

Supporting Information

Bio-inspired Smart Electronic-Skin Relies on Inorganic Perovskite Nanoplates for Application in Photo-memories and Mechanoreceptors

Zhongwei Xu^{1†}, Chaoxing Wu^{1†}, Yangbin Zhu¹, Songman Ju¹, Fumin Ma¹, Tailiang

Guo¹, Fushan Li^{1,*}, Tae Whan Kim^{2,*}

¹Institute of Optoelectronic Technology, Fuzhou University, Fuzhou 350108, People's
Republic of China

² Department of Electronic and Computer Engineering, Hanyang University, Seoul
133-791, Korea

* Corresponding authors' E-mail addresses: fsli@fzu.edu.cn (F. Li),

twk@hanyang.ac.kr (T.W. Kim)

† These authors contributed equally to this work

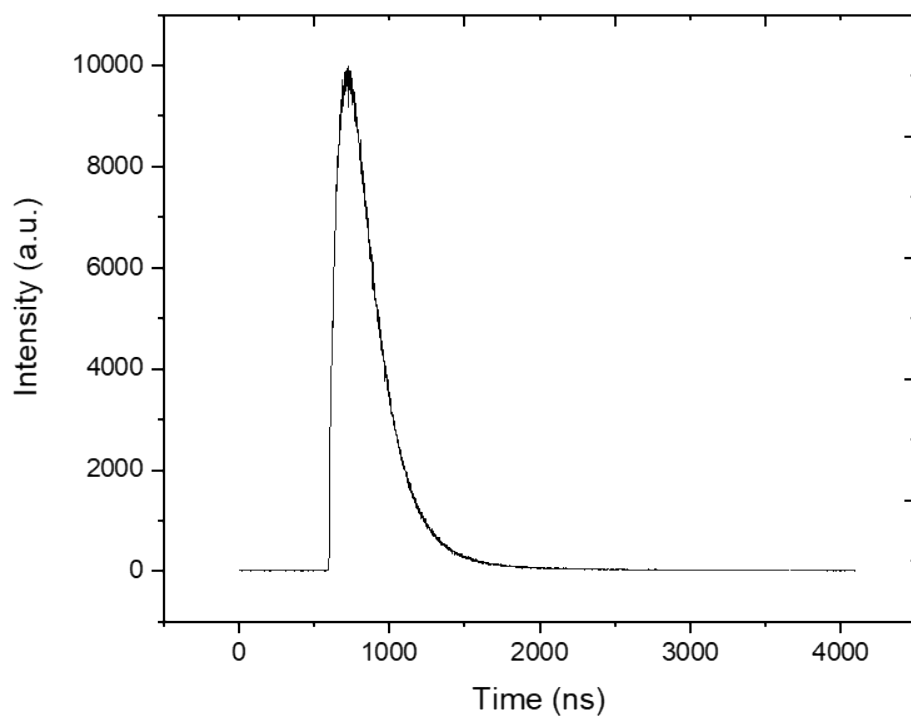


Figure S1. The time-resolved photoluminescence data of inorganic perovskite nanoplates

