

Supporting Information

Tailored Nano Structures of Solution-Processed Rutile TiO₂ Thin Films for Complementary and Bipolar Switching Characteristics

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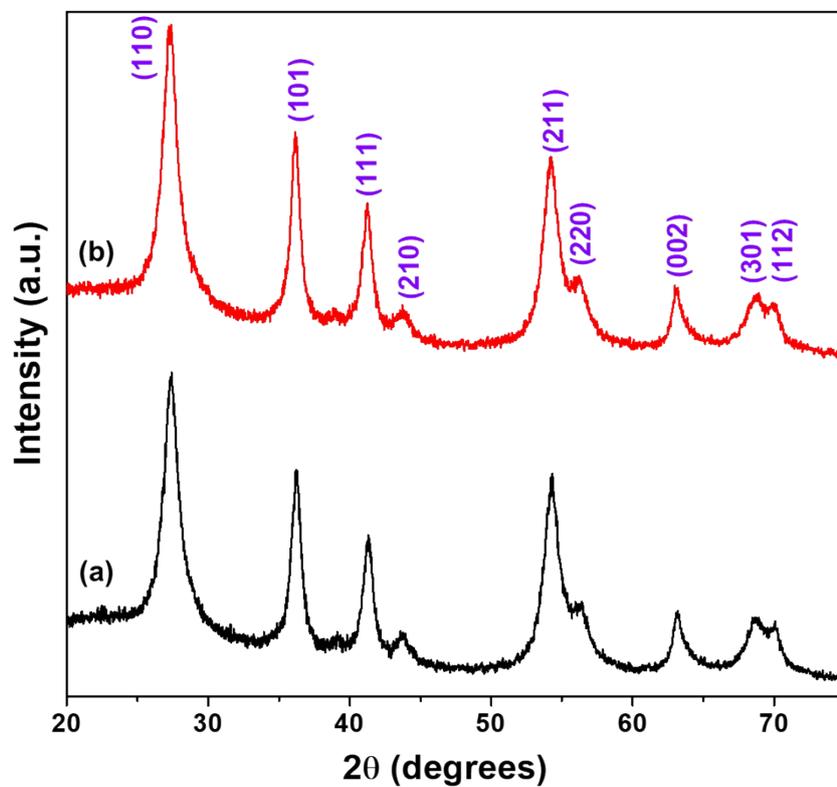


Figure S1. XRD patterns of TiO₂ deposited using different concentrations (a) 0.1 M, and (b) 0.15 M.

Table S1. Comparison of d-spacing (Å) values of TiO₂ at different concentrations from XRD data.

Sample	(110)	(101)	(111)	(210)	(211)	(002)	(301)	(112)
0.1 M	3.250	2.4821	2.1831	2.0647	1.6895	1.4731	1.3601	1.3403
0.15 M	3.2614	2.5243	2.1921	2.0790	1.6910	1.4748	1.3672	1.3445

