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Comparison of the Magnetization Behavior in Nd and Sm Substituted $La_{0.7}Pb_{0.3}MnO_3$ Systems

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In this work, the magnetization behavior of two maganite oxide systems, $La_{0.7-x}Nd_xPb_{0.3}MnO_3$ and $La_{0.7-x}Sm_xPb_{0.3}MnO_3$, has been synthesized. The partial replacement of La ions by Nd or Sm results in a considerable decrease in the ferromagnetic ordering temperature Tc and clearly irreversible behavior in the field-coolingand zero-field-cooling curvesat a low applied field, showing a short-range spin order phase. These facts are in agreement with the smaller ionic radii of Nd (0.127 nm) and Sm (0.124 nm) ions in contrast to La ion(0.136 nm), and the corresponding larger distortion of perovskite structures. The saturation magnetization M_S is increase as Nd content increase (shown in Fig. 1) relative to the decrease of M_S as Sm content increase (shown in Fig. 2). This can be interpreted in terms of the competition between suppression of ferromagnetism due to structure tuning induced by the small ionic radius of the interpolated cation into the La-site and increase of ferromagnetic spins due to the introduce of magnetic Nd or Sm ions with *f*-shell electrons.

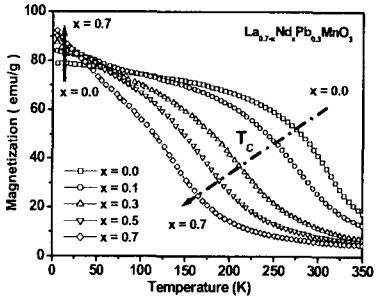

Fig. 1. Temperature dependence of magnetization curves in an applied field of 50 kOe for the $La_{1-x}Nd_xPb_{0.3}MnO_3$ compounds.

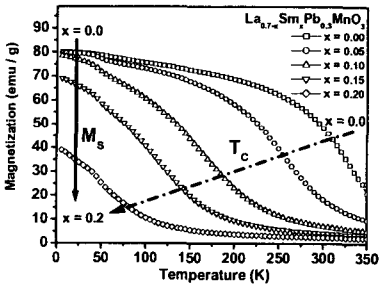

Fig. 2. Temperature dependence of magnetization curves in an applied field of 50 kOe for the $La_{1-x}Sm_xPb_{0.3}MnO_3$ compounds.

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Dissipative Dynamics of Vortices in Cuprates

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In cuprates La_{2-x}Sr_{x}CuO_{4} (LSCO), due to inherent strong coupling of charge and spin degrees of freedom, the structure of spin system essentially influence the charge transport in those systems. The spin structure of LSCO is determined by the fact that the holes have a magnetic moment. As one knows in that case the spiral phase in spin system is possible. Because of random distribution of dopant ,i.e. also the holes, the spin glass(SG) phase is formed(0.02<x<0.05). In SG phase the rotational symmetry is completely broken.The SG phase has the global SO(3) symmetry and the relevant order parameter is a rotaton matrix. In a system with that topology of order parameter the topological excitations-Z_{2} non-Abelian vortices are possible. To make the Z_{2}vortex energy finite it should interact with an other field. The one possibility is interaction with an other vortex [1]. We state that Z_{2}vortex has finite energy in SG phase of LSCO due to interaction with frustrated background.

We have considered the structure of Z_{2} vortex that interacts with frustrated background spins, in SG phase ofLSCO. In our model frustrations described by the gauge potential of SO(3) group (the Yang-Mills field) are coupled(minimally) to the SG order parameter. We have found that in the presence of frustrations the Z_{2}vortex has a finite energy, i.e. it can be thermally activated. The vortex structure of SG phase in LSCO is the essential feature of a spin structure of that material. Assuming that the charge carriers are attached to vortices we can conclude that the dissipative motion of Z_{2}vortices yields an electrical resistivity proportional to temperature, at high temperature [1].

REFERENCES

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