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Structural and electrical characterization of NbO_2 vertical devices grown on TiN coated SiO_2/Si substrate[1] TOYANATH JOSHI, PAVEL BORISOV, West Virginia University, Morgantown, WV, DAVID LEDERMAN, West Virginia University, Morgantown, WV, University of California, Santa Cruz, CA — Due to its relatively high MIT temperature (1081 K) and current-controlled negative differential resistance, NbO_2 is a robust candidate for memory devices and electrical switching applications. In this work, we present in-depth analysis of NbO_2 thin film vertical devices grown on TiN coated SiO_2/Si substrates using pulsed laser deposition (PLD). Two of the films grown in 1 mTorr and 10 mTorr O_2/Ar (˜7% O_2) mixed growth pressures were studied. The formation of NbO_2 phase was confirmed by Grazing Incidence X-ray Diffractometry (GIXRD), X-ray Photoelectron Spectroscopy (XPS) and current vs. voltage measurements. A probe station tip (tip size ˜2 μm) or conductive AFM tip was used as a top and TiN bottom layer was used as a bottom contact. Device conductivity showed film thickness and contact size dependence. Current pulse measurements, performed in response to applied triangular voltage pulses, showed a non-linear threshold switching behavior for voltage pulse durations of ˜100 ns and above. Self-sustained current oscillations were analyzed in terms of defect density presented in the film.

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