Temperature dependent electronic structure of $Sm_{0.1}Ca_{0.6}Sr_{0.3}MnO_3$ and $Sm_{0.1}Ca_{0.3}Sr_{0.6}MnO_3$

Manas Kumar Dalai
CSIR – National Physical Laboratory,
New Delhi

Abstract

Manganites with general formula $R_{1-x}A_xMnO_3$, where R and A are trivalent-rare and divalent-alkaline earth elements have spurred a lot of interest and excitement over last two decades mainly due to the colossal magneto resistance (CMR) effect. The electron doped side of such manganites have drawn relatively scant attention possibly due to substantially lower magnitude of CMR effect. The electron doped manganites are promising systems in view of their rich phase diagram. In view of the study on electron doped manganites, Sr doped $Sm_{0.1}Ca_{0.9}MnO_3$ has attracted great attention because of its diversified structural, magnetic, and electronic properties. In this talk, the temperature dependent electronic structure of $Sm_{0.1}Ca_{0.6}Sr_{0.3}MnO_3$ and $Sm_{0.1}Ca_{0.3}Sr_6MnO_3$ will be discussed from the high resolution photoemission data. For a comparison reason, we have judiciously chosen these two compositions (x=0.3 and 0.6) because of their different structural phases both at room temperature as well as low temperature. In the case of $Sm_{0.1}Ca_{0.6}Sr_{0.3}MnO_3$, the density of e_g states near the Fermi level increases at 200 K and reaches the maximum value at 295 K by moving from 50 to 295 K. However the temperature dependent changes in the case of $Sm_{0.1}Ca_{0.3}Sr_6MnO_3$ is quite different; there are no changes in the density of e_g states by varying the temperature from 50 to 200 K and a slight enhancement by further increase of temperature to 295 K. The enhancement of density of e_g states in the insulating phase of $Sm_{0.1}Ca_{0.3}Sr_{0.6}MnO_3$ is quite interesting and could be due to the thermal effect along with the associated structural properties. The temperature dependent variations in the near E_F density of states of $Sm_{0.1}Ca_{0.6}Sr_{0.3}MnO_3$ and $Sm_{0.1}Ca_{0.3}Sr_{0.6}MnO_3$ are very interesting and will be discussed by considering their structural, transport and magnetic properties reported earlier.