HL 99: Transport: Spintronics and magnetotransport 2 (TT, jointly with HL, MA)

Time: Friday 9:30–10:30 Location: H20

HL 99.1 Fri 9:30 H20

Bulk sensitive photoelectron spectroscopy on CrO_2 thin films — •Jonas Weinen[1], Stefano Agrestini[1], Martin Rotter[1], Simone G. Altendorf[1], Zhiwei Hu[1], Chun-Fu Chang[1], Arun Gupta[2], Yen Fa Liao[3], Ku-Ding Tsuei[3], and Liu Hao Tjeng[1] — [1]Max-Planck-Institut für Chemische Physik fester Stoffe, Dresden — [2]The University of Alabama, Tuscaloosa, USA — [3]National Synchrotron Radiation Research Centre, Hsinchu, Taiwan

For transition metal compounds with a high oxidation state the so-called charge transfer energy can become negative, with the result that a spontaneous electron redistribution could occur in which oxygen holes are formed. Such seems to be the case for the ferromagnet CrO_2. Using the LDA+U method, Korotin et al. [PRL **80**, 4305 (1998)] calculated that the material is a metal and remains a metal even for very large values of U. This suggests that it is not so much the Cr 3*d* states that determine whether the system is metallic or insulating, but rather that it is the O 2*p* states which straddle the chemical potential.—Several photoelectron spectroscopy (PES) studies have been reported in the literature, but the results are not consistent, supposedly related to the fact that the surface of CrO_2 tends to decompose to Cr_2O_3 under vacuum conditions, so that surface sensitive PES may not have probed the true bulk spectrum of CrO_2.—We set out to perform bulk sensitive photoemission experiments below and above T_C on CrO_2 thin films using our HAXPES system at SPring-8. Our results suggest that CrO_2 may be considered more like a bad metal rather than a normal metal.

This work is also supported by DFG through FOR1346.

HL 99.2 Fri 9:45 H20

Initial stages of epitaxial growth of Fe_3O_4/MgO (001) thin films: atomic reconstruction at the polar interface — •Chun-Fu Chang[1], Zhiwei Hu[1], Stefan Klein[2], Ronny Sutarto[2], Philipp Hansmann[2], Arata Tanaka[3], Julio Criginski Cesar[4], Nicholas Brookes[4], Hong-Ji Lin[5], Hui-Huang Hsieh[6], Chien-Te Chen[5], A. Diana Rata[1], and Liu Hao Tjeng[1] — [1]Max Planck Institute for Chemical Physics of Solids, Dresden, Germany — [2]II. Physikalisches Institut, Universität zu Köln, Köln, Germany — [3]Department of Quantum Matter, ADSM, Hiroshima University, Hiroshima, Japan — [4]ESRF, Grenoble Cédex, France — [5]NSRRC, Hsinchu, Taiwan — [6]Chung Cheng Institute of Technology, National Defense University, Taoyuan, Taiwan

By means of reflection high energy electron diffraction and Fe $L_{2,3}$ x-ray absorption spectroscopy we find evidence for an atomic structural reconstruction at the interface of polar Fe_3O_4/MgO (001) thin films. This reconstruction takes place over several monolayers, while each monolayer still preserves the Fe_3O_4 stoichiometery. Our findings for such a transition interface layer may have important implications especially in the field of spintronics, where ultrathin Fe_3O_4 films are widely used for various sensitive devices.

HL 99.3 Fri 10:00 H20

Investigation of the Verwey transition in Fe_3O_4 thin films — •Xionghua Liu, Akfiny Hasdi Aimon, A. Diana Rata, Chun-Fu Chang, and Liu Hao Tjeng — Max-Planck-Institut für Chemische Physik fester Stoffe, Dresden, Germany

Magnetite Fe_3O_4 is one of the most investigated materials from the class of transition metal oxides. It shows a first-order anomaly in the temperature dependence of the electrical conductivity at T_V= 120 K, the famous Verwey transition. However, thin films of Fe_3O_4 show always a lower T_V compared to the bulk material. In order to find out the reason for the decreased T_V in magnetite thin films we have performed a systematic investigation of the transport properties in dependence of the oxygen pressure and thickness. Epitaxial Fe_3O_4 films were grown by Molecular Beam Epitaxy on MgO(100) and $MgAl_2O_4$ (100) substrates and the structural and spectroscopic characteristics were in-situ determined by RHEED and XPS, respectively. Resistivity measurements have been performed ex-situ by PPMS. Results of this study and ongoing work will be presented.

HL 99.4 Fri 10:15 H20

Electronic Structure and Magnetic Properties of Sc doped EuO Thin Films — •Andreas Reisner[1], Simone Altendorf[1], Chun-Fu Chang[1], Hong-Ji Lin[2], Chien-Te Chen[2], and Liu Hao Tjeng[1] — [1]Max-Planck-Institute for Chemical Physics of Solids, Nöthnitzer Str.40, 01187 Dresden, Germany — [2]National Synchrotron Radiation Research Center, Hsin-Ann Road, 30076 Hsinchu, Taiwan, R.O.C.

Europium monoxide is a ferromagnetic semiconductor with a Curie temperature T_C of 69 K. Upon doping the material can show an increase of the Curie temperature, a metal-to-insulator transition and a high spin polarization of the charge carriers. Applying pressure can also enhance T_C. Mostly other trivalent rare earth metals are used as dopant. Here we set out to explore the possibility of using transition metals as dopants. As a start we focus on the non magnetic Sc ions. We are able to achieve excellent crystalline growth of Sc-doped EuO thin films on YSZ (001) substrates using molecular beam epitaxy. We will report our results on the crystal structure as characterized by RHEED and LEED, the electronic structure as determined by XPS and ARPES, and on the magnetic propertes as measured by SQUID.