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Evidence of thermal heating in the low temperature resistive switching of V_2O_3 microbridges MARIELA MENGHINI, LEANDER DILLEMANS, KAREN LEVRIE, PIA HOMM, CHEN-YI SU, RUBEN LIETEN, TOMAS SMETS, JEAN-PIERRE LOCQUET, Katholieke Univ Leuven — Vanadium sesquioxide (V_2O_3) is a strongly correlated material that exhibits a metal-insulator-transition (MIT) at low temperatures. The electrical triggering of this transition could result in an exciting new category of applications, such as resistive switching-based memories and field-effect transistors. We have fabricated V_2O_3 microbridges by combining MBE growth with UV lithography and etching.The MIT is studied in microbridges with different length/width aspect ratios. We found that the size of the MIT is largest for the widest and shortest microbridges. We discuss the influence of device processing in the observed behavior. We have also measured voltage-current characteristics (VIs) of the microbridges at different temperatures across the MIT. At intermediate temperatures we observe a sudden change to a more resistive state while the current is swept continuously. The only way to switch back to an insulating state is by thermal cycling. At sufficiently low and high temperatures the VIs are smooth. We have estimated the power transferred to the device by the applied current in order to understand this behavior in terms of local Joule heating. The distribution of size of the resistance jumps and the values of voltage and current at which these jumps occur are studied as a function of width and length of the microbridge.

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