Max Planck Research Department for **Structural Dynamics**

SEMINAR

November 29th, 2010 - 3:00 pm

Seminar Room 108, DESY Bldg. 49

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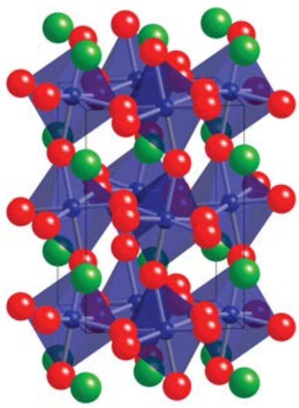
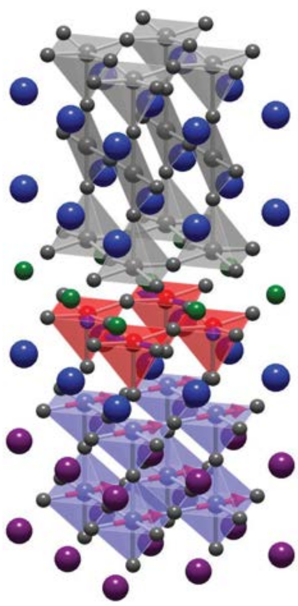
Understanding and Controlling Phases of Complex Oxides

Complex oxides are a class of materials containing a variety of competing strong interactions that create a subtle balance to define the lowest energy state, which leads to a wide variety of interesting properties (e.g. superconductivity, magnetism,...). These states arise from the interaction between the charge, orbital, spin, and lattice degrees of freedom. Within this class of materials one of the most interesting questions is how to control the ground-states in which the system resides (e.g. metal vs. insulator). However, to understand the resulting properties requires a detailed knowledge of the structural, chemical, and magnetic properties.



Here I will present some recent highlights illustrating how the use of polarized x-ray spectroscopy and scattering has been harnessed to understand the resulting lowest energy state. In this talk, I will present some recent results for the case of external control of a bulk system ($Pr_{0.7}Ca_{0.3}MnO_3$) close to a phase boundary [1], highlight how strain can be used to control unique magnetic and electronic phenomena for complex oxide surfaces and interfaces [2-8], and finally an introduction to our new materials discovery program to rationally synthesize oxides by combining in-situ x-ray studies of growth with the theory of synthesis.



[1] M. Rini et al. Phys. Rev. B 80, 155113 (2009).
[2] J.W Freeland et al. Nature Materials 4, 62 (2005).
[3] J. Chakhalian, J.W. Freeland et. al. Nature Physics 2, 244 (2006).
[4] V.B. Nascimiento, J.W. Freeland, et al. Phys. Rev. Lett. 103, 227201 (2009).
[5] J.W Freeland et al. Phys. Rev. B 81, 094414 (2010).
[6] J. Chakhalian, J.W. Freeland et. al. Science 318, 1114 (2007).
[7] J.W. Freeland et. al. arXiv:1008.5618

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Host: Andrea Cavalleri, MPSD, CFEL