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Effect of Surface Engineering on $LaAlO_3/SrTiO_3$ Interfaces SANJAY ADHIKARI, West Virginia University, CHANG-BEOM EOM, University of Wisconsin, Madison, MICHAEL KLOPF, Jefferson Lab, CHENG CEN, West Virginia University — Carrier properties at the $LaAlO_3/SrTiO_3$ interfaces are highly sensitive to potential profile generated by $LaAlO_3$ top surface termination. In ambient environment, the uncontrolled surface exposure may introduce randomly distributed charge or polarization and therefore significantly impact interfacial transport by disorder related effect. As evidence, local fluctuation in carrier density and mobility has been observed in nanostructures defined by atomic force microscope (AFM) lithography. Here we report controlled modification of $LaAlO_3$ surface by solvent deposition. Surface desorption is first carried out by sample annealing in O_2 environment. The annealed $LaAlO_3$ surfaces are later coated with various solvents of controlled thicknesses by pulsed laser deposition using frozen targets. Coated surfaces are analyzed by pulsed force and frictional force microscopy. AFM lithography is also carried out to locally alter the surface charge state and modulate the potential disorder level. Effect of different controlled surface coatings on interface are studied by magneto-transport measurement

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