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Colossal electroresistance in phase separated manganite nanobridges[1] G. SINGH-BHALLA, A. BISWAS, A. F. HEBARD — We have examined the electric field effect on the nanometer scale in the manganite (La,Pr,Ca)MnO$_{3}$which is well known for its micrometer scale phase separation (PS) into coexisting metallic and insulating regions. When thin films of this material are patterned into micrometer and nanometer wide bridges, alternating insulating and metallic regions may form along the length of the bridge within the PS temperature range. At the onset of PS, nanoscale ferromagnetic islands appear within the insulating antiferromagnetic background. Within this temperature range, transport properties along the length of the bridge are reminiscent of transport across metallic islands in the Coulomb blockade regime. Applications of a magnetic field induce unusual bifurcations in the current-voltage characteristics implying either a change in resistance arising from spin canting or a change in the ferromagnetic phase fraction. Next, within the micrometer scale PS temperature regime, current-voltage measurements reveal colossal, step like drops in resistance with increasing current. We will discuss our results both in the context of previously considered models for manganite electroresistance and new interpretations with a focus on the microscopic details of the metallic and insulating regions.

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