Nanoscale control at the LaAlO$_3$/SrTiO$_3$ Interface grown on LSAT\textsuperscript{1} DANIELA BOGORIN\textsuperscript{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$_2$AlTaO$_3$)$_{0.7}$ (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.

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