AS10

Structural and Transport Properties of B-site Cu Doped $La_{0.80}Sr_{0.20}MnO_3$ thin Film on $LaAlO_3$ by Spray Pyrolysis

Pawan Kumar[1], Ravikant Prasad[2], P. K. Siwach[2]*, R. K. Dwivedi[1], and H. K. Singh[2]

[1]Department of Physics & Materials Science, JIIT University, A-10, Sector-62, Noida-201307 (India)
[2]National Physical Laboratory, Dr. K. S. Krishnan Road, New Delhi-110012 (India)

*Corresponding Author: pksiwach@yahoo.com

Thin film of $La_{0.80}Sr_{0.20}Mn_{1-x}Cu_xO_3$ (LSMCO) with x = 0.00, 0.02, 0.04, 0.08, 0.10, 0.15 and 0.20 were deposited on single crystal $LaAlO_3$ (001) substrate at 250 ^oC by nebulized spray pyrolysis technique. Post deposition annealing has been done at ~ 920 ^oC for two hrs. Structural and transport characterization has been done by XRD and standard four probe technique, respectively. XRD reveals that all the films are single phase polycrystalline with rhombohedral crystal structure. The lattice parameters and particle size (~25 nm) remain unaffected by Cu doping. This has been attributed to lesser time given for grain growth in present Cu doped LSMO films. The Cu substitution result in uniform decrease in the insulator metal transition temperature (T_{IM}) from ~353 K (x~0.00) to ~323 K (x~0.10), then TIM drastically goes down to ~ 128 K for x ~ 0.15. For higher Cu concentrations the insulator metal transition vanishes. The variation in TIM with Cu can be explained on the basis of double exchange mechanism. Cu substitution perturbs the Mn^{3+}-O-Mn^{4+} network resulting in decrease in TIM. However, the observed resistivity variation with Cu doping do not show any systematic trend. The fact that the conductivity increases up to x=0.08 in whole temperature regime can be due to enhancement of Mn^{4+}/Mn^{3+} ratio with respect to the Cu free film. Above x=0.08, the conductivity increases. All the film show significant low field magnetoresistance measured at H=3 kOe. The peak MR at the vicinity of T_{IM} gradually shifts towards lower temperatures with increasing Cu content. We have also explored the electrical conduction at $T>T_{IM}$ in the frame work of the small polaron hopping in the adiabatic limit. The activation energy shows a strong dependence on the Cu concentration.

AS11

Low Field Room Temperature Magnetoresistance in Spray Pyrolysis Deposited $La_{0.7}Ca_{0.3-x}Ag_xMnO_3$ ($0 \leq x \leq 0.3$) Films

P. K. Siwach[1]*, Pankaj Srivastava[2], H. K. Singh[1], and O. N. Srivastava[2]

[1]National Physical Laboratory, Dr K S Krishnan Road, New Delhi-110012, India.
[2]Physics Department, Banaras Hindu University, Varanasi-221005, India.

*Corresponding Author E-mail: pksiwach@yahoo.com

Polycrystalline $La_{0.7}Ca_{0.3-x}Ag_xMnO_3$ ($0 \leq x \leq 0.3$) films have been deposited by low temperature chemical vapor deposition technique of spray pyrolysis on single crystal $LaAlO_3$ (100) substrate. XRD reveals single phase growth up to x ~0.2 and above that Ag segregation is observed. This suggests that solubility of Ag at the La/Ca site is limited to ~20%. Surface morphological characterization shows that Ag doping results in enlargement of grain size. Significant enhancement in insulator-metal transition (T_{IM}), Curie temperature (T_C) and room temperature magnetoresistance has been observed in Ag doped films. All the Ag doped films have single characteristic T_{IM} and T_C. The TIM increases from ~ 255 K for x= 0 to ~ 320 K for x= 0.3 while T_C goes up from ~ 265 to ~ 316K. All the films show significant LFMR around respective T_{IM} or T_C. The improved magnetotransport properties have been explained on the basis of disorder induced due to radii and valance fluctuations at La site and incorporation of nascent oxygen in the perovskite lattice as a consequence of Ag doping by spray pyrolysis. Our results suggest that for achieving Ag doping and tailoring magneto transport properties one should carefully use a low temperature synthesis technique such as spray pyrolysis or sol-gel.

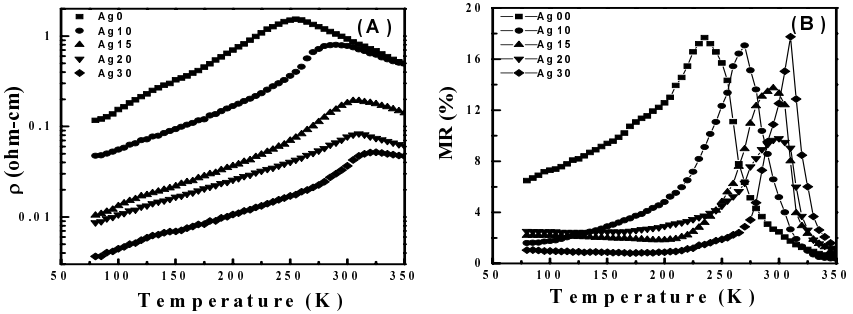

Fig. 1. (A) Temperature dependence of resistivity, (B) Variation of MR measured at 10 kOe with temperature, for $La_{0.7}Ca_{0.3-x}Ag_xMnO_3$ ($0 \leq x \leq 0.3$) films.