Supporting Information

High-performance Flexible Resistive Random-access Memory Based on SnS$_2$ Quantum Dots with Charge Trapping/de-trapping Effect

Hua An[1†], Yiyang Li[1†], Yi Ren[1], Yili Wan[1], Weigao Wang[1], Zhenhua Sun[1], Junwen Zhong[2*], and Zhengchun Peng[1,3*]

1. *State Key Laboratory of Radio Frequency Heterogeneous Integration (Shenzhen University), School of Physics and Optoelectronic Engineering, Shenzhen University, Shenzhen, Guangdong, 518060, China*

2. *Department of Electromechanical Engineering, University of Macau, Macau, SAR, 999078, China*

3. *School of Electronic Information and Electrical Engineering, Shanghai Jiao Tong University, Shanghai 200240, P. R. China*

E-mail: junwenzhong@um.edu.mo, zcpeng@szu.edu.cn

Figure S1. The photograph of the SnS$_2$ QD solution under an incident light beam.
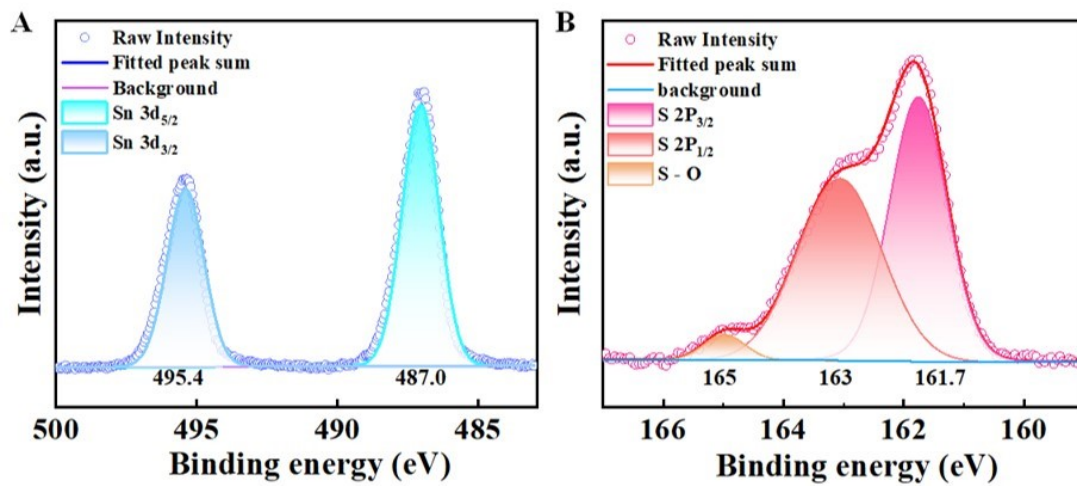

Figure S2. The high-resolution XPS spectra of (A) Sn+4 3d and (B) S-2 2p.

Figures S2 present the high-resolution XPS spectra. Through deconvolution, it is found that the S-2 2p core energy peaks at 161.7, 163, and 165 belongs to 2p$_{3/2}$, 2p$_{1/2}$, and S-O, respectively. Additionally, the split peaks at 487 and 495.4 are in accord with Sn+4 3d$_{5/2}$ and Sn+4 3d$_{3/2}$.
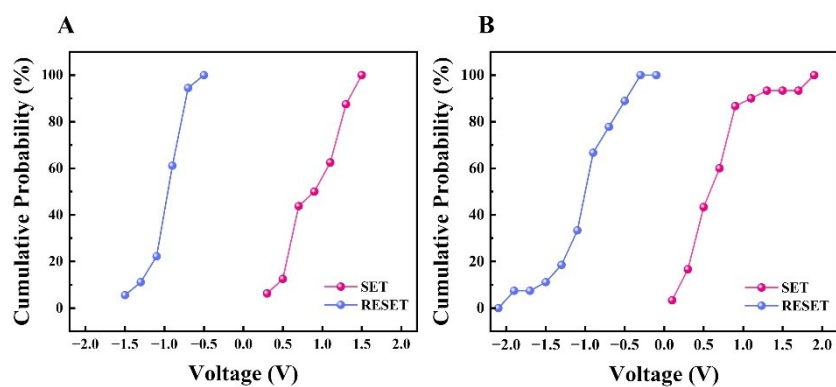
Figure S3. Cumulative probability of the SET and RESET voltages of a SnS_2 QD based memristor on rigid substrate (A) and a SnS_2 QD based memristor on flexible substrate (B).
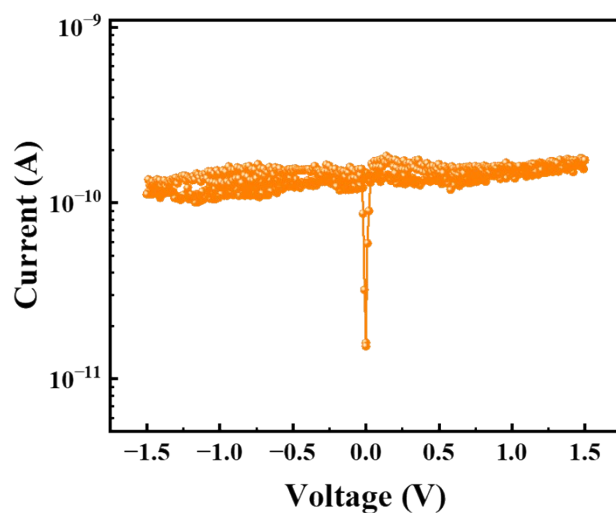

Figure S4. Current-voltage characteristics of Ag/PVP/Au devices.

The current-voltage characteristics within the voltage window of -1.5 V－1.5 V are shown in Figure S4. The current of the device without SnS_2 QDs stabilized around 10^{-10} A with increasing voltage and no marked switching behavior occurred throughout the process.
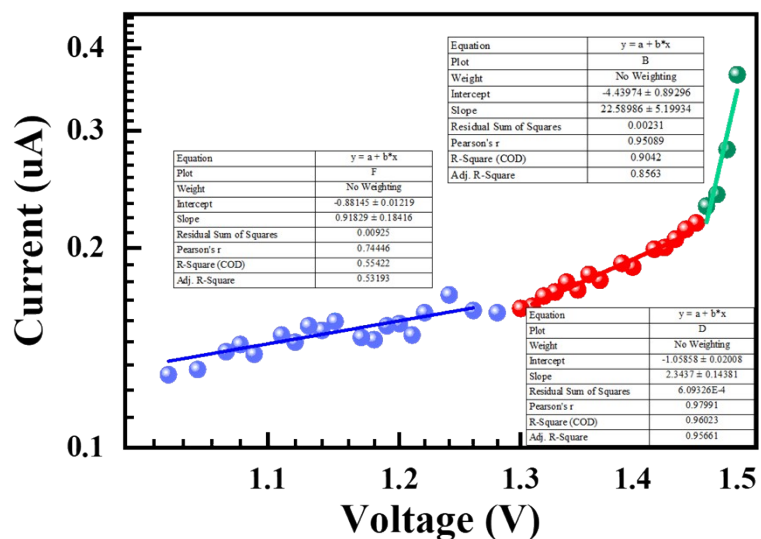
Figure S5. Specific fitting results to the switching region.

The linear fitting indicates a slope of 0.92 ~ 1 in blue, which means $\log(I) \propto \log(V)$ in this region. The slope of red line is approximated as 2, and means $\log(I) \propto \log(V^2)$. Significantly, the slope of the green part is more than 2.