Investigation of cubic $La_{0.2}Sr_{0.8}MnO_3$: an Overview

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Abstract

In this talk I will an overview on the investigation done on $La_{0.2}Sr_{0.8}MnO_3$. At room temperature, $La_{0.2}Sr_{0.8}MnO_3$ stabilizes in cubic structure with space group $Pm\bar{3}m$. This material exhibits interesting phase transitions; cubic to tetragonal, paramagnetic to C-type antiferromagnetic, and metal to insulator transition ~ 265 K. Our EXAFS studies carried out on this compound reveal distortion in the MnO_6 octahedra even in the cubic phase and exhibit direct connection between transport properties and the local structural parameters. Although the low temperature phase is insulating, the value of linear specific heat is high. To understand the microscopic origin of these complex behaviours, temperature dependent transmission electron microscopy (TEM), high resolution photoemission spectroscopic studies, high resolution x-ray diffraction and inverse photoemission studies were carried out. Our results show, at even room temperature there occur co-existence of two structural phases (cubic and tetragonal) and a pseudogap at the Fermi level. The cubic phase is charge ordered and the low temperature phase is tetragonal and non-charge ordered. Interestingly, charge ordering occurs only in intermediate temperature range. Pinning of chemical potential was observed at temperatures well below T_N and hard gap was opened only below 200 K. The inverse photoemission studies suggest the shift in the chemical potential towards the conduction band and localisation of disorder induced states closer to the conduction band. These results reveal the complexity of strongly correlated systems.