

Supporting Information

Bi-functional 3-Terminal Memristor Applicable as Artificial Synapse and Neuron

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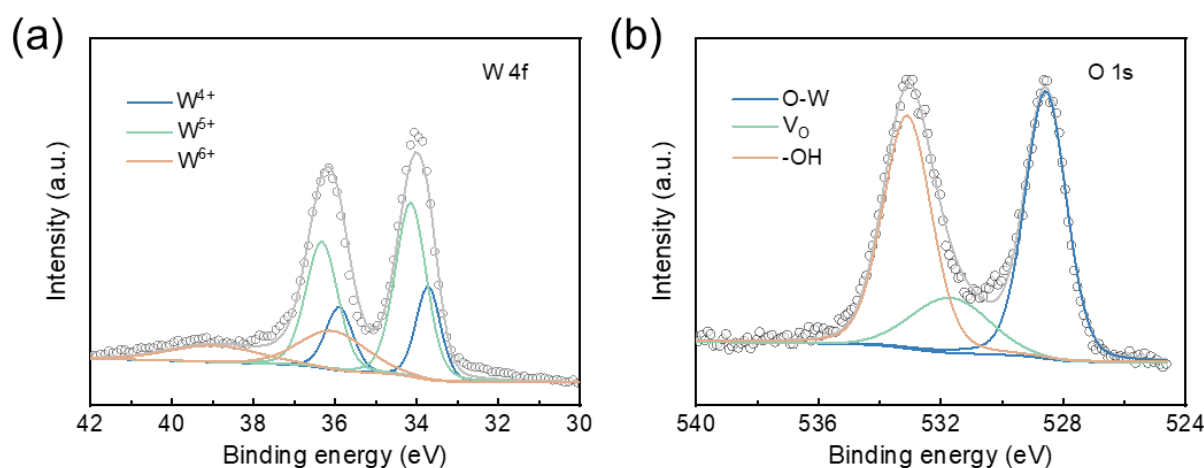


Figure S1. XPS spectra of (a) W 4f and (b) O 1s in WO_x film.

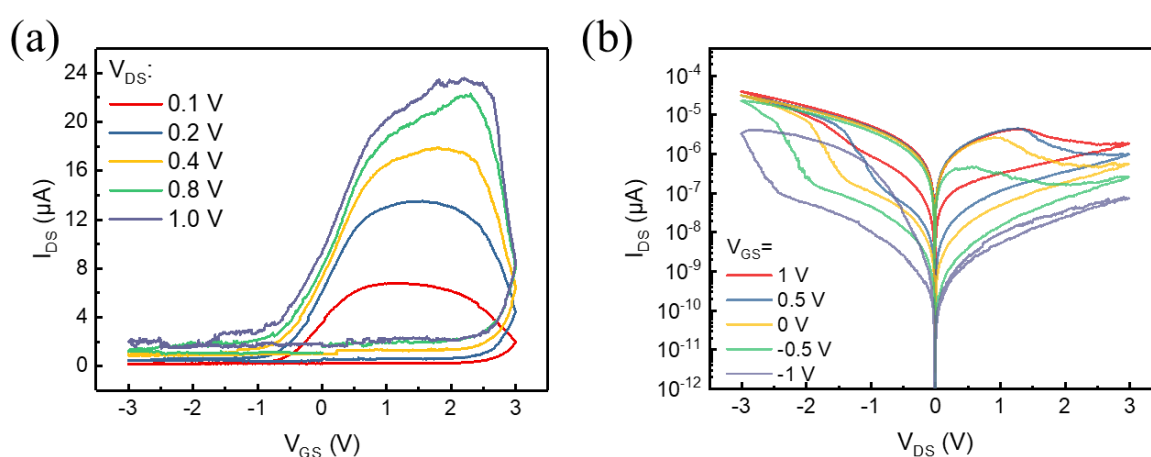


Figure S2. (a) Transfer characteristics under various V_{DS}. (b) Output characteristics under different V_{GS}.

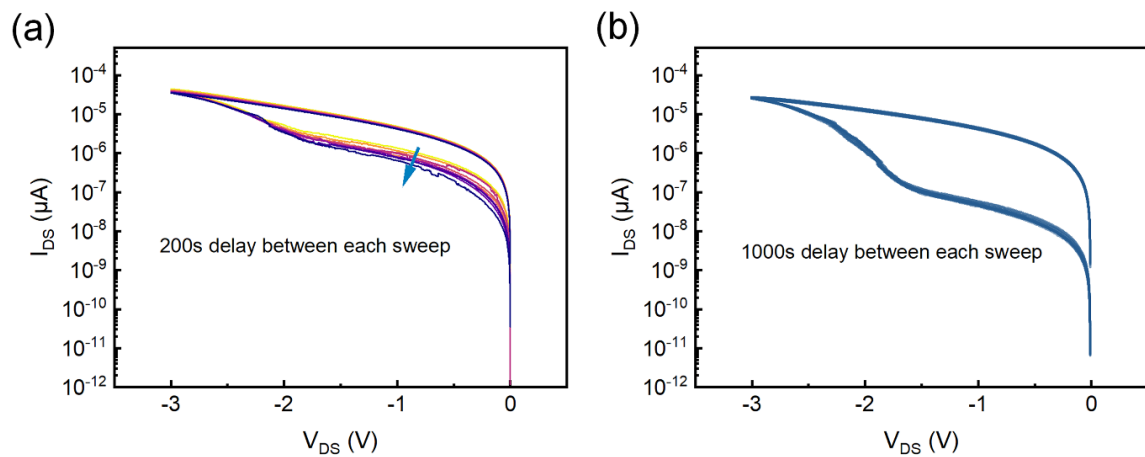


Figure S3. I_{DS} under negatively swept V_{DS} with (a) 200 s delay and (b) 1000 s delay between each sweep cycle.

