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Role of the surface in writing, erasing and maintaining nanostructures at the $LaAlO_3/SrTiO_3$ interface[1] FENG BI, DANIELA F. BOGORIN, CHENG CEN, JEREMY LEVY, University of Pittsburgh, CHUNG WUNG BARK, JAE-WAN PARK, CHANG-BEOM EOM, University of Wisconsin-Madison — Nanoscale control of the metal-insulator transition in $LaAlO_3/SrTiO_3$ heterostructures can be achieved using local voltages applied by a conducting AFM probe. The mechanism is believed to be governed by a "water cycle" in which the surface is locally charged via hydrogen passivation, resulting in high-resolution modulation doping of the $LaAlO_3/SrTiO_3$ interface.[2] A Kelvin probe image method is applied to study how water content in the gas environment influences such charge writing. Persistence tests are performed, in which the long-term behavior is studied by keeping the AFM-written nanostructures (nanowire and sketch FET[3]) in different ambient environments. The self-erasure process is particularly obvious in moisture environments, but is slowed greatly in dry inert gas and can be even halted under modest vacuum conditions ($\sim 10^{-3}$ Torr).

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[2]F. Bi et al., Appl. Phys. Lett.97, 173110 (2010)
[3]C.Cen et al., Science, 323, 1026 (2009)

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