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Ferroelectric Tunnel Junctions: Resistive Switching Behavior by Scanning Probe Microscopy A. STAMM, H. LU, University of Nebraska-Lincoln, D. WU, Duke University, Y. WANG, University of Nebraska-Lincoln, D. FELKER, M. RZCHOWSKI, H. W. JANG, C. W. BARK, C.-B. EOM, University of Wisconsin-Madison, E. Y. TSYMBAL, A. GRUVERMAN, University of Nebraska-Lincoln — In this work, we demonstrate the reproducible tunneling electroresistance effect in ultrathin epitaxial ferroelectric heterostructures by means of scanning probe microscopy techniques. Ultrathin films of barium titanate (in the range from 2 nm to 10 nm) with microscopically patterned SrRuO3 top electrodes have been grown on the SrRuO3/SrTiO3 substrates by atomic-layer-controlled pulsed-laser deposition. Imaging and control of polarization state in SrRuO3/BaTiO3/SrRuO3 and BaTiO3/SrRuO3 heterostructures have been performed via Piezoresponse Force Microscopy (PFM) along with conductance measurements by Conducting Atomic Force Microscopy (C-AFM). The selected locations have been probed by performing the local I-V measurements using a fixed tip. In parallel, at the same locations local PFM hysteresis loops have been measured. The obtained results show a change in resistance by about two orders of magnitude upon polarization reversal on a lateral scale of 20 nm at room temperature. These results are promising for employing ferroelectric tunnel junctions in non-volatile memory and logic devices.

Alexei Gruverman
University of Nebraska-Lincoln

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