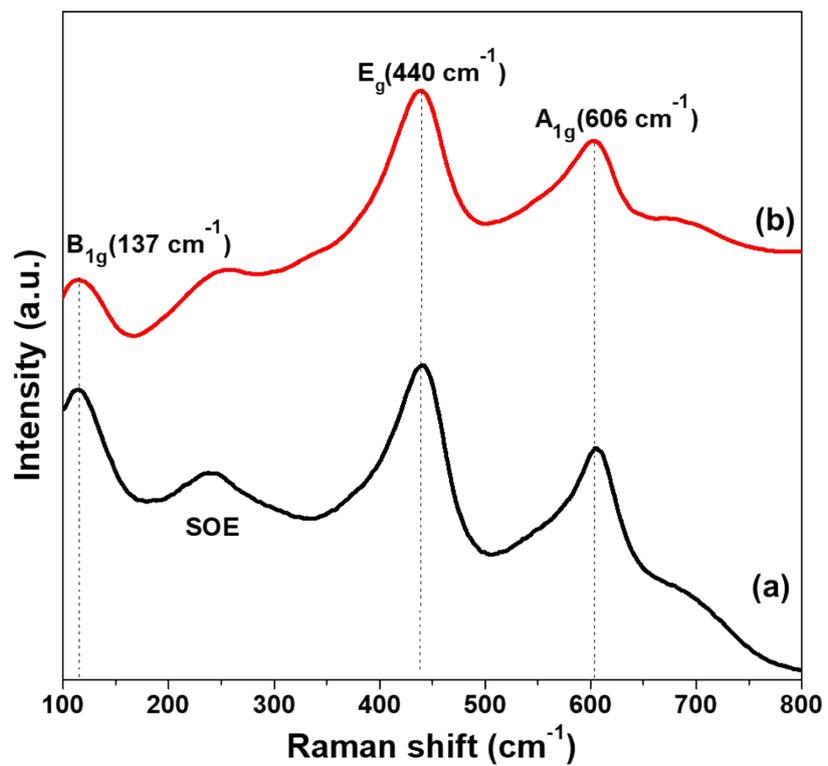


Figure S2. Raman patterns of TiO₂ deposited using different concentrations (a) 0.1 M, and (b) 0.15 M.

