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Antiferromagnetic instability in $Sr_3Ru_2O_7$: stabilized and revealed by dilute Mn impurities MUHAMMED HOSSAIN, University of British Columbia (UBC), B. BOHNENBUCK, Max-Planck Institute, Y.-D. CHUANG, E. CRUZ, Advanced Light Source, LBNL, H.-H. WU, L.H. TJENG, Universität zu Köln, I.S. ELFIMOV, UBC, Z. HUSSAIN, Advanced Light Source, LBNL, B. KEIMER, Max-Planck Institute, G.A. SAWATZKY, A. DAMASCELLI, UBC — X-ray Absorption Spectroscopy (XAS) and Resonant Elastic Soft X-ray Scattering (RESXS) studies have been performed on Mn-doped $Sr_3Ru_2O_7$, both on the Ru and Mn L-edges, to investigate the origin of the metal insulator transition. Extensive simulations based on our experimental findings point toward an intrinsic antiferromagnetic instability in the parent $Sr_3Ru_2O_7$ compound that is stabilized by the dilute Mn impurities. We show that the metal-insulator transition is a direct consequence of the antiferromagnetic order and we propose a phenomenological model that may be applicable also to metal-insulator transitions seen in other oxides. Moreover, a comparison of Ru and Mn L-edge data on 5% Mn doped system reveals that dilute Mn impurities are generating much more intense signal than Ru which is occupying 95% of the lattice sites. This suggests the embedding of dilute impurities as a powerful mean to probe weak and, possibly, spatially inhomogeneous order in solid-state systems. In collaboration with: Y. Yoshida (AIST), J. Geck, D.G. Hawthorn (UBC), M.W. Haverkort, Z. Hu, C. Schüßler-Langeheine (Cologne), R. Mathieu, Y. Tokura, S. Satow, H. Takagi (Tokyo), J.D. Denlinger (ALS).

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