Piezoresponse force microscopy imaging of nanostructures created by conductive AFM lithography at oxide heterointerfaces

MENGCHEN HUANG, FENG BI, University of Pittsburgh, SANGWOO NYU, CHANG-BEOM EOM, University of Wisconsin-Madison, JEREMY LEVY, University of Pittsburgh — Nanoscale control of the metal-insulator transition in 3-unit cell (u.c.) LaAlO$_3$/SrTiO$_3$ heterostructures using conductive AFM (c-AFM) lithography allows the creation of conductive nanostructures. Piezoelectric effects have recently been observed in planar LaAlO$_3$/SrTiO$_3$ heterostructures, and the piezoresponse differs between the conducting and insulating states of 3-u.c. samples where c-AFM modulates the transition. We have employed piezoresponse force microscopy (PFM) to detect and image the piezoresponse variations of nanostructures created by c-AFM lithography. PFM imaging allows visualization of the nanostructures, expanding capabilities for characterizing and studying individual devices.

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