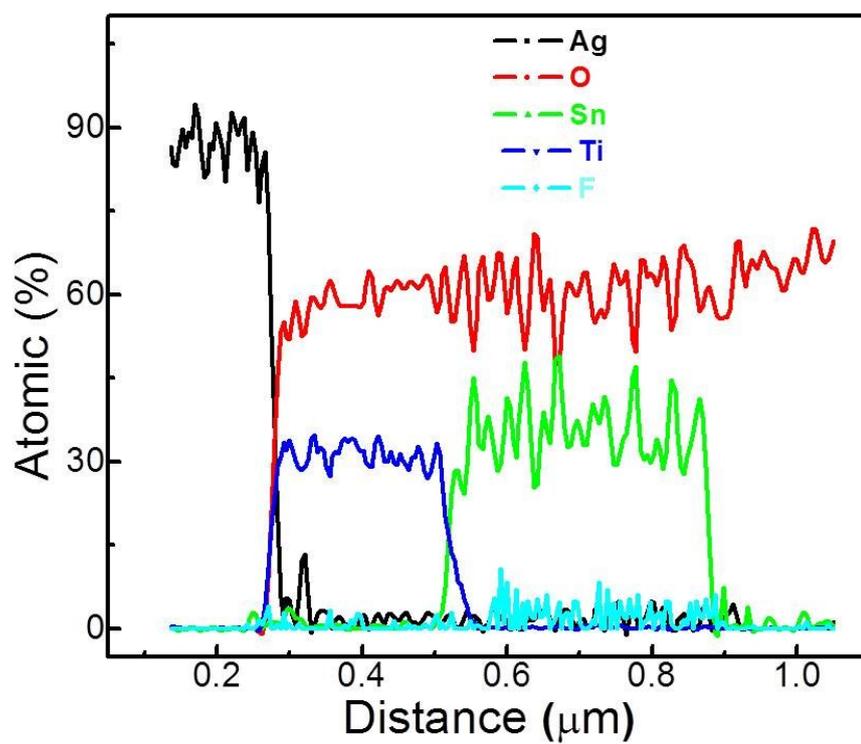


Figure S3. The elemental line EDS of the device using HTEAM in STEM mode

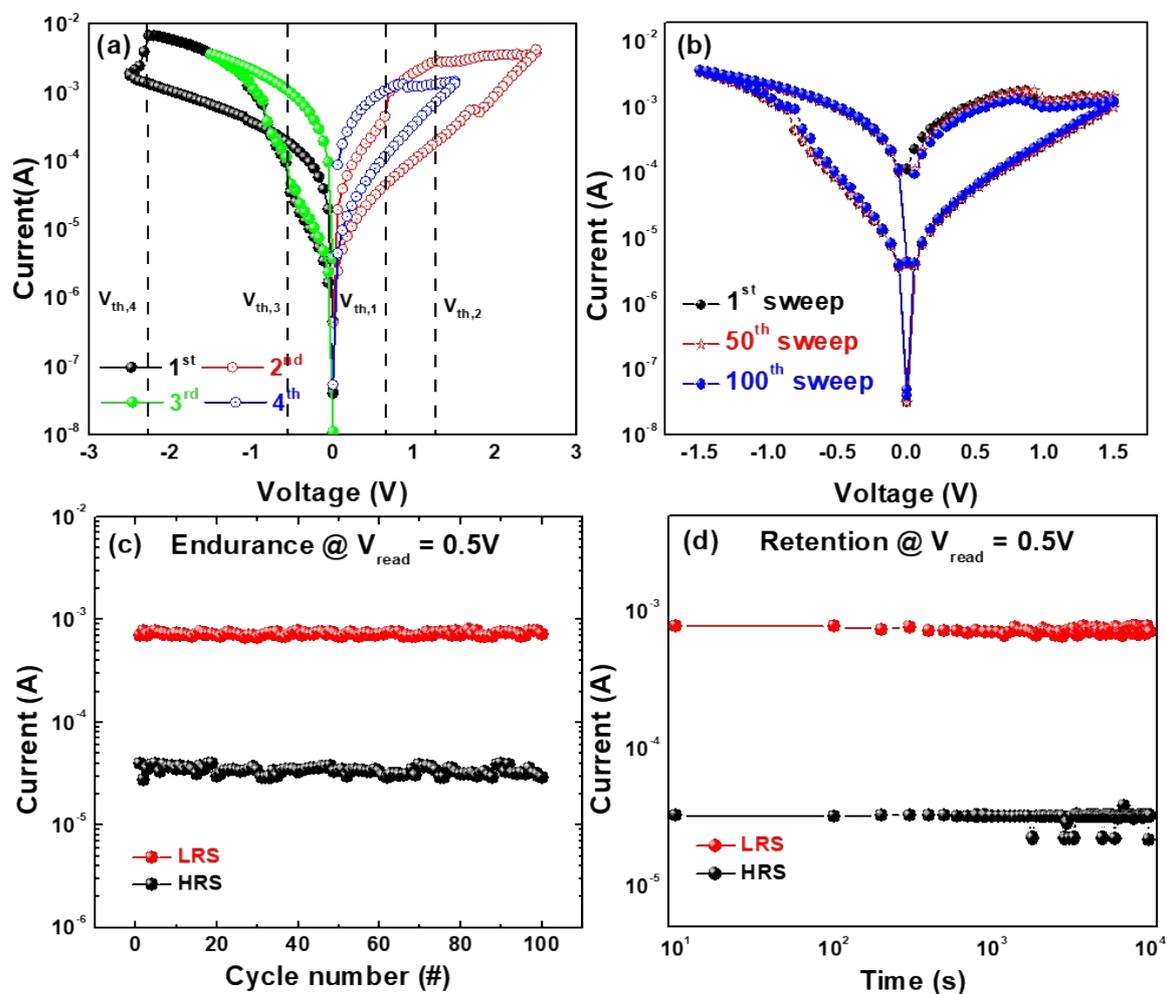


Figure S4. The device characteristics with nano-plateau structured $r\text{-TiO}_2$. (a) The voltages induced CRS to BRS conversion, (b) BRS induced by lower voltage sweeps, (c) the endurance of the device presenting the reproducibility of the switching cycles and (d) the retention of LRS and HRS depicting the stability of states with time.