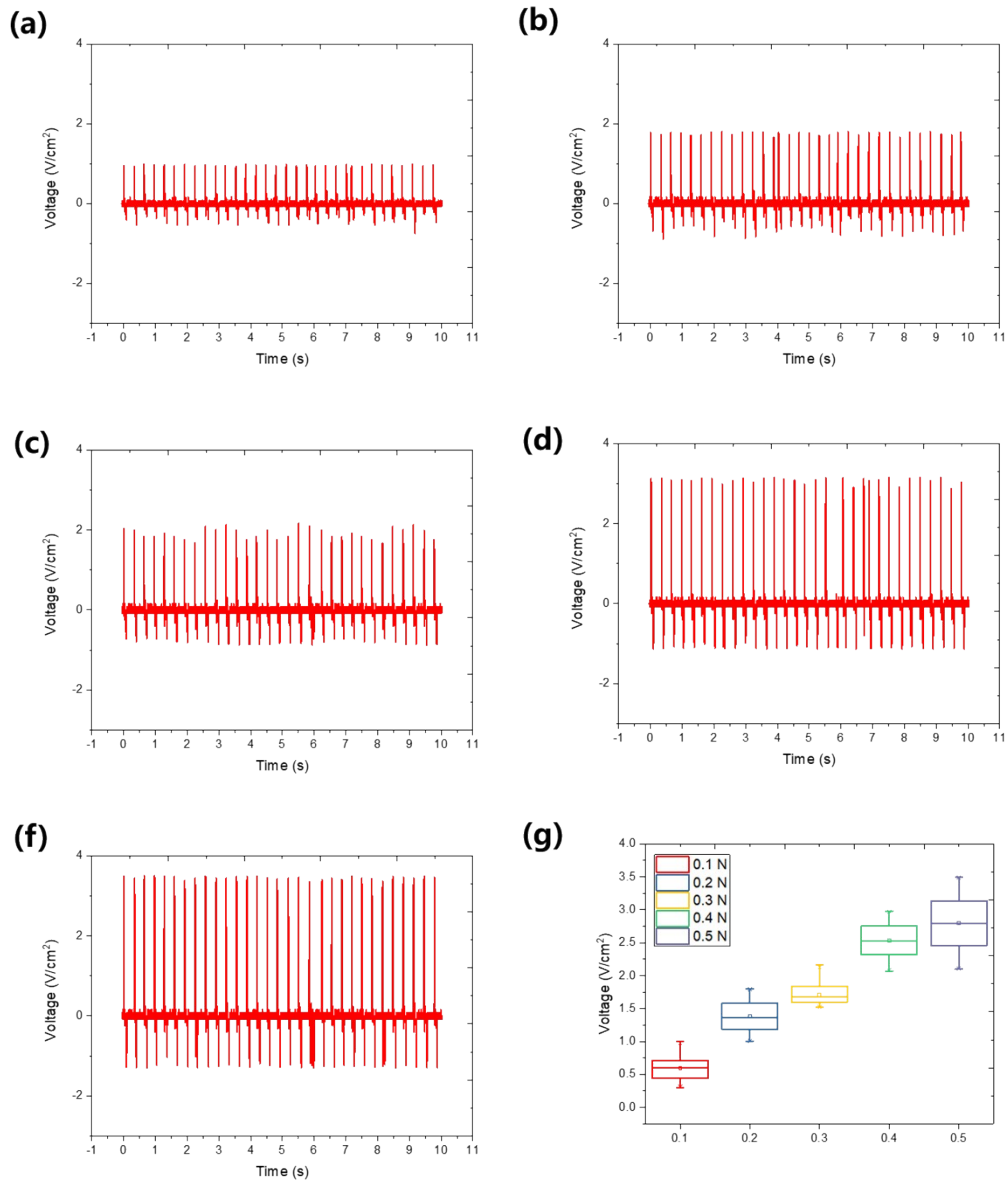


Figure S2. The Devices with structure: PET/PEDOT:PSS/perovskite NPs/Au. The voltage signal produced by the device in which 3Hz frequency and a force of 0.1N to 0.5N repeatedly stimulate the device in the darkroom.

