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Nanoscale Control of an Interfacial Metal-Insulator Transition at Room Temperature[1] CHENG CEN, JEREMY LEVY, STEFAN THIEL, GERMAN HAMMERL, CHRISTOF W. SCHNEIDER, JOCHEN MANNHART, KRISTOPHER E. ANDERSON, C. STEPHEN HELLBERG — We report the creation and erasure of nanoscale conducting regions at the interface between two insulating oxides, $LaAlO_3$ and $SrTiO_3$. Using voltages applied by a conducting atomic force microscope (AFM) probe, the buried $LaAlO_3/SrTiO_3$ interface is locally and reversibly switched between insulating and conducting states. Persistent field effects are observed using the AFM probe as a gate. Patterning of conducting lines with widths $\sim$3 nm, as well as arrays of conducting islands with densities $>10^{14}/\text{in}^2$, are demonstrated. The patterned structures are stable for >24 hours at room temperature.

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Cheng Cen
University of Pittsburgh

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