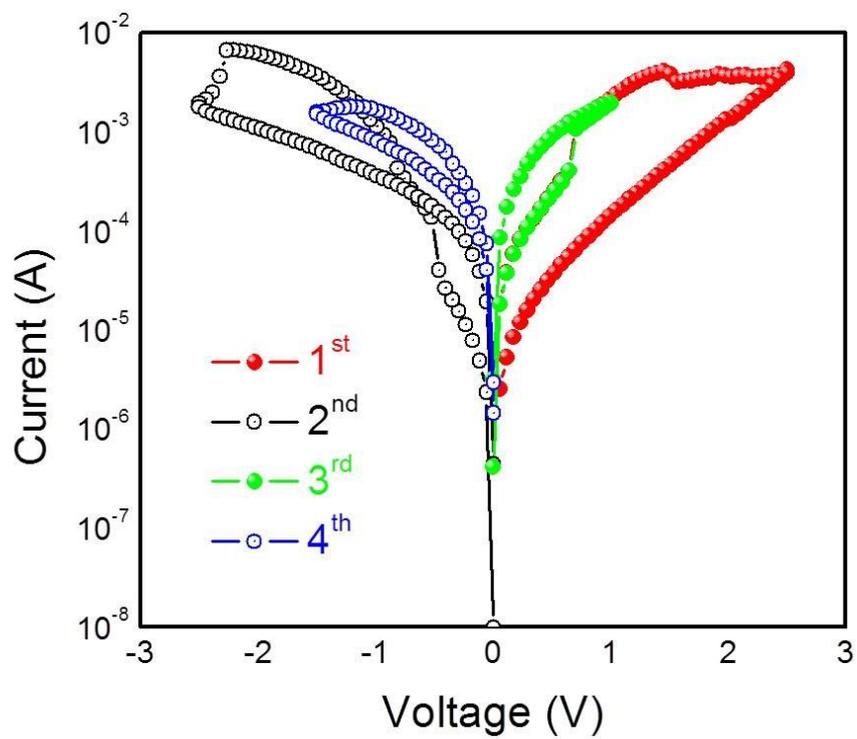


Figure S5. BRS with SET at positive sweep and RESET at negative sweep voltage after CRS characteristic.

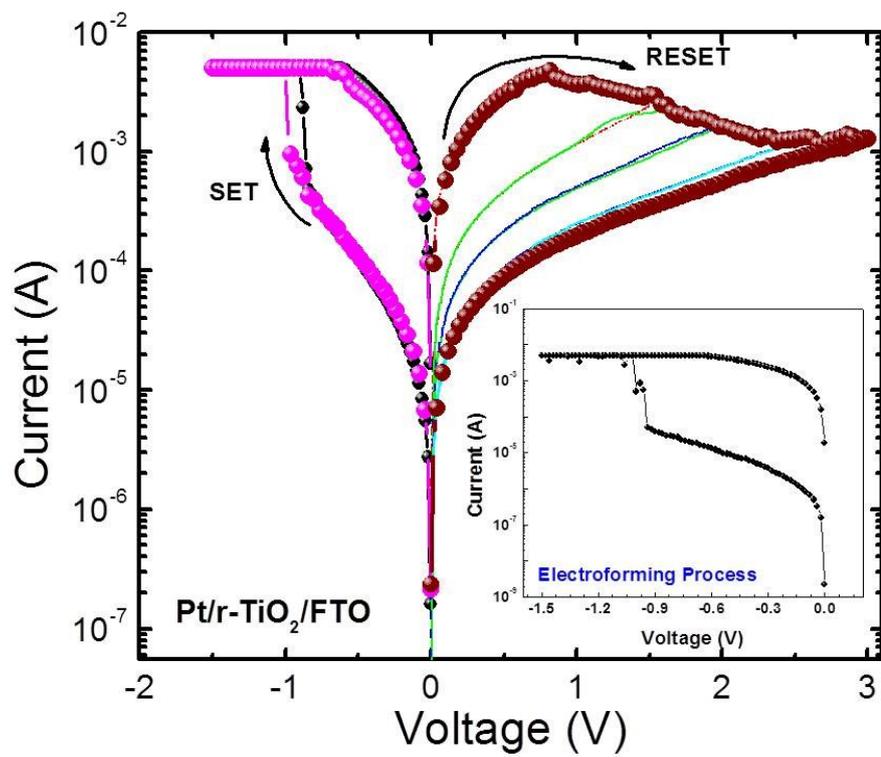


Figure S6. The I-V characteristics of Pt/r-TiO₂/FTO device exhibiting only BRS with SET at negative voltage sweep and RESET at positive voltage sweep after electroforming process.

