Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Electronic Transport Properties of the $PrAlO_3/SrTiO_3$ Interface: Effects of Oxygen Pressure SHIRIN MOZAFFARI, MARK C. MONTI, Department of Physics, The University of Texas at Austin, SAMARESH GUCHHAIT, Microelectronics Research Center, The University of Texas at Austin, JEREMY W. PASTER, DANIEL M. TENNANT, JOHN T. MARKERT, Department of Physics, The University of Texas at Austin — We explored the electronic and magnetic behavior of epitaxial $PrAlO_3$ films on TiO_2-terminated $SrTiO_3$ (PAO/STO) substrates grown by pulsed laser deposition at various oxygen pressures. We report structural (x-ray and AFM), electronic (van der Pauw resistivity, magnetoresistance (MR), and Hall effect), and magnetic data for PAO films grown in 10^{-3}–10^{-6} torr O_2. Resistivity data exhibit metallic behavior from 300 K down to 100–150 K (75 K; 40 K) for the interface grown in 10^{-3} (10^{-4}; 10^{-5}) torr O_2, and semiconducting behavior below that. One 10^{-3} torr O_2 interface shows typical behavior for current parallel to atomic terraces, and a resistance anomaly in the range 50–100 K for current perpendicular to step edges. MR data for all 10^{-3}–10^{-4} torr O_2 samples show a small ($\leq$0.5%) positive MR at low fields, and a larger negative MR (2–30%) at high fields; for 10^{-5} torr O_2, the MR is positive up to 9 tesla. Sheet resistivity for the 10^{-6} torr O_2 interface is anomalously low, suggesting a thick conducting layer. Hall effect data exhibit several variations in the carrier density. We discuss these data considering intrinsic charge transfer, oxygen vacancies and interstitials, and cation interdiffusion.

John T. Markert
Department of Physics, The University of Texas at Austin

Date submitted: 11 Nov 2014 Electronic form version 1.4