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Influence of Preparation Conditions on Properties of Superconductor Bi-2223 Thin Films

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From both of scientific and technology points of view, it is important to study effect of the thickness of film and substrate on the superconducting transition temperature, and also to examine thickness for the occurrence of superconducting states. In this case of high-temperature superconducting (HTS), the dimensionality of HTS has also been an interesting subject for understanding the mechanism of superconducting phenomena. Intensive studies on the preparation of high-Tc $Bi_2Sr_2Ca_2Cu_3O_{10+x}$(BSCCO) superconducting thin films have been reported [1]. Several fabrication techniques of Bi-2223 films have been performed, such as pulse laser deposition [2], molecular beam epitaxy [3], co-evaporation [4], metal organic chemical vapor deposition [5] etc.

We report the electrical transport properties of $Bi_2Sr_2Ca_2Cu_3O_{10+x}$ (Bi-2223) thin films fabricated by pulsed laser deposition on $SrTiO_3$ substrates. The aim of the study was to investigate the influence of prepared conditions on the properties of the films. Three studied processing parameters which are deposition temperature (T_S), annealing time (t_A) and deposition rate (r) were investigated. The results show that the optimal results as critical temperature, T_c=110K and critical current density, J_c=6.2×10^6 A/cm^2 at 20K are obtained at T_S=760^{o}C, t_A=4h and r=1.5Å/s. On the other hand we investigated effect of Li doped on the Bi-2223 thin films. The resistive transition in the presence of the magnetic field exhibits a broadening induced by the magnetic field and the broadening increases with rising field. The large broadening of resistivity curve in magnetic field suggests that this phenomenon is directly related to the intrinsic superconducting properties of this kind of oxide superconductors. The sudden drop in Jc as soon as a magnetic field is applied (H<0.5 Tesla) is due to the effect of Josephson weak-links at the grain boundaries.

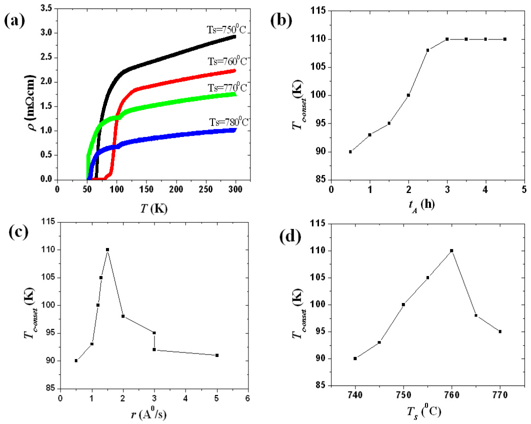

Fig. 1. (a) The temperature dependent resistivity of Bi-2223 doping Li thin films on $SrTiO_3$ substrate at different T_s, (b) effect of t_A, (c) effect of r, and (d) effect of T_S on the T_c of Bi-2223 thin films.

REFERENCES

[1] R.Simon, RF military electronics (RF design - August) 28 (2003).
[2] R.Rossler *et. al*, Physica C 361, 13 (2001).
[3] H.Fujino *et. al*, Physica C 362, 256 (2001).
[4] X.Cui *et. al*, Physica C 351, 75 (2001).
[5] M. Doudkowsky *et. al*, Chem. Phys. 288, 1 (1997).

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Physical Properties of $La_{0.45}Sr_{0.55}Mn_{1-x}Co_xO_3$

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The magnetic and the transport properties for $La_{0.45}Sr_{0.55}Mn_{1-x}Co_xO_3$ (x = 0, 0.05, 0.10 and 0.15) were investigated in this work. The samples were synthesized with the conventional solid-state reaction method. Figure 1 shows the temperature dependence of magnetization [$M(T)$] in a 100-Oe magnetic field. The parent sample $La_{0.45}Sr_{0.55}MnO_3$ undergoes the paramagnetic-ferromagnetic transition at T_C = 290 K and the ferromagnetic-antiferromagnetic transition at T_N = 191 K. The doping of Co ions enhances the ferromagnetism and suppresses the antiferromagnetism. The temperature dependence of inverse magnetic susceptibility [$M^{-1}(T)$] is shown in Fig. 2. The curves for all samples deviate from the Curie-Weiss linear behavior and show a sharp downturn above T_C. The deviation temperatures are the same for all doped samples (x = 0.05, 0.10 and 0.15), which is T_G = 368 K. These are the characteristics of the Griffiths singularity. We also investigated the relationship between magnetization and applied field, which further confirms the existence of Griffiths phase. The transport property measurements present that the doping of Co ions enhances the insulating properties. From the detailed analysis on these data, it can be concluded that there exists a ferromagnetic super-exchange J_2 interaction between Mn and Co ions, but that the enhancement of ferromagnetism originates mainly from the double-exchange interaction J_1 between Mn^{3+} and Mn^{4+} ions. J_1 is stronger than J_2, and J_2 acts as a dilute interaction in the Griffiths phase.

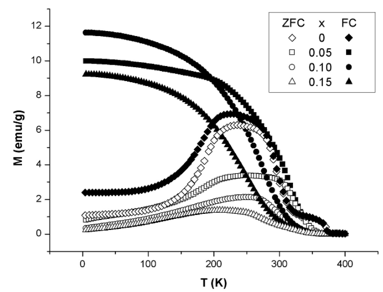

Fig. 1. Temperature dependence of the magnetization for $La_{0.45}Sr_{0.55}Mn_{1-x}Co_xO_3$.

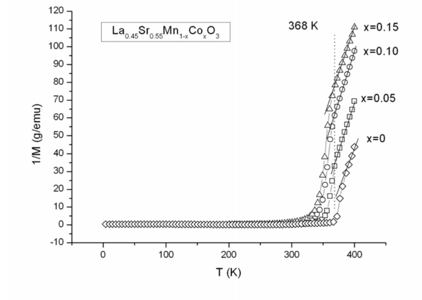

Fig. 2. Temperature dependence of the inverse magnetization for $La_{0.45}Sr_{0.55}Mn_{1-x}Co_xO_3$.