Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Nanoscale control at the $LaAlO_3/SrTiO_3$ Interface grown on LSAT[1] DANIELA BOGORIN[2], CHENG CEN, Department of Physics and Astronomy, University of Pittsburgh, Pittsburgh, PA 15260, CHUNG WUNG BARK, CHANG BEOM EOM, Department of Materials Science, University of Wisconsin-Madison, Madison, WI 53706, JEREMY LEVY, Department of Physics and Astronomy, University of Pittsburgh, Pittsburgh, PA 15260 — The two-dimensional electron gas (2DEG) that forms at the interface between two semiconductors or between a semiconductor and oxide is currently the basis for some of the most useful electronic devices. We are able to control the 2DEG interface between $LaAlO_3/SrTiO_3$ with nanoscale precision and create transistors, nanodiodes and other nanostructures. Future scaling of oxide nanoelectronics requires scaling to wafer sizes larger than what can be provided from $SrTiO_3$. $(LaAlO_3)_{0.3}$–$(Sr_2AlTaO_3)_{0.7}$ (LSAT) substrates can allow for coherently strained $LaAlO_3/SrTiO_3$ heterostructures to be created. A sharp insulator to metal transition occurs at 8 uc $LaAlO_3$ thicknesses, in contrast to what is observed for unstrained $SrTiO_3$ substrates. We describe the properties of nanoscale structures created at the 2DEG interface of $LaAlO_3/SrTiO_3$ grown on LSAT wafers and compare them with structures grown on bulk $SrTiO_3$ substrates.

[1]Work supported by NSF DMR-0704022 (J.L.), DARPA W911NF-09-10258 (J.L.), the Fine Foundation (JL), NSF DMR-0906443 (C.B.E.) and David and Lucile Packard Fellowship (C.B.E.)
[2]currently at Oak Ridge National Laboratory, Oak Ridge, TN 37831

Daniela Bogorin
Department of Physics and Astronomy,
University of Pittsburgh, Pittsburgh, PA 15260

Date submitted: 24 Nov 2010 Electronic form version 1.4