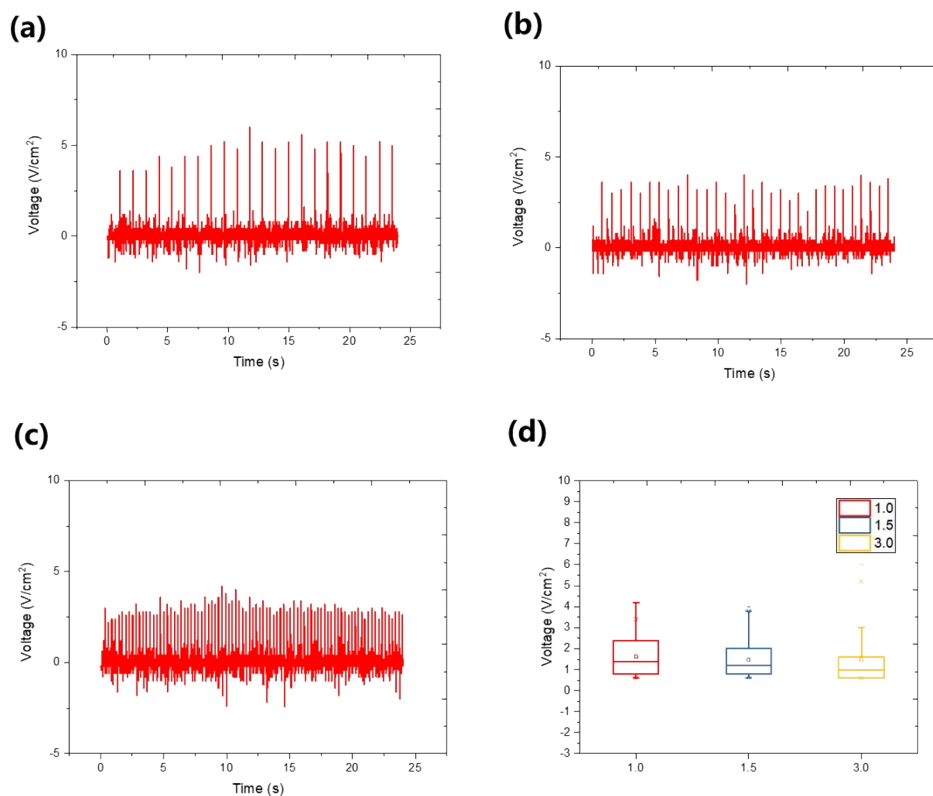


Figure S3. The Devices with structure: PET/PEDOT:PSS/perovskite NPs/Au. The voltage signal produced by the device in which 1Hz to 3Hz frequency and a force of 0.5N to repeatedly stimulate the device in the darkroom.

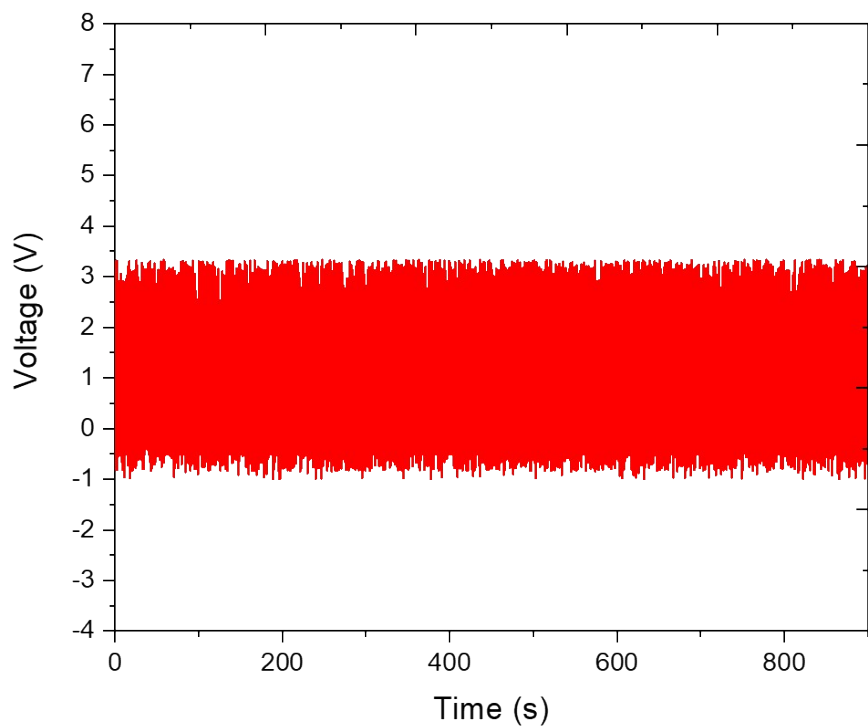


Figure S4. The Devices with structure: PET/PEDOT:PSS/perovskite NPs/Au. The voltage signal produced by the device in continuous work for 900 seconds, with 3Hz frequency and a force of 0.5N.

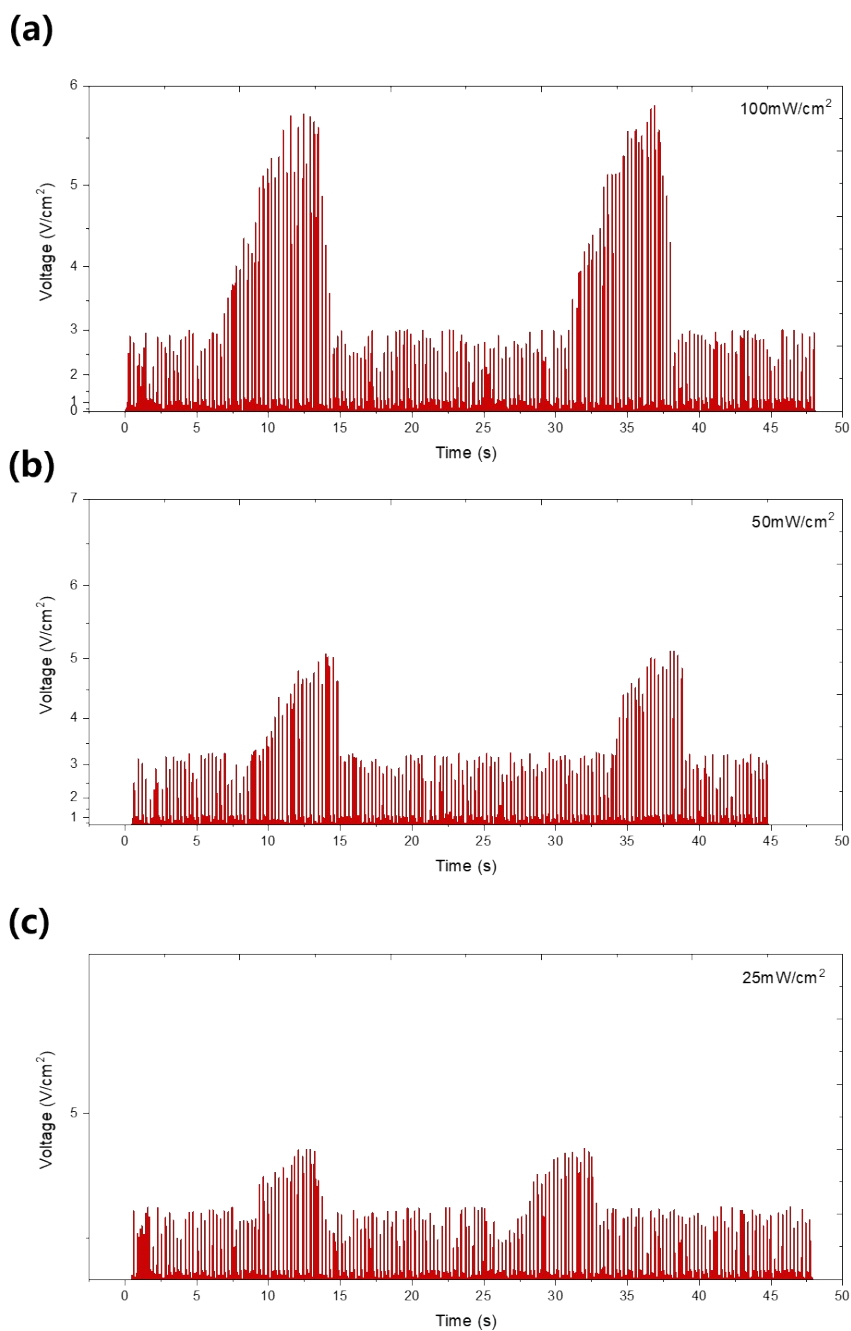


Figure S5. The Devices with structure: PET/PEDOT:PSS/perovskite NPs/Au. The voltage signal produced by the device, with 3Hz frequency and a force of 0.5N. Application of 8s UV irradiation twice, with intensity 75mW/cm² 50mW/cm² and 25mW/cm² repeatedly.

