

Supporting Information

Electrochemical Tuning of Metal Insulator Transition and Non-Volatile Resistive Switching in Superconducting Films

Anna Palau^{§}, Alejandro Fernandez-Rodriguez[§], Juan Carlos Gonzalez-Rosillo^{§†},
Xavier Granados[§], Mariona Coll[§], Bernat Bozzo[§], Rafael Ortega-Hernandez^{§,‡}, Jordi
Suñé[‡], Narcís Mestres[§], Xavier Obradors[§], Teresa Puig[§]*

† Institut de Ciència de Materials de Barcelona, ICMA-B-CSIC, Campus UAB, 08193
Bellaterra, Spain

‡ Departament d'Enginyeria Electrònica, Universitat Autònoma de Barcelona, 08193
Bellaterra, Spain

*E-mail: palau@icmab.es

†Present address: Electrochemical Materials Laboratory Massachusetts Institute of
Technology, Cambridge, MA 02139, USA

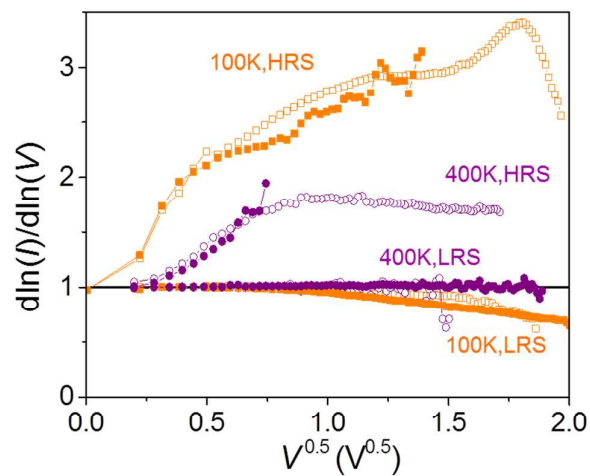


Figure S1. $d(\ln(I)/d(\ln(V)))$ as a function of $|V|^{0.5}$ at 100K (squares) and 400K (circles) for the HRS and LRS, measured at positive (closed symbols) and negative (solid symbols) voltage.

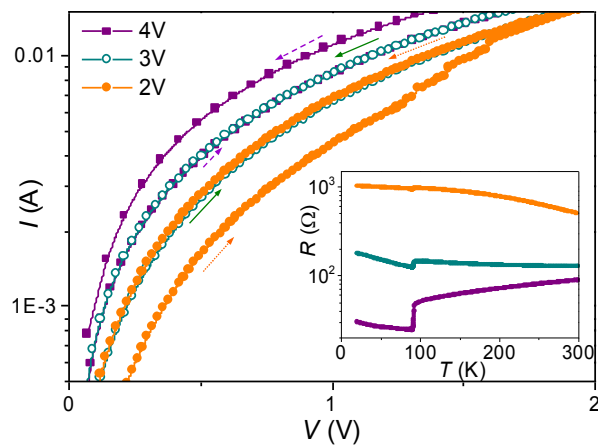


Figure S2. Minor I - V loops measured 100 nm thick, 100 μm wide VER -gate device ramping the voltage to 2V, 3V and 4V. Inset shows the temperature dependence of the different resistance states obtained with the minor loops.