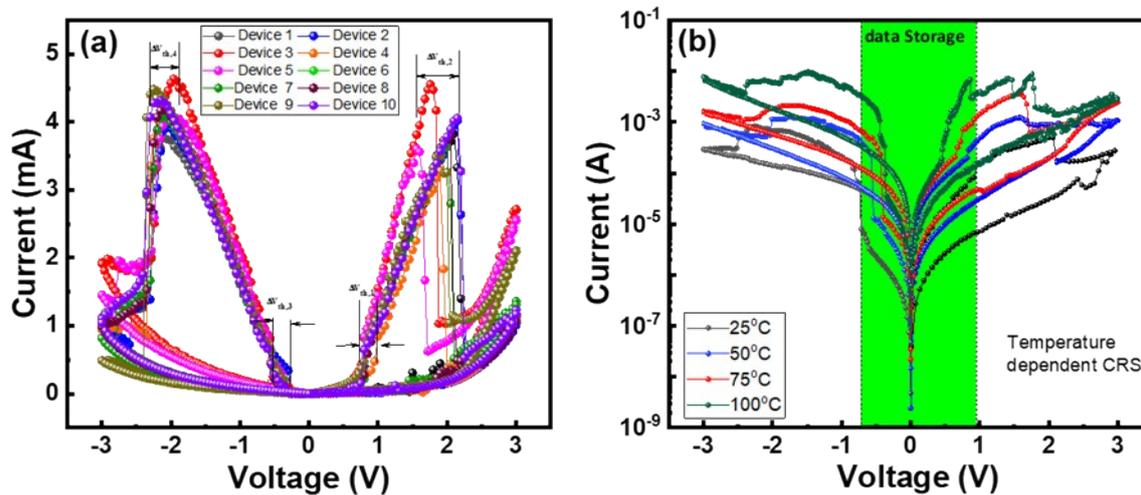


Figure S7. The electrical characteristics showing (a) CRS behavior of 10 randomly selected devices and (b) CRS characteristics of the device at elevated temperatures.

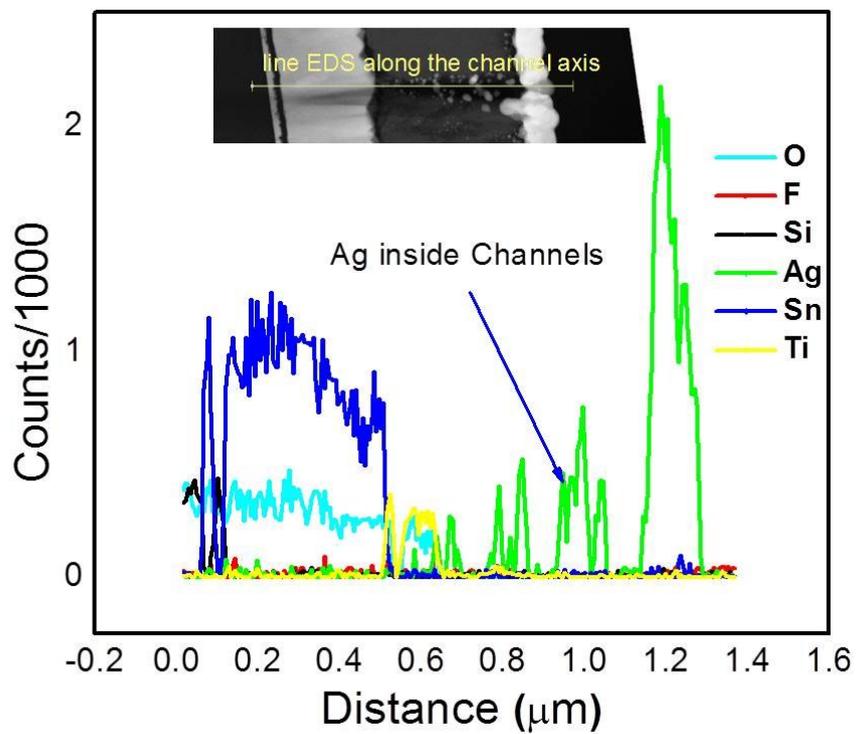


Figure S8. The elemental line EDX in STEM mode along the pre-defined channels

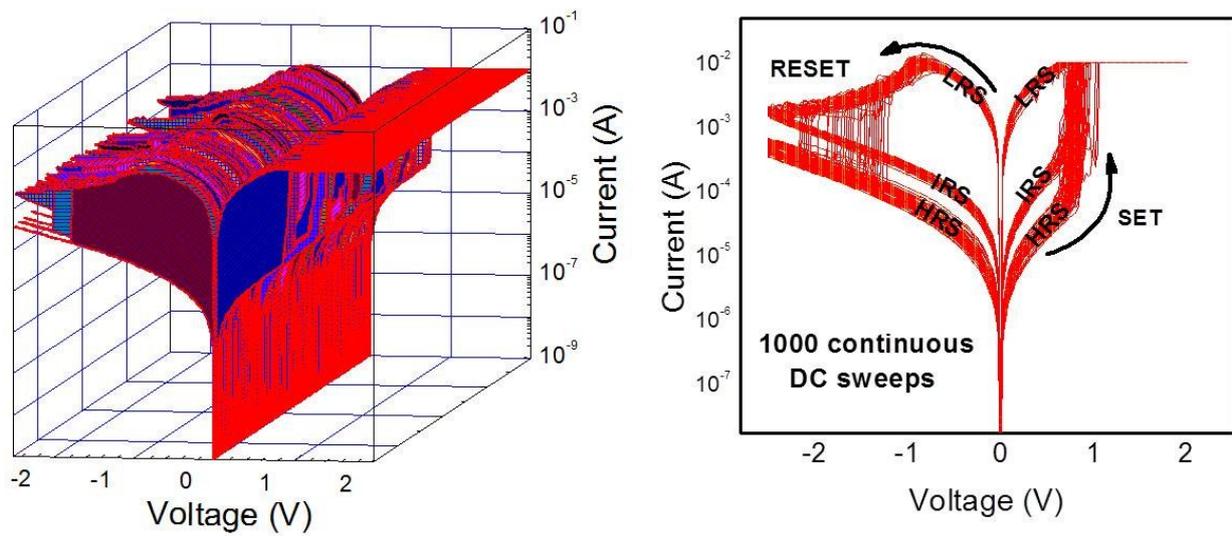


Figure S9. The electrical stability of device with nano-channel r-TiO₂ thin film. (a) The representative 3D BRS characteristic and (b) the collective 1000 consecutive sweeps with any degradation in I_{ON/OFF} window

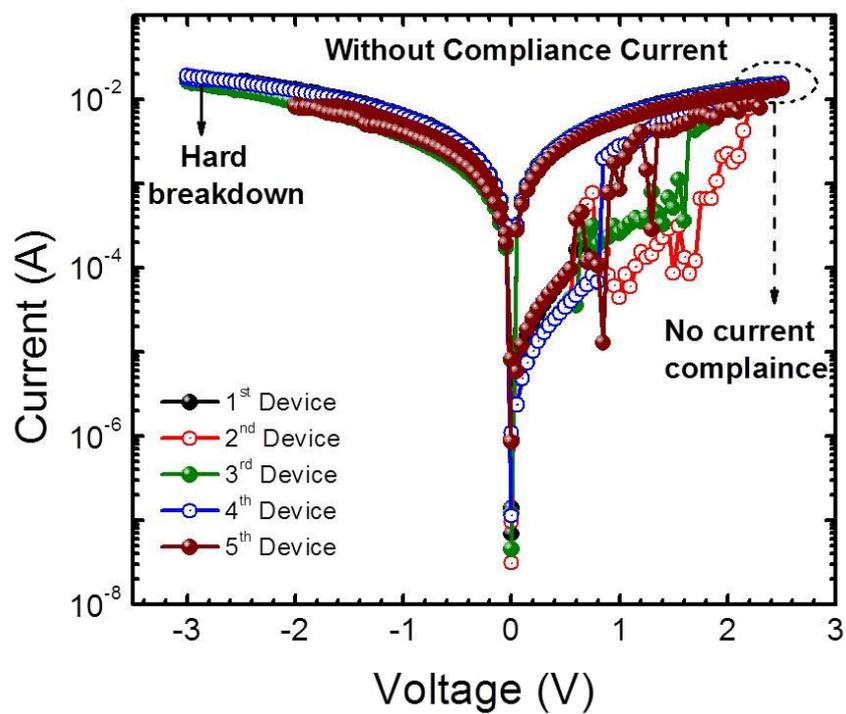


Figure S10. I-V characteristics depicting the RESET failure of the device when no compliance is applied during the initial SET process.

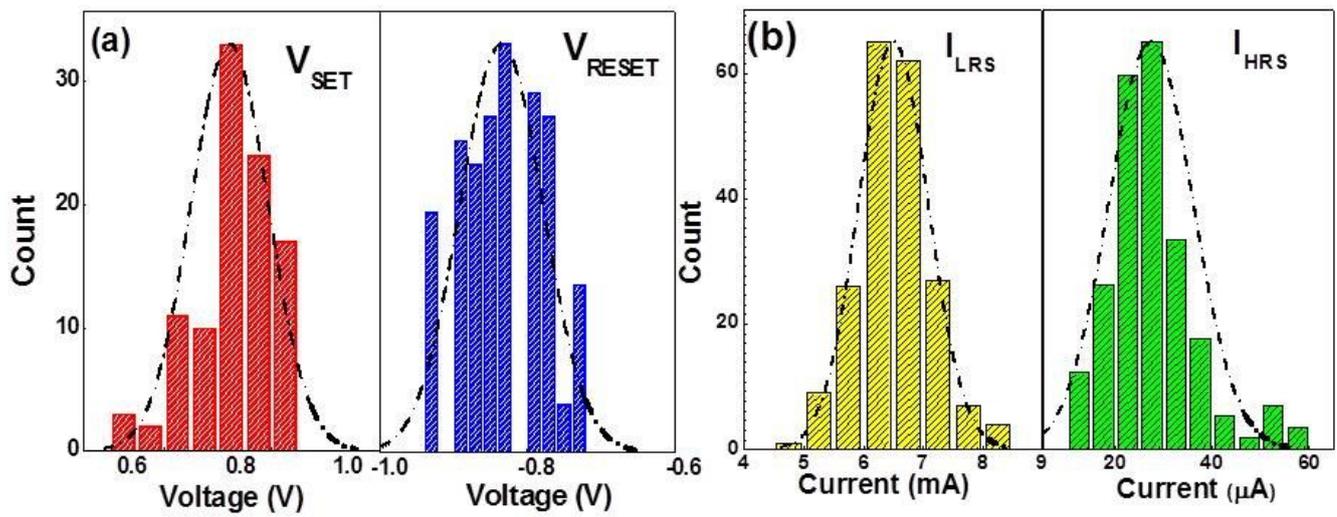


Figure S11. The histogram of switching parameters (a) V_{SET} and V_{RESET} histogram as well as (b) I_{LRS} and I_{HRS} levels showing very small variations.