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Electric-field-driven phase transition in vanadium dioxide B. WU, LPEM, ESPCI-ParisTech-CNRS-UPMC, 10 rue Vauquelin, Paris 05, France / National Laboratory for Superconductivity, IOP, CAS, Beijing 100190, P.R.China, A. ZIMMERS, H. AUBIN, LPEM, ESPCI-ParisTech-CNRS-UPMC, 10 rue Vauquelin, Paris 05, France, R. GOSH, Y. LIU, R. LOPEZ, Department of Physics and Astronomy, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina 27599, USA — In recent years, various strongly correlated materials have shown sharp switching from insulator to metallic state in their I(V) transport curves. Determining if this is purely an out of equilibrium phenomena (due to the strong electric field applied throughout the sample) or simply a Joule heating issue is still an open question. To address this issue, we have first measured local I(V) curves in vanadium dioxide (VO_2) Mott insulator at various temperatures using a conducting AFM setup and determined the voltage threshold of the insulator to metal switching. By lifting the tip above the surface (>35nm), we have then measured the purely electrostatic force between the tip and sample surface as the voltage between these two was increased. In a very narrow temperature range (below 360K), a tip height range (below 60nm) and a voltage applied range (above 8V), we observed switching in the electrostatic force (telegraphic noise vs. time and vs. voltage). This purely electric field effect shows that the switching phenomenon is still present even without Joule heating in VO_2.

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