Abstract Submitted
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Nanoscale control of the $LaAlO_3/SrTiO_3$ metal-insulator transition using a self-assembled monolayer of APTES[1] JIANAN LI, MENGCHENG HUANG, PATRICK IRVIN, JEREMY LEVY, University of Pittsburgh, SANGWOO RYU, CHANG-BEOM EOM, University of Wisconsin-Madison, DANIEL EICHELSDOERFER, KEITH BROWN, CHAD MIRKIN, Northwestern University — Nanoscale control over the metal-insulator transition at oxide interfaces represents an exciting opportunity for science and technology. Nanostructures created from 3-unit-cell $LaAlO_3/SrTiO_3$ heterostructures via a conductive AFM technique typically decay within hours under ambient conditions, representing a challenge for some technologies. By chemically modifying the top $LaAlO_3$ surface with a self-assembled monolayer of (3-Aminopropyl)triethoxysilane (APTES), normally conductive 4-unit-cell $LaAlO_3/SrTiO_3$ can be made highly insulating. The APTES layer can be locally patterned, revealing a highly stable conductive nanoregion. Four-terminal measurements show that nanowires created by selective desorption of APTES remain conductive indefinitely under ambient conditions. The results suggest a robust mechanism for creating long-lived nanostructures at oxide interfaces.

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