Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Two-dimensional electron gas at the epitaxial alumina/$SrTiO_3$ interface: control of oxygen vacancies KRISTY KORMONDY, AGHAM POSADAS, University of Texas at Austin, THONG NGO, Univ of Texas, Austin, SIRONG LU, Arizona State University, NICHOLAS GOBLE, Case Western Reserve University, JEAN JORDAN-SWEET, IBM T.J. Watson Research Center, XUAN GAO, Case Western Reserve University, MARTHA MCCARTNEY, DAVID SMITH, Arizona State University, JOHN EKERDT, ALEXANDER DEMKOV, University of Texas at Austin — A highly interesting application for $SrTiO_3$ involves the formation of a high mobility two-dimensional electron gas (2DEG) at the oxide/oxide interface. We report on the conducting layer formed at the crystalline γ-alumina/$SrTiO_3$ (STO) interface which is attributed to oxygen vacancies. We describe the structure of thin γ-alumina layers deposited by molecular beam epitaxy on STO (001), as determined by reflection-high-energy electron diffraction, x-ray diffraction, and high-resolution electron microscopy. *In-situ* x-ray photoelectron spectroscopy was used to confirm the presence of oxygen vacancies at the interface. Electrical characterization indicates a higher sheet resistance for lower deposition temperature. A maximum electron Hall mobility of 3100 $cm^2V^{-1}s^{-1}$ at 3.2 K and room temperature mobility of 22 $cm^2V^{-1}s^{-1}$ are measured.

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Date submitted: 14 Nov 2014 Electronic form version 1.4