Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Theory of the Switchable Interfacial Metal-Insulator Transition in $LaAlO_3$ thin films on $SrTiO_3$ C. STEPHEN HELLBERG, Naval Research Lab, KRISTOPHER ANDERSEN, Northern Arizona University, CHENG CEN, JEREMY LEVY, University of Pittsburgh, STEFAN THIEL, GERMAN HAMMERL, CHRISTOF SCHNEIDER, JOCHEN MANNHART, Augsburg University — Although bulk $LaAlO_3$ and $SrTiO_3$ are both insulating, an electron gas can form at the interface between these compounds. For up to 2 unit cells (uc) of $LaAlO_3$, the interface remains insulating, while for 4 uc and beyond, it is metallic. For 3 uc films, the interface can be reversibly switched from metallic to insulating using voltages applied by an atomic force microscope (AFM). We present first- principles density functional calculations of $LaAlO_3$ films on $SrTiO_3$. We show the AFM induced interfacial metal- insulator transition can be explained by the formation and annihilation of oxygen vacancies on the $LaAlO_3$ surface.

C. Stephen Hellberg
Naval Research Lab

Date submitted: 27 Nov 2007 Electronic form version 1.4