poly(glycidyl methacrylate). The PSA films were prepared with solution casting on pre-cleaned glass surfaces. From a naive point of view, one would have expected homogenous films which are characterized by the average monomer composition. To investigate the surface structure, we probed the density profile perpendicular to the PSA surface using x-ray reflectivity (XRR). We detected the presence of an enrichment layer of one type of monomer at the surface, followed by an enrichment of the other monomer type underneath. Which type of monomer of the statistical copolymer is enriched at the free surface depends on the choice of the minority component. The lateral structure of the detected enrichment layers is probed with grazing incidence small angle x-ray scattering (GISAXS).

Keywords: surface analysis, X-ray reflectivity, polymer films

MS.55.4

Acta Cryst. (2008). A**64**, C98

Coordination effects in magnetic nanostructures

Carlo Carbone
Consiglio Nazionale delle Ricerche, Istituto di Struttura della Materia, Area Science Park Basovizza, Trieste, Italy, 34012, Italy, E-mail：carlo.carbone@ism.cnr.it

Advanced synchrotron radiation techniques are able to provide high sensitivity to the study of very diluted magnetic systems, unveiling thus novel properties hardly accessible by other experimental techniques. X-ray circular dichroism, in particular, has been successfully used to track the evolution of the magnetic properties in nanostructures constructed at surfaces, from finite-sized particles to isolated adatoms. This presentation will illustrate how x-ray circular magnetic dichroism carried out in high magnetic fields and cryogenic conditions can be employed to simultaneously measure the valence state and magnetic moment of individual atoms and small clusters on surfaces. The results show how Hunds rule magnetic moments of a free atom change upon adsorption on a surface, the appearance of magnetic anisotropy, the dependence of the magnetic and electronic configuration on the substrate interaction and the atomic coordination.

Keywords: naomagnetism, surfaces, X-ray circular magnetic dichroism

MS.55.5

Acta Cryst. (2008). A**64**, C98

Structural effects and the spin reorientation in Au/Co/Au films

Elizabeta Holub-Krappe[1], Cecilia Andersson[2], Masako Sakamaki[3], Takehisa Konishi[3], Takashi Fujikawa[3], Hermann H. Rossner[1], Biplab Sanyal[2], Olle Eriksson[2], Lars Nordstrom[2], Jonathan Hunter Dunn[4], Andreas Persson[2], Olof Karis[2], Dimitri Arvanitis[2]
[1]Hahn-Meitner-Institut Berlin GmbH, Magnetism, SF2, Glienicker Str. 100, Berlin, Berlin, D-14109, Germany, [2]Department of Physics, Uppsala University, Box 530, SE - 751 21 Uppsala, Sweden, [3]Graduate School of Advanced Integration Science, Chiba University, 1-33 Yayoi-cho, Inage, Chiba 263-8522, Japan, [4]MAX-lab, Lund University, Box 118, SE - 221 00 Lund, Sweden, E-mail：holub-krappe@hmi.de

Ultrathin Au/Co/Au films are known to exhibit Spin Reorientation Transitions (SRT) from in- to out-of plane as a function of the Co-film thickness, Au cap-layer thickness and temperature. We performed an in-situ systematic study of the magnetic, electronic and structural properties of Co/Au and Au/Co/Au films grown on W(110), by means of soft x-ray absorption and photoemission experiments with synchrotron radiation. Our recent X-Ray Magnetic Circular Dichroism (XMCD) measurements on this system establish that, contrary to a widely accepted opinion, the perpendicular magnetic anisotropy is not necessarily accompanied by an increase of the orbital moment along the easy magnetic direction [1]. This experimental observation is confirmed by theoretical considerations, showing that the magneto-crystalline anisotropy is system-dependent [1]. Here, we furthermore, study the correlation of structural effects with the magnetic properties in these films. We present Co L-edge Extended X-ray Absorption Fine Structure (EXAFS) results on the local structure for the same in-situ grown films, whose magnetic properties were characterized using XMCD and X-ray resonant reflectivity experiments. We apply the Bayes-Turchin approach developed by Krappe and Rossner [2,3] to analyze EXAFS spectra. From this analysis we obtain quantitative information on the structural strain and disorder of the Co layers, for both the in- and the out-of-plane magnetic phases. We are, for the first time, able to perform a systematic investigation of the interplay between local structural changes and the occurrence of the SRT [1].

[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 et al., Phys. Rev. B 74, 134107 (2006)

Keywords: XAFS data analysis, crystal and magnetic structure, magnetic phase transitions

MS.56.1

Acta Cryst. (2008). A**64**, C98-99

Quantum phase transitions using non-resonant X-ray magnetic scattering at high pressures

Yejun Feng[1,2]
[1]Argonne National Laboratory, Advanced Photon Source, 431E-002, 9700 S. Cass Ave., Argonne, IL, 60439, USA, [2]The James Franck Institute, University of Chicago, GCIS-ESB47, 929 E. 57th St., Chicago, IL 60637, USA, E-mail：yejun@aps.anl.gov

Over the last decade or two, quantum phase transitions (QPT) and their associated critical behavior have provided an accessible experimental approach and also an expressive language to our understanding of quantum fluctuation and correlation. Correlation between electrons is responsible for kaleidoscopic forms of novel phases in important materials of both technological interest and intellectual challenges, while fluctuation from Heisenberg's uncertainty principle rather than a thermal exploration of states drives phase transitions at absolute zero of temperature. Traditionally, experimental approaches of QPT rely on tuning via magnetic field or alloying. However, hydrostatic pressure serves as a cleaner method than doping because it retains a constant chemical environment and, unlike a magnetic field, does not break any symmetries. Through a combination of cryogenics, diamond anvil cell, and synchrotron x-ray diffraction techniques, we directly measure the spin and charge orders in pure Cr metal as it is driven through the spin-density-wave/paramagnet QPT. We observe that both the spin and charge orders are suppressed exponentially with pressure, well beyond the region where disorder cuts off such a simple evolution. The evolution of the magnetic wavevector reveals a rigid band structure under pressure, and ascribes the destruction of antiferromagnetism to the growth in electron kinetic energy. The observed order parameter behavior follows a weak-coupling BCS theory for the ground state, even though strong correlations were observed in Cr to surprisingly high