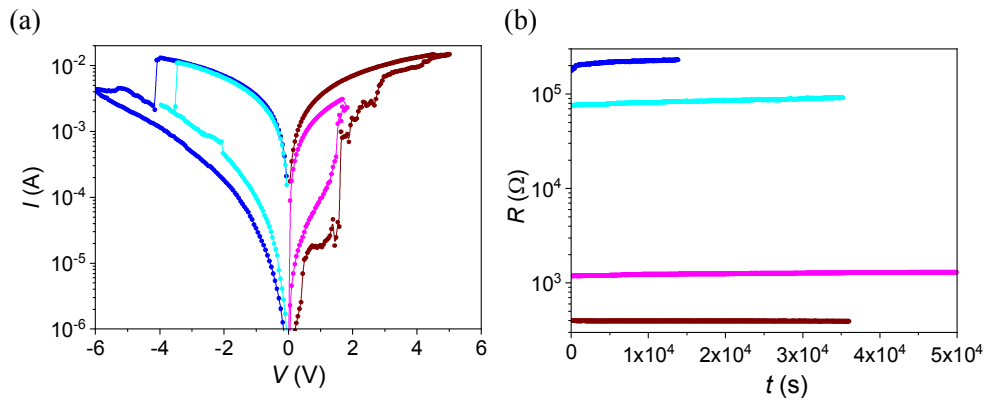


Figure S3. (a) Multiple-branch hysteresis loops performed in a 150 nm thick, 10 μm wide *VER-gate* device, inducing different resistance states. (b) Retention characteristics of multi-level resistance states.

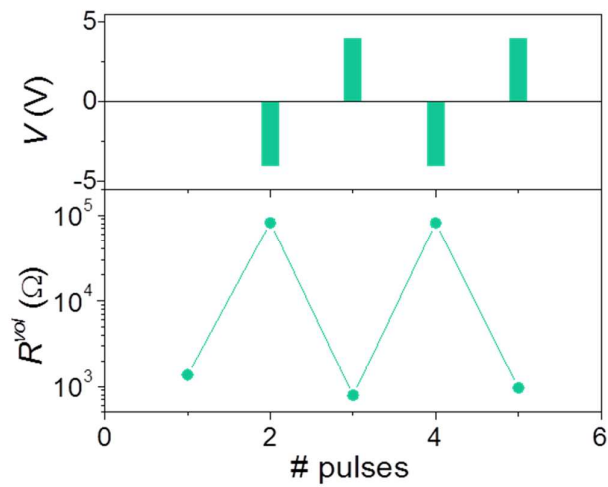


Figure S4. Voltage pulses and volume bridge resistance evolution obtained for a 50 nm thick, 30 μm wide *VERT-gate* device.

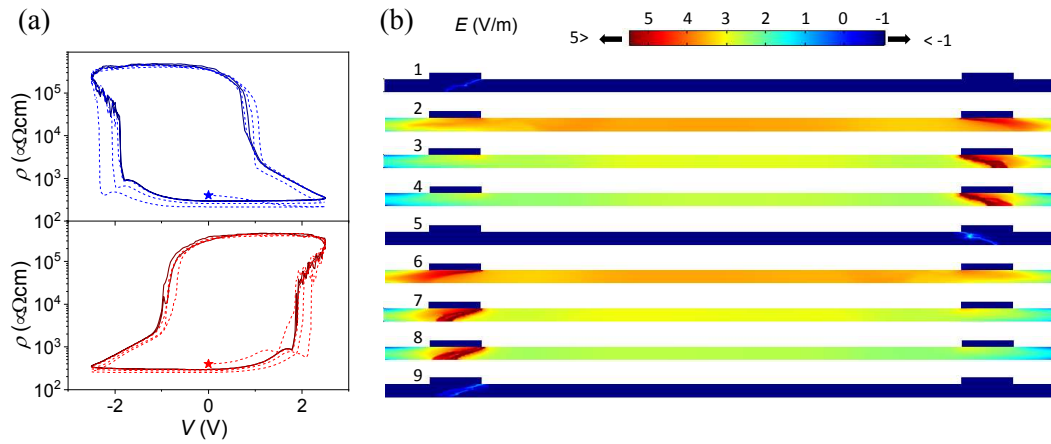


Figure S5. (a) Simulated hysteresis loops starting from an initial homogenous oxygen concentration (resistance of the initial point is indicated with a star). Dashed lines show the evolution to a stable switching performance (solid lines). (b) Electric field induced at different stages of the switching process, after the application of a sinusoidal voltage pulse of amplitude 2.5V with a frequency of 50Hz at the left contact with the right one grounded. Images are acquired every 2.5 ms. Colours in the bar show the value of the electric field in logarithmic scale.