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Preparation of LSMO/BNT/CFO Thin Films by Pulsed Laser Deposition for Multiferroic Tunnel Junction Application

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Abstract—*Multiferroic coupling allows switching of the ferroelectric state with a magnetic field and vice versa. Interestingly, using multiferroic behavior, multiferroic tunnelling junctions (MFTJ), can act as a four-state resistive system leading to a new generation of memory device that can be electrically written and magnetically read. In literature there are two kinds of heterostructures that are used as multiferroic tunnel junctions (MFTJ) . First is a device in which two conducting ferromagnetic layers are separated by a thin ferroelectric layer of few nanometers thickness [1]. Another type of MFTJ is feasible in which the barrier itself is made of a material that exhibits multiferroic properties in the bulk phase [2]. Four state non-volatile memories based on such multiferroic tunneling junctions are very favorable for the future of memory industry. In our work, we have explored this idea little further and inted to exploit the magnetostrictive effect of the magnetic layer on tunneling resistance.*

We have deposited La0.67Sr0.33MnO3 (conducting ferromagnetic oxide), CoFe2O4 (magnetostrictive oxide) and Bi0.5Na0.5TiO3 (ferroelectric oxide) hetrostructures by pulsed laser deposition (PLD) technique. For the deposition of thin films, parameters like substrate temperature, oxygen pressure, fluence, frequency, target to substrate distance and annealing condition etc. have been optimized. Bilayered and trilayered hetrostructures of conducting oxides, magnetostrictive oxides and ferroelectric oxides have been prepared. X-ray diffraction (XRD) measurements confirmed the formation of desired phase. EDX spectra confirms the presence of different elements in proper proportion. Atomic force microscopy (AFM) measurement is used to study the surface morphology of deposited thin films.

References

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