

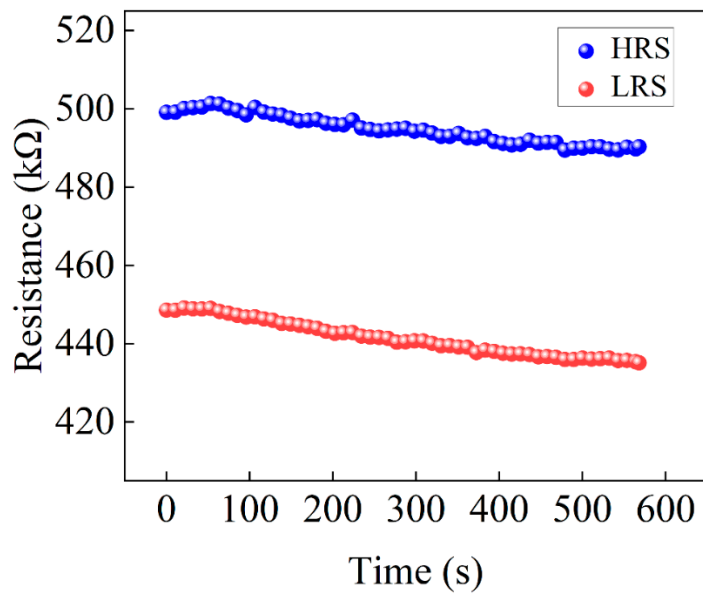


Figure S1. Long time stability test of the device.

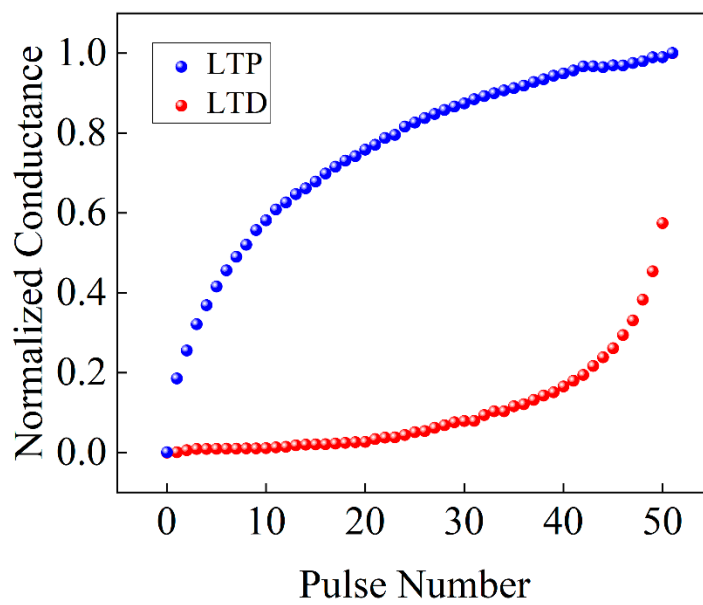


Figure S2. Normalized conductance of 50 pulses.

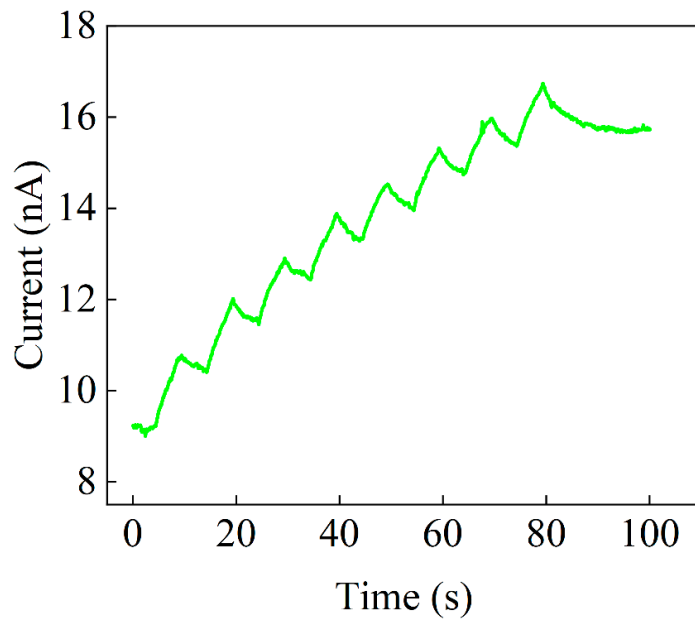


Figure S3. Synaptic behavior under light stimulation of 520 nm wavelength.

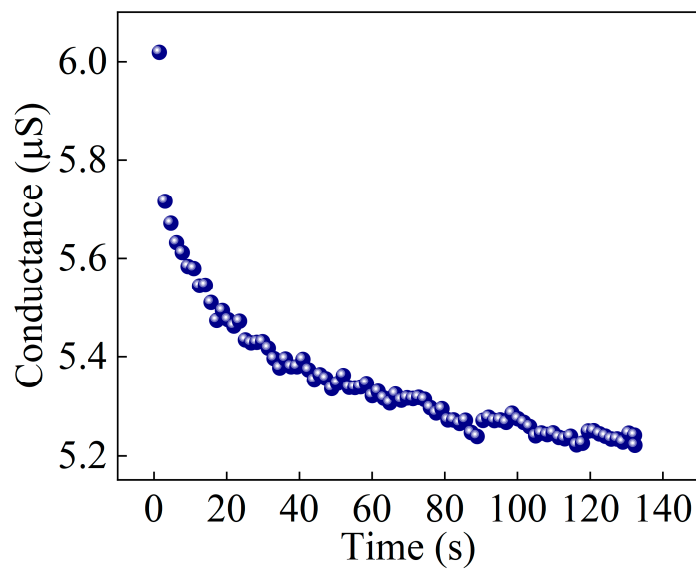


Figure S4. Forget behaviors.

Table S1. compared the present work with some previous optoelectronic memristors.

memristor	light-tuned range	light wavelength (nm)	energy consumption	references
Au/HfO _x /ZnO/ITO	1.0-11.0 nA	375	2.65×10^{-14} J	[1]
TiN/CeO _x /ZnO/ITO	2.0-5.0 μA	405	NA	[2]

ITO/ZnO NRs/PMMA/Al	0.2-2.5 μ A	405	NA	[3]
Ag/ZnO/Cu ₂ O/FTO	2.0-8.9 μ S	450/520	10 ⁻⁹ J	This work

1. Shan, X.; Zhao, C.; Lin, Y.; Liu, J.; Zhang, X.; Tao, Y.; Wang, C.; Zhao, X.; Wang, Z.; Xu, H.; et al. Optoelectronic synaptic device based on ZnO/HfOx heterojunction for high-performance neuromorphic vision system. *Applied Physics Letters* **2022**, *121*.
2. Zhou, Z.; Pei, Y.; Zhao, J.; Fu, G.; Yan, X. Visible light responsive optoelectronic memristor device based on CeOx/ZnO structure for artificial vision system. *Applied Physics Letters* **2021**, *118*, 191103.
3. Jaafar, A.H.; Kemp, N.T. Light-Mediated Multilevel Neuromorphic Switching in a Hybrid Organic-Inorganic Memristor. *ACS Omega* **2024**, *9*, 51641-51651.