Abstract Submitted for the MAR08 Meeting of The American Physical Society

Structural Basis of Conduction at LaAlO₃-SrTiO₃ Interfaces¹ ROY CLARKE, D. KUMAH, C. CIONCA, University of Michigan, P.R. WILLMOTT, Paul Scherrer Insitut, Swiss Light Source, R. HERGER, C.M. SCHLEPUETZ, S.A. PAULI, D. MARTOCCIA, B.D. PATTERSON, B. DELLEY, Paul Scherrer Institut, Y. YACOBY, Hebrew University, Jerusalem — We present new results on the application of the x-ray phase retrieval method, Coherent Bragg Rod Analysis (COBRA), to heteroepitaxial interfaces in LaAlO₃ thin films grown on SrTiO₃ substrates, a system known to form an interfacial quasi-2D electron gas. We observe a dilated, mixed-valence interface which modifies the electronic band structure, lowering the minimum of the conduction band below the Fermi level and thereby rendering the dilated interface conducting. In particular the COBRA measurements reveal the formation of an interfacial La,SrTiO₃ layer with an accumulation of trivalent Ti at the interface which is responsible for the lattice dilation and minimizes the electrostatic energy at the TiO₂-terminated SrTiO₃ substrate surface. The work presented here establishes a structural basis for the formation of the conducting interface.

¹Supported by Department of Energy, Basic Energy Sciences.

Roy Clarke University of Michigan

Date submitted: 02 Dec 2007 Electronic form version 1.4