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Transport Property Dependence on Surface Preparation Methods of $LaAlO_3/SrTiO_3$ Heterointerfaces[1] J.G. CONNELL, O.B. KORNETA, J. NICHOLS, S.S.A. SEO, Department of Physics and Astronomy, University of Kentucky — $LaAlO_3/SrTiO_3$ heterointerfaces have shown metallic, superconducting, insulating, and magnetic properties depending on their growth conditions. Here we show that the choice of substrate preparation method also affects the properties of the interface between $LaAlO_3/SrTiO_3$. Atomically flat $SrTiO_3$ (001) substrates have been prepared using the well-known buffered hydrofluoric acid (BHF) etching method and the deionized-water (DI-water) leaching method [1]. Epitaxial $LaAlO_3$ thin films then are deposited simultaneously via pulsed laser deposition. Metallic samples with $n_s > 10^{14}$ cm^{-2} display little difference in carrier concentrations. However, less metallic samples with $n_s < 10^{13}$ cm^{-2} demonstrate an order of magnitude difference in conducting carriers at low temperatures depending on the method of substrate preparation. This behavior is caused presumably by additional carriers provided by fluorine ions originating from the use of BHF in substrate preparation. These results indicate that the properties of oxide heterointerfaces are not only sensitive to deposition conditions, but also substrate preparation methods.

[1] J. G. Connell, B. J. Isaac, G. B. Ekanayake, D. R. Strachan, and S. S. A. Seo, Appl. Phys. Lett., **101**, 251607, (2012).

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