# MA 6: Complex Magnetic Oxides

Time: Monday 11:00–12:00 Location: H37

MA 6.1 Mon 11:00 H37

**Polaronic behavior in $La_{1.2}Sr_{1.8}Mn_2O_7$** — •Daniel Jost[1], Matteo Rossi[1], Hsiao-Yu Huang[2], Amol Singh[2], Di-Jing Huang[2], Yonghun Lee[1,3], Brian Moritz[1], John Mitchell[4], Zhi-Xun Shen[1,3,5,6], Thomas Devereaux[1,7], and Wei-Sheng Lee[1] — [1]Stanford Institute for Materials and Energy Sciences, Menlo Park, USA — [2]National Synchrotron Radiation Research Center, Hsinchu, TW — [3]Department of Physics, Stanford University, Stanford, USA — [4]Materials Science Division, ANL, Lemont, USA — [5]Department of Applied Physics, Stanford University, USA — [6]Geballe Laboratory for Advanced Materials, Stanford University, USA — [7]Department of Materials Science and Engineering, Stanford Univeristy, USA

The microscopic mechanism driving colossal magneto-resistance (CMR) remains controversial. In $La_{1.2}Sr_{1.8}Mn_2O_7$, CMR is most pronounced at its insulator to ferromagnetic-metal transition at $T_c$ = 120 K. In this compound, initial ARPES studies revealed the abrupt formation of quasi-particles having a strong mass renormalization below $T_c$, subsequently interpreted as the condensation of localized polarons into a coherent polaronic liquid. Yet, conflicting results showing finite quasi particle spectral weight above $T_c$ cast doubt on this scenario. Here we use resonant inelastic X-ray scattering (RIXS) to investigate this controversy. In contrast to ARPES which measures the single particle spectral function, RIXS probes collective excitations directly and is thus especially suitable for the investigation of charge-lattice coupled phenomena. In this presentation, I will discuss the RIXS signatures of polarons in $La_{1.2}Sr_{1.8}Mn_2O_7$.

MA 6.2 Mon 11:15 H37

**Magneto-optic Kerr effect in ferromagnetic manganite multilayers** — •Jörg Schöpf, Paul H.M. van Loosdrecht, and Ionela Lindfors-Vrejoiu — Universität zu Köln, II. Physikalisches Institut, Zülpicherstr. 77, 50937 Köln (DE)

Magnetic functional oxide epitaxial thin films and heterostructures offer a rich variety of physical properties due to lattice mismatch induced strain, interfacial effects and interlayer coupling between different ferromagnetic (FM) layers. The magneto-optic Kerr effect (MOKE) can be used as an indirect probe of the magnetization of a sample. The MOKE of a material is wavelength dependent, and is non-monotonic in the vicinity of MO-active transitions, where the Kerr rotation can change sign and even vanish at particular wavelengths. Knowledge of the wavelength dependence can help to distinguish the contributions of different FM layers within a multilayer to the total measured Kerr effect. Here we present a study on the MOKE of a heterostructure of 10% Ru-doped La0.7Sr0.3MnO3 (LSMRO), where the layers are of different thickness (30 nm bottom layer and a 10 nm top layer), and separated by a NdNiO3 spacer. We found that the measured Kerr hysteresis loops of the heterostructure have an anomalous shape originating from a different sense of rotation of the MOKE from the different LSMRO layers. This can readily be described by Kerr-loops measured on reference samples using the additivity of the MOKE in multilayer systems.

MA 6.3 Mon 11:30 H37

**Strain-induced ferromagnetism in LaCoO3 thin film** — •Farzin Abadizaman, Michal Kiaba, and Adam Dubroka — Department of Condensed Matter Physics, Faculty of Science, Masaryk University, Kotlářská 2, 611 37 Brno, Czech Republic.

Ellipsometry measurements were performed on unstrained, tensile strained, and compressive strained LaCoO3 thin films. Only the tensile strained sample shows ferromagnetism, which has a Currie temperature of about 85 K. Using the differential optical conductivity, $\delta\sigma_1 = \sigma_1(T) - \sigma_1(T = 7K)$, we find that in the tensile strain sample, while the spectral weight $N_{eff} = 2mV/\pi e^2 \int \sigma_1(\omega), d\omega$ below 3.5 eV decreases with decreasing temperature in the paramagnetic phase, it starts increasing in the ferromagnetic phase below the transition temperature. This is the first time that the ferromagnetism in this material is observed via optical measurements, and we interpret the results as stabilization of the high-spin state in the ferromagnetic phase associated with transition of spectral weight from higher to lower energy region.

MA 6.4 Mon 11:45 H37

**Spin-Orbit Excitations in a Strongly Correlated 4d-Metal Studied by Resonant Inelastic X-ray Scattering** — •Valentin Zimmermann[1], Deniz Wong[2], Christian Schulz[2], Maciej Bartkowiak[2], Klaus Habicht[2], Arvind Yogi[3], Masahiko Isobe[1], Lichen Wang[1], Matteo Minola[1], Giniyat Khalliulin[1], Bernhard Keimer[1], and Matthias Hepting[1] — [1]Max-Planck-Institute for Solid State Research, Stuttgart, Germany — [2]Helmholtz-Zentrum Berlin für Materialien und Energie, Berlin, Germany — [3]UGC-DAE-Consortium for Scientific Research, Indore, India

Spin-orbit coupling (SOC) is an important player determining the electronic and magnetic properties of 4*d* and 5*d* transition metal oxides. The 5*d* compound $Sr_2IrO_4$ is an antiferromagnetic Mott insulator, where SOC leads to a splitting of the $t_{2g}$ manifold into bands with effective total angular momentum $J_{eff}$ = 3/2 and 1/2. This electronic structure gives rise to low-energy excitations with excitonic character, which were recently studied by resonant inelastic X-ray scattering (RIXS) and assigned to the transition of holes across the spin-orbit split states. Here, we use RIXS at the oxygen K-edge to investigate the isovalent 4*d* compound $Sr_2RhO_4$, which is a paramagnetic, strongly correlated metal. We observe similar spin-orbit excitons as in $Sr_2IrO_4$, however, on a smaller energy scale and with a distinct dispersion, which we attribute to a reduced SOC strength and the metallic ground state, respectively. In addition, we explore whether the solid-solution $Sr_2Rh_{1-x}Ir_xO_4$ is a viable platform to tune the effective strength of SOC.