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Characterization of Anisotropy in Manganite (LPCMO) Thin Films G. SINGH-BHALLA, S. TONGAY, T. DHAKAL, R. RAIRIGH, A. BISWAS, A.F. HEBARD, University of Florida — Resistance measurements on thin films of strongly correlated electronic materials that have anisotropic properties due to atomic layering and/or substrate induced strain are primarily sensitive to in-plane conduction paths and therefore fail to capture any information about perpendicular transport. We present an experimental technique in which the films under investigation, pulse laser deposited $(La_{1-y}Pr_y)_{5/8}Ca_{3/8}MnO_3$ (LPCMO) with thicknesses in the range 300-900 Å, comprise the base electrodes of trilayer capacitor structures, thus allowing the simultaneous characterization of dc transport (resistance) in the parallel direction and ac transport (capacitance) in the perpendicular direction. For a given film, we find two distinct direction-dependent insulator-metal percolation transitions reflecting the competition between insulating and ferromagnetic metallic phases. With increasing thickness, the temperature difference between these transitions decreases. This decrease occurs because the presence of a strain-stabilized ferromagnetic metal phase at the LPCMO/substrate ($NdGaO_3$) has less of an effect on transport as the thickness increases and the LPCMO manifests isotropic bulk behavior.

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