

Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

**Oxygenation Dependence of the Resistance Upturn
in LaAlO₃/SrTiO₃ Heterostructures**¹

H. ZHANG, University of Toronto, K. A. MAJLAN, J. H. NGAI, University of Texas at Arlington, C. MCMAHON, D. G. HAWTHORN, University of Waterloo, J. Y. T. WEI, University of Toronto & Canadian Institute for Advanced Research — Among the phenomena exhibited by LaAlO₃/SrTiO₃ (LAO/STO) heterostructures, the appearance of a low-temperature resistance upturn has attracted much recent debate [1-4]. This phenomenon has been observed to co-occur with both nonlinear Hall effect and anisotropic magnetoresistance, and attributed to either Kondo effect, multiband conduction, or localization. It is primarily seen in samples grown by pulsed laser deposition, and is sensitive to film thickness, growth condition and electrostatic gating, all of which could affect the oxygen content. In this work, we study the effect of post-growth oxygenation on the resistance upturn in samples grown by molecular beam epitaxy, and how the Hall conductance and magnetoresistance are related to the occurrence of the upturn. X-ray photoelectron spectroscopy is used to monitor the valence states of Ti ions, in an effort to correlate them with the conduction and magnetic properties. Our results are analyzed in terms of oxygen vacancies in the presence of polar charge transfer, and the effect of these vacancies on the resistance upturn in LAO/STO heterostructures. [1] S. Das *et al.*, PRB 90 (2014). [2] V. K. Guduru *et al.*, PRB 88 (2013). [3] Z. Huang *et al.*, PRB 88 (2013). [4] C. Bell *et al.*, APL 94 (2009).

¹Work supported by NSERC, CFI/OIT, and the Canadian Institute for Advanced Research.

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Date submitted: 12 Nov 2015

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