attributed to disordered growth. Using a bottom-up approach, we have used a scanning tunneling microscope to arrange single V atoms and TCNE molecules to form charge transfer complexes of different sizes and geometries. By tunneling spectroscopy we prove chemical bonding as well as the emergence of magnetic properties. Special attention is given to the influence of the metallic substrate on the properties of TCNE and the implications for future organic-inorganic nanoscopic devices.

O 14.6 Mon 16:30 MA 043

Optical and magnetic properties of Ni films grown on Cu(110)-(2x1)O and Cu(110)-(2x3)N — •Richard Denk, Michael Hohage, Lidong Sun, and Peter Zeppenfeld — Atomic Physics and Surface Science Division, Institute for Experimental Physics, Johannes Kepler Universiät Linz, Austria

In the last years many studies concerning the growth and magnetic properties of thin ferromagnetic layers on nonmagnetic metallic substrates have been reported. While Ni on Cu(001) is one of the most prominent and best studied model systems, significantly less attention has been given to the Cu(110) surface, due to the less favourable growth mode of Ni on the bare Cu(110) surface. We have utilised Reflectance Difference Spectroscopy (RDS), to investigate the growth and the magnetic properties of thin Ni-films on two Cu(110) templates, namely Cu(110)-(2x1)O and Cu(110)-(2x3)N. The regular RDS signal allows for real time monitoring of the film growth and for film characterization. In addition, the sensitivity of the RD-spectrometer to the polar Magneto-Optical Kerr Effect (RD-MOKE) [1] has been used, in combination with an in situ magnet, to study the magnetic properties of the Ni films. Further characterization of the films was performed with STM and LEED/AES. Finally we report on adsorbate-induced (CO) quenching and spin reorientation of the magnetism of the Ni films. References: [1] Th. Herrmann, K. Lüdge, W. Richter, K.G. Georgarakis, P. Poulopoulos, R. Nünthel, J. Lindner, M. Wahl and N. Esser, Phys. Rev. B 73, 134408 (2006)