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Role of lanthanum aluminate composition in interface formation with strontium titatnate ABDUL RUMAIZ, National Synchrotron Light Source II, Brookhaven National Laboratory, CONAN WEILAND, National Institute of Standards and Technology, GEORGE STERBINSKY, Advanced Photon Source, Argonne National Laboratory, C. STEPHEN HELLBERG, Center for Computational Materials Science, Naval Research Laboratory, JOSEPH WOICIK, National Institute of Standards and Technology, SHAOBO ZHU, DARRELL SCHLOM, Department of Materials Science and Engineering, Cornell University — While $LaAlO_3$ (LAO) and $SrTiO_3$ (STO) are both insulators, the interface between the two materials is conductive when the LAO is above a critical thickness and the STO is TiO_2-terminated; the origin of this conductivity is widely debated. It has also been demonstrated that the conductive interface depends on the composition of the LAO film: conductive interfaces were only found to occur for La:Al < 0.97. Hard x-ray photoelectron spectroscopy has been performed on ten unit cell thick Al-rich (La:Al $= 0.9$), stoichiometric (La:Al $= 1$), and La-rich (La:Al $= 1.1$) LAO films deposited on STO to elucidate the role of LAO composition in the interfacial structure. A small built-in potential was observed in the Al-rich film compared to the stoichiometric and La-rich films, as determined from valence-band broadening. The stoichiometric and La-rich films were also found to have La-enrichment at the interface, while the Al-rich film did not. These results combined with first-principles calculations demonstrate the role that defects in the LAO film play in the LAO/STO interfacial structure.

Conan Weiland
National Institute of Standards and Technology

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