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Unusual Hall effect of $La_{0.67}Ca_{0.33}MnO_3$ thin films with percolative phase transition LIUQI YU, XIAOHANG ZHANG, S. VON MOLNAR, P. XIONG, Florida State University, LINGFEI WANG, W. WU, Heifei National Lab for Physical Science at Microscale, USTC — Detailed transport measurements have been performed on three PLD-grown epitaxial $La_{0.67}Ca_{0.33}MnO_3$ (LCMO) thin films on $NdGaO_3$ (NGO) substrate. The films were grown under identical conditions (735°C substrate temperature and 45 Pa O_2 pressure) but post-annealed at 780°C in flowing O_2 for 1, 10 and 20 hours respectively to produce increasing degrees of strain relaxation which could lead to charge-ordered states.[1] In all three samples, the Hall resistivity in the paramagnetic phase takes on two distinct slopes: a negative slope at low fields which decreases with increasing temperature, and an almost temperature-independent positive slope at high fields. It is found that the switch in the Hall resistivity slope occurs at the same critical magnetization regardless of both temperature and magnetic field, which we interpret as an indicator of the percolative nature of the phase transitions.[2] In the two strain-relaxed samples, pronounced dips in the Hall resistivity are observed near the transition temperature. The apparent correlation of the appearance of the dips with increasing strain relaxation and their suppression by increasing in-plane magnetic field suggests a possible connection of the Hall resistivity dips with the presence of the charge ordered state. Work supported in part by NSF DMR-0908625.

[1]Z. Huang et al., JAP 105, 113919(2009)
[2]X. Zhang et al., PRL 103, 106602 (2009)

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