Evolution of magnetic structures and correlated transport behavior of perovskite manganites

Presenter :**Indu Dhiman**[1]

https://scholar.google.com/citations?user=4-SloEAAAAAJ&hl=en

The work presented here was mainly carried out at Bhabha Atomic Research Center, Mumbai, India

Half doped manganites $R_{0.5}A_{0.5}MnO_3$ (R: a trivalent earth ion, A: a divalent alkaline earth ion) are of considerable research interest due to strong coupling between charge, orbitals and spins. The lecture will present how A- and B-site disorder effect the magnetic and crystal structure and concomitant variation of magnetic and transport properties of charge ordered manganites. The crystal and magnetic structure as a function of temperature (5-300K) were investigated by neutron diffraction technique employing polarized and unpolarized neutrons, in combination with other techniques.

We have studied the effect of A-site disorder on the nature of magnetic ordering in charge and orbitally ordered $La_{0.5}Ca_{0.5}MnO_3$ manganite by ionic substitution on the La^{3+} and Ca^{2+} sites covering a wide range of ionic radii $\langle r_A \rangle$ and disorder σ^2. The phase boundaries across different magnetic phases are not sharp, and evidence of short range ordering above the transition temperature has been found. External and internal pressure have analogous effects on magnetic structure.

We have also studied the influence of B-site disorder in $La_{0.5}Ca_{0.5}Mn_{1-x}B_xO_3$ and $(La_{0.3} Pr_{0.7})_{0.65}Ca_{0.35}Mn_{1-x}B_xO_3$ on the respective CE- and Pseudo CE-type antiferromagnetic ground states. As against A-site disorder, the few percent of Mn-site doping favors suppression of CE-/pseudo CE-type anti ferromagnetic order with the evolution of several coexisting competing magnetic states. Interestingly, contrasting nature in favoring of various magnetic phases with different (magnetic and non-magnetic) B-site dopants is found. Our studies show the evolution of A-type antiferromagnetic state driven by non-magnetic B-site dopants, in lieu of theoretically proposed C-type antiferromagnetic state.

---

[1] Now at BNC, Centre for Energy Research, Budapest, Hungary

Brief research background

Dr Indu Dhiman obtained her Ph. D. under the aegis of the Mumbai University DAE collaboration under the supervision of Dr. Amitabh Das and Dr. S. L. Chaplot, working at the Solid State Physics Division of the Bhabha Atomic Research Centre (BARC), Mumbai (Mar. 2006–Aug. 2011).

Her scientific expertise comprises with comprehensive experience in the field of materials science and low temperature physics: magnetism, strongly correlated systems and superconductors, molecular dynamic simulations, neutron diffraction / scattering and transmission while including various laboratory based techniques. This is combined with hands on experience at various beamlines worldwide in facilities at BARC, Mumbai India; Helmholtz Zentrum Berlin (HZB), Germany; Oak Ridge National Laboratory (ORNL), USA and currently at the Center for Energy Research at the Budapest Neutron Center (BNC), Hungary.

During her postdoctoral tenures at HZB Germany (Aug. 2012 – Dec. 2015), and ORNL USA (Dec. 2015 – Dec 2018), she was involved in polarized and unpolarized neutron radiography measurements towards the study of Meissner effect and flux trapping behavior in superconductors, also research topics such as water uptake in plants, geochemistry, packing in granular materials and Li ion battery research.

In her current role at BNC, she is working as an instrument scientist on a neutron diffraction beamline MTEST. Her responsibilities include, but are not limited to, serving as a local contact, instrument upgrade, sample environment development and related softwares.