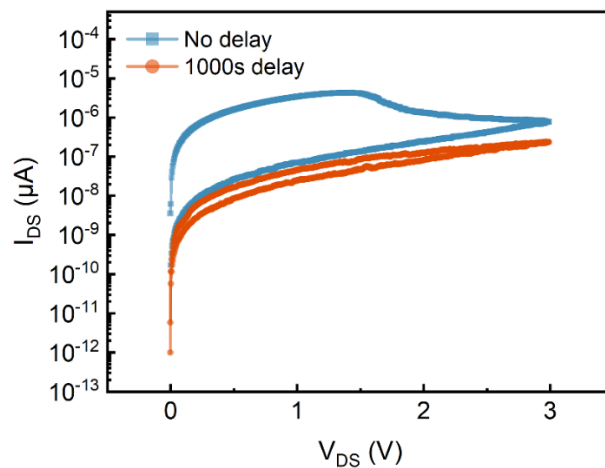


Figure S4. I_{DS} against positive V_{DS} with and without a delay of 1000 s delay after negative sweeping of V_{DS} .

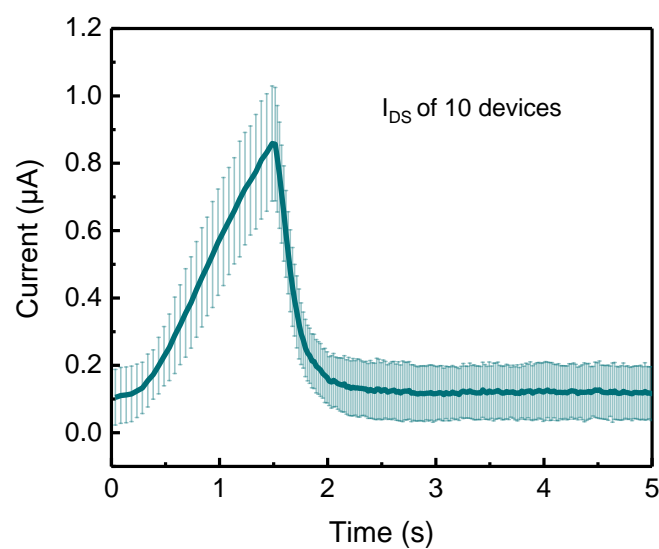


Figure S5. I_{DS} of 10 devices under the gate stimuli of 30 pulses (3 V, 50 ms). The solid line indicates the average value of the current, and the error bars are the respective standard deviation.

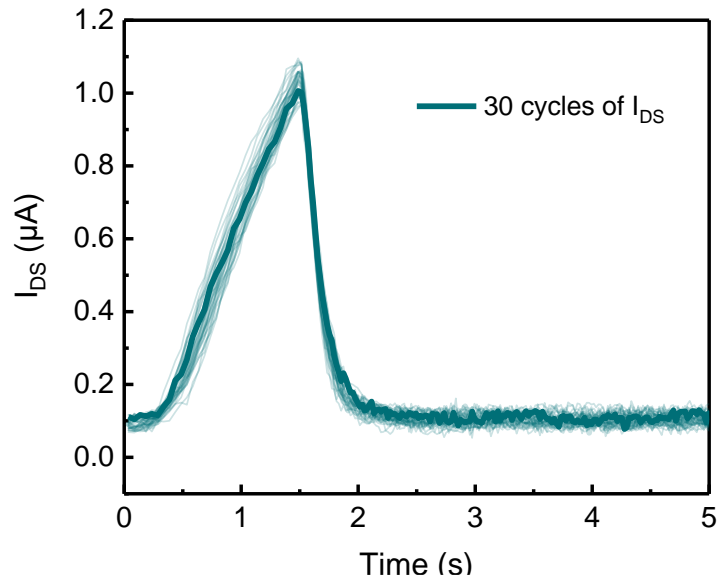


Figure S6. 30 cycles of I_{DS} under the gate stimuli of 30 pulses (3 V, 50 ms).

Stack	Mobile ion	Number of Terminal	Capacitor needed	CMOS compatibility	Ref.
V/VO _x /HfWO _x /Pt	Oxygen vacancy	2	Yes	Yes	1
Ta/Ag-NCs/Ta ₂ O ₅ /Pt/Ti	Ag ⁺	2	No	Yes	2
Pd/NdNiO ₃ /n-Si	Oxygen vacancy	2	Yes	Yes	3
TiW/Ge ₂ Sb ₂ Te ₅ /Ag :SiO ₂ /Ag/Au	Ag ⁺ Phase change of GST	2	Yes	Yes	4
TiN/Ti/HfO ₂ /TiN	Oxygen vacancy	2	Yes	Yes	5
Ag/2D Ti ₃ C ₂ T _x -doped PVA/ ITO	H ⁺	3	No	No	6
Pt/HfO ₂ /WO _x	O ²⁻	3	No	Yes	This work

Table S1: Comparison of reported bi-functional devices.

Reference

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- 2 J. Li, Y. Yang, M. Yin, X. Sun, L. Li and R. Huang, *Mater Horiz*, 2020, **7**, 71–81.
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