Magnetic and transport properties of $La_{0.5}Sr_{0.5}(Fe_xCo_{1-x})O_3$ ($0 \leq x \leq 0.2$) perovskites

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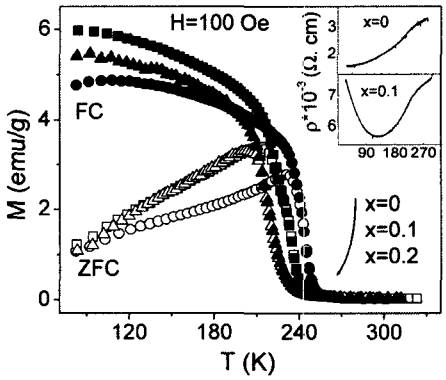
$La_{0.5}Sr_{0.5}CoO_3$ is one of candidates remarkably that has recently been chosen as a typical cluster-glass (CG) member of the $La_{1-x}Sr_xCoO_3$ system in several studies [1-2]. However, the understanding on the origin of spin-glass or cluster-glass behaviors is still in discussion. In a streamline of this interest, we investigated the influence of the Fe doping on magnetic and transport properties of the series $La_{0.5}Sr_{0.5}(Fe_xCo_{1-x})O_3$ ($0 \leq x \leq 0.2$). It is shown that the ferromagnetic to paramagnetic transition temperature (T_c) decreases slightly with increasing the Fe-doped content up to x=2 (see Figure), due to development of a weak atiferromagntic (AF) Co-O-Fe compared to the pre-existing ferromagnetic Co-O-Co double exchange (DE). At higher Fe dopant, there is an additional appearance of antiferromagnteic Fe-O-Fe [3] super-exchange interactions that suppress the ferromagnitism and the conductivity. It is worthy noting that an upturn of the resistivity emerges at low temperatures (see the inset), liking to the weaking of correlations and the development of frustration and disorder. Thereby, we strongly suggest that the frustration and disorder induced by the Fe doping at the B-site (B=Co) are the origin of the spin-glass-like behavior.



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