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Colossal Piezoresistance in strained $La_{0.67}Sr_{0.33}MnO_3$ thin films[1]

MARIA VIITANIEMI, IN HAE KWAK, AMLAN BISWAS, Department of Physics, University of Florida, Gainesville, FL 32611 — Piezoresistance is the change in electrical resistance as a function of strain. A known mechanism leading to piezoresistance is thermodynamic phase separation. It has been shown that the compound $(La_{1-y}Pr_y)_{1-x}Ca_xMnO_3$ (LPCMO) exhibits colossal piezoresistance (CPR) at low temperatures due to electronic phase separation. For use in many applications, such as sensors, materials must exhibit CPR near room temperature. A possible candidate compound is $La_{0.67}Sr_{0.33}MnO_3$ (LSMO) which has a Curie temperature of approximately 350 K. However, bulk LSMO single crystals do not show CPR since such samples are uniformly ferromagnetic and metallic with no phase separation. In this study, we examine the piezoresistance of ultrathin LSMO films grown on $SrTiO_3$ (STO) substrates using a three-point beam bending method to control the compressive and tensile strain. It has been suggested that the lattice mismatch strain due to the substrate induces phase separation in these thin films. We have observed CPR in such strained LSMO thin films even at room temperature.

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