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Coexistence Mechanisms of Negative Differential Resistance and Resistive Switching Effects in WO_x Based Memristor

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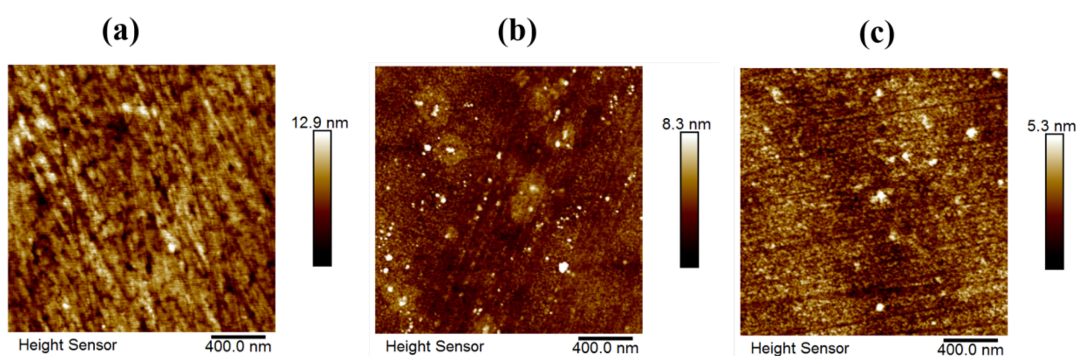

Fig. S1 AFM images of the (a) W; (b) WO_x; (c) Ti films. The RMS of three layers are1.77 nm, 2.21 nm, and 0.743 nm, respectively.

The AFM images of each layer of the W/WO_x/Ti memristor is given in Fig. S1. The root-mean-square (RMS) roughness of W, WO_x, and Ti are 1.77 nm, 2.21 nm, and 0.743 nm, respectively, proving the good uniformity of the memristor.

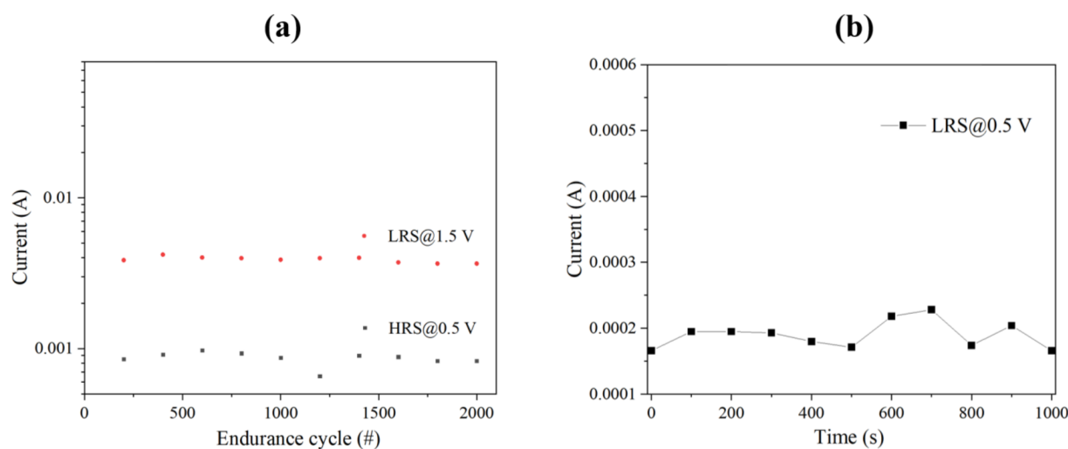

Fig. S2 (a) Endurance cycles and (b) retention times of the W/WO_x/Ti memristor

Stable RS endurance (2000 cycles) and retention characteristic (10^3 s) are given in Fig. S2, indicating the reliability of the memristor.

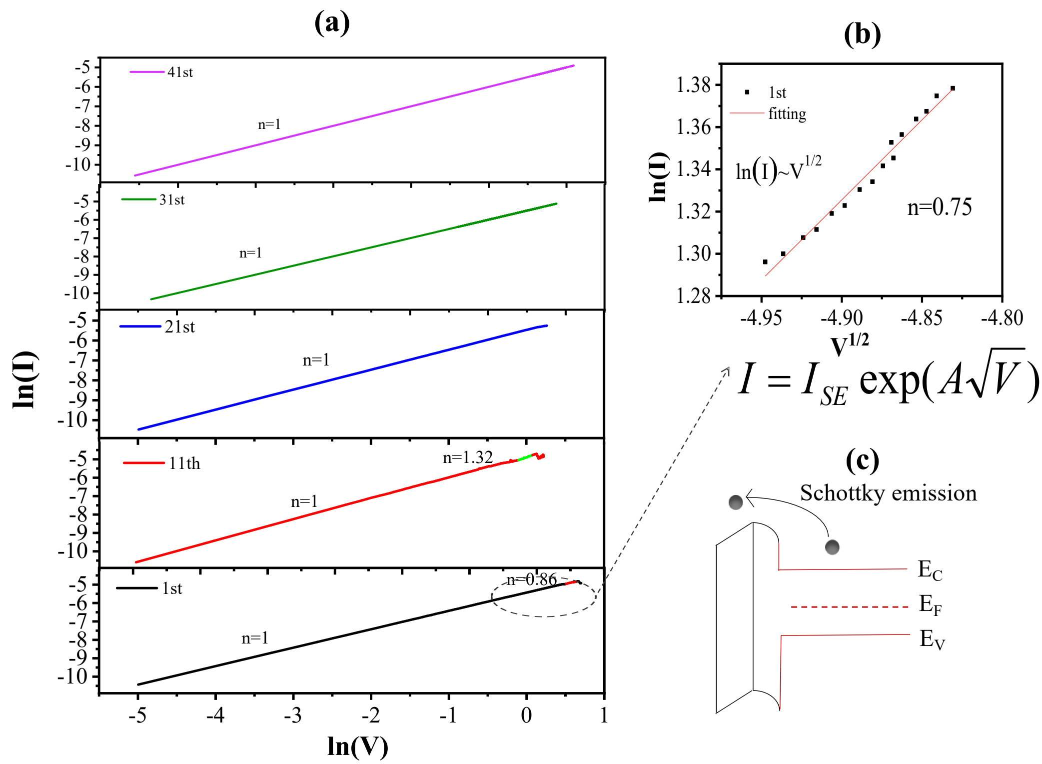

Fig. S3 (a) Fitting results (LRS) (b) Local curve fitting (I_{SE} and A (>0) are two parameters related to Schottky emission behaviour) (c)Schottky Emission mechanism of carriers crossing the potential barrier to the metal side under electric field

Fig. S3 shows the results of fitting I-V curves (LRS part of the RESET process), demonstrating the change in the conductive mechanism at different stages.