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Anisotropic Transport in Manganite Films: Tuning Emergent Electronic Phase Separation THOMAS Z. WARD, JOHN BUDAI, JIAN SHEN, Oak Ridge National Laboratory — Emergent electronic phase separation has been linked to many exciting behaviors such as the metal-insulator transition, colossal magnetoresistance, and high Tc superconductivity. The intricate energy overlaps of spin-charge-lattice-orbital interactions in complex materials that lead to electronic phase separation have made the phenomena very difficult to study. By selectively tuning the elastic energy in manganite films, we have uncovered never before seen anisotropic transport properties that answer fundamental questions on the role of electronic phase separation in manganites. Using La[5/8-x]Pr[x]Ca[3/8]MnO[3] (x = 0.3) (LPCMO) as a model system, we have found that we can selectively induce anisotropic electronic domain formation along one axis of a pseudocubic perovskite single crystal thin film manganite by epitaxially locking it to an orthorhombic substrate. Simultaneous temperature-dependent resistivity measurements along the two perpendicular in-plane axes show significant differences in the metal-insulator transition temperatures and extraordinarily high anisotropic resistive behaviors on macroscales. These findings show that emergent electronic phase domain formation can be selectively tuned over long distances which gives us a fuller understanding of the balanced energetics that drive emergent behaviors in complex materials.

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