## CQ09

# Magnetotransport Studies on LCMO/STO Nanocomposites

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Nanocomposites LCMO($La_{0.67}Ca_{0.33}MnO_3$/STO($SrTiO_3$) have been synthesized by the solid state route having average grain size of LCMO in microns and that of STO in nano range. Structural and electrical transport studies have been done to complete immiscibility between the two phases. Electrical transport studies show that the composite samples of this series show two possible Colossal Magnetoresistance (CMR) effects - intrinsic and extrinsic. The intrinsic CMR effect observed around this transition temperature is caused by the 'double exchange' mechanism proposed by Zener [1] whereas the grain boundary MR or extrinsic CMR effect is reported to be due to natural or artificial grain boundaries [2,3]. Due to grain boundary alterations there is improvement in low field MR which make it more applicable by decreasing the field requirement.

### REFERENCES

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## CQ10

# Magneto-transport Properties of LSMO Films with Various Textures

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We report on microstructure, magnetic and magneto-transport properties of $La_{0.7}Sr_{0.3}MnO_3$ thin films, having various textures. Epitaxial LSMO films on MgO (001) single crystal substrate, 2 dimensionally (2D)-oriented films on IBAD (ion beam assisted deposition)-processed MgO layers on metal tapes[1], and 1D (or fiber)-textured LSMO films on MgO buffered $SiO_2$/Si substrate were prepared, respectively, by pulsed laser deposition (PLD) *in*-situ growing at 800°C and 400 mTorr oxygen. Randomly oriented LSMO films were also prepared by solid phase crystallization of amorphous films deposited by DC magnetron sputter at room temperature (RT). The solid phase crystallization (SPC) process was conducted on the amorphous films through post annealing at 900°C for 2 h in oxygen atmosphere. The phases and textures of the films were analyzed by XRD $\theta$-$2\theta$ and $\Phi$ scan and the microstructures of the films were revealed by SEM.

The samples information and properties are presented in Table 1. The Curie temperatures of all the films are higher than RT. The resistivity of the films most significantly increases with losing their texture. The 1-D and 2-D textured films show relatively large LFMR, while the epitaxial film show very small LFMR at 100 and 300K. The highest LFMRs of 16 % at 100K and 1% at 300K and 500 Oe are obtained at randomly oriented LSMO films, which is also superior as compare with reported data. The results are explaining that the magneto-transport of LSMO films is dominantly controlled by grain boundary properties, such as the angle between the grains and grain connectivity.

**Table 1.** Information of the LSMO films : Film thickness (t), Curie temperature ($T_C$), metal-insulator transition temperature ($T_{M\text{-}I}$), zero field resistivity ($\rho$) at 100 K, LFMR (=[R(Hc)-R(H)]/R(H) ×100 %) at 100 K and H=1500 Oe / 300 K and H=500 Oe, respectively.

| Substrate | Crystalline orientation | Growth method | t (nm) | $T_C$ (K) | $T_{M\text{-}I}$ (K) | $\rho$ ($\Omega$cm) | LFMR (%) |
|---|---|---|---|---|---|---|---|
| MgO (001) | epitaxial | PLD, In-Situ | 100 | 358 | 380 | $4.2\times 10^{-4}$ | ~ 0.2 / ~0.3 |
| IBAD MgO | 2D textured | PLD, In-Situ | 100 | 340 | 275 | $2.\times 10^{-3}$ | 6.2 / 0.23 |
| MgO/$SiO_2$/Si | c-axis oriented | PLD, In-Situ | 100 | 356 | 195 | 0.17 | 8.8 / 0.35 |
| $SiO_2$/Si | randomly oriented | SPC | 100 | 370 | 265 | 0.49 | 16.0 / 1.0 |

### REFERENCES

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