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Anomalous High Mobility in $LaAlO_3/SrTiO_3$ Nanowires[1]
PATRICK IRVIN, JOSHUA VEAZEY, GUANGLEI CHENG, JEREMY LEVY, Department of Physics and Astronomy, University of Pittsburgh, Pittsburgh, PA 15260, C.W. BARK, S. RYU, C.B. EOM, Department of Materials Science and Engineering, University of Wisconsin-Madison, Madison, WI 53706 — Nanoscale control over the $LaAlO_3/SrTiO_3$ interface[2] provides a possible pathway for reconfigurable oxide-based nanoelectronics at densities that exceed conventional silicon electronics. One of the central challenges in replacing silicon relates to energy dissipation, which in turn depends on the carrier mobility. We have performed four-terminal transport measurements of $LaAlO_3/SrTiO_3$ nanowires at room temperature (300 K) and at low temperature ($\sim$ 500 mK). We find that the equivalent 2D mobility of nanowires greatly exceeds that of bulk $SrTiO_3$ (μ_{STO} = 6 cm^2/Vs), and approaches that of optimally doped Si at room temperature. Low-temperature mobilities can exceed 30,000 cm^2/Vs. We discuss possible physical mechanisms to explain the anomalously high mobility and the implications for future device technologies.

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[2]C. Cen, S. Thiel, K. E. Andersen, C. S. Hellberg, J. Mannhart, and J. Levy, Nature Materials **7**, 2136 (2008).

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