Transport Studies on Manganite Based Thin Film Composite

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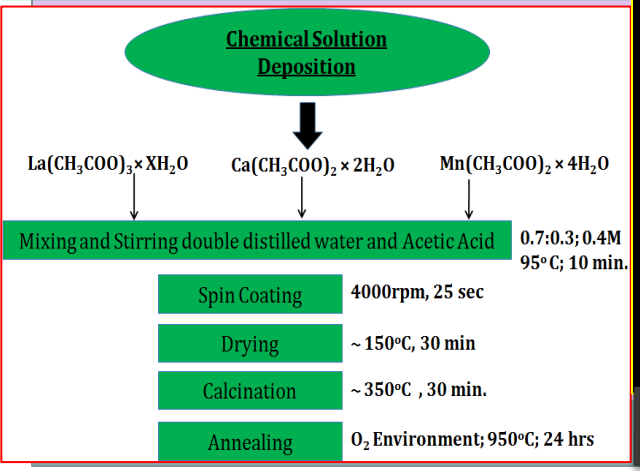
Introduction & Aim

Manganites are oxide ceramics having chemical formula: $R_{1-x}A_xMnO_3$ (R is the rare earth ions and A is monovalent / divalent / trivalent / tetravalent ions) with ABO_3 type perovskite structure.

In this communication, we have successfully synthesized manganite based $LaMnO_{3-\delta}$ / $La_{0.7}Ca_{0.3}MnO_3$ / $LaAlO_3$ (LMO / LCMO / LAO) thin film composite by using low cost and vacuum free chemical solution deposition (CSD) method. Our Aim is to understand the transport mechanisms in presently studied bi-layered thin film composite and its field sensitivity [electroresistance ER)] for better spintronic based device applications.



Results & Discussion

1. XRD studies reveal single crystalline nature of bi-layered composite with parallel epitaxial growth of LMO and LCMO layers onto LAO substrate
2. I – V characteristics of the interface showed that junction exhibits strong backward diode like behavior at higher applied voltage, well above cross over voltage (V_{NB}), below which interface demonstrates normal diode like behavior throughout the temperature range studied
3. Large electric field induced modulation of junction resistance of composite interface has been observed and electric field dependent electroresistance (ER) modifications at different temperatures have been studied

Conclusion

1. Temperature and voltage dependent backward diode like behavior has been observed, which has been described in the context of tunneling process induced increase in reverse current at higher applied voltage. Temperature dependent reduction in normal to backward diode like characteristic transition voltage has been discussed in the light of thermal reduction in depletion region
2. Complex temperature and field dependent ER behavior has been understood by considering a competition between charge injection, tunneling, modifications in depletion region and thermal processes across LMO / LCMO composite interface

Acknowledgement

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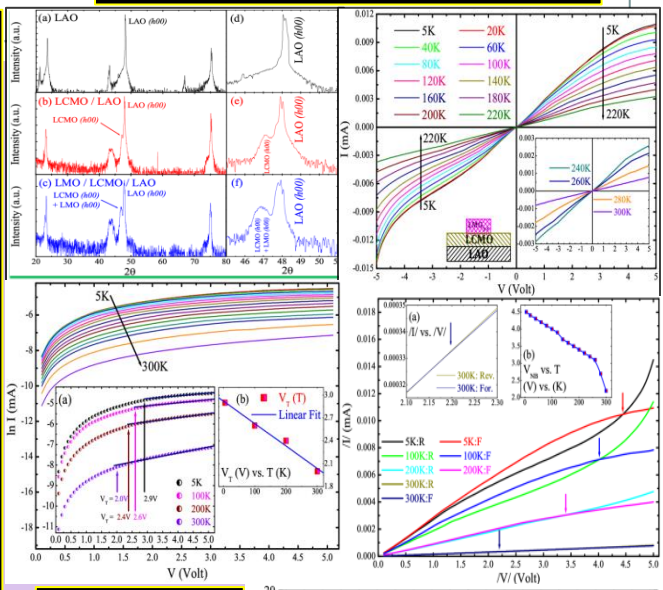
XRD & I-V Characteristics



ER vs. E