Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

In-situ TEM Analysis and Transport in Manganites $La_{5/8-y}Pr_yCa_{3/8}MnO_3$ Exhibiting Phase Separation below Metal-Insulator Transition V. VOLKOV, J. HE, T. OSAKA, Y. ZHU, Brookhaven National Laboratory, S. CHAUDHURI, R. BUDHANI, Indian Institute of Technology — Epitaxial films of doped $La_{5/8-y}Pr_yCa_{3/8}MnO_3$ (LPCMO: y = 0.275-0.375) manganites were examined by *in-situ* Lorentz microscopy and other TEM methods below the metal-insulator transition point T_{MI} ∼164 K. Such films are known for colossal magneto-resistance effect (CMR). Clear evidences were obtained for mesoscale two-phase separation process involving antiferromagnetic charge-ordered (AFM/CO) and ferromagnetic (FM) phases, coexisting below T_{MI} in LPCMO films. The first-order CO-FM phase transition is accompanied by partial magnetic melting of the CO phase at CO/FM interfaces thereby creating charge-disordered spin-glass metastates. In contrast, FM phase shows specific "zigzag" magnetic domains coupled with dense (101) crystal twins. This allows refining relations for charge-orbital and spin-ordering vectors in films. Transport resistance data show that T_{MI} point is decreased with Pr_y growth in LPCMO. On cooling films below T_{MI} their resistance drops by several orders in magnitude. The observed M-I transition shows striking linear relation for log-conductance curve versus FM fraction measured by TEM, which does not follow typical percolation equations, suggesting that percolation transport model in manganites needs further revisions.

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Date submitted: 18 Nov 2010 Electronic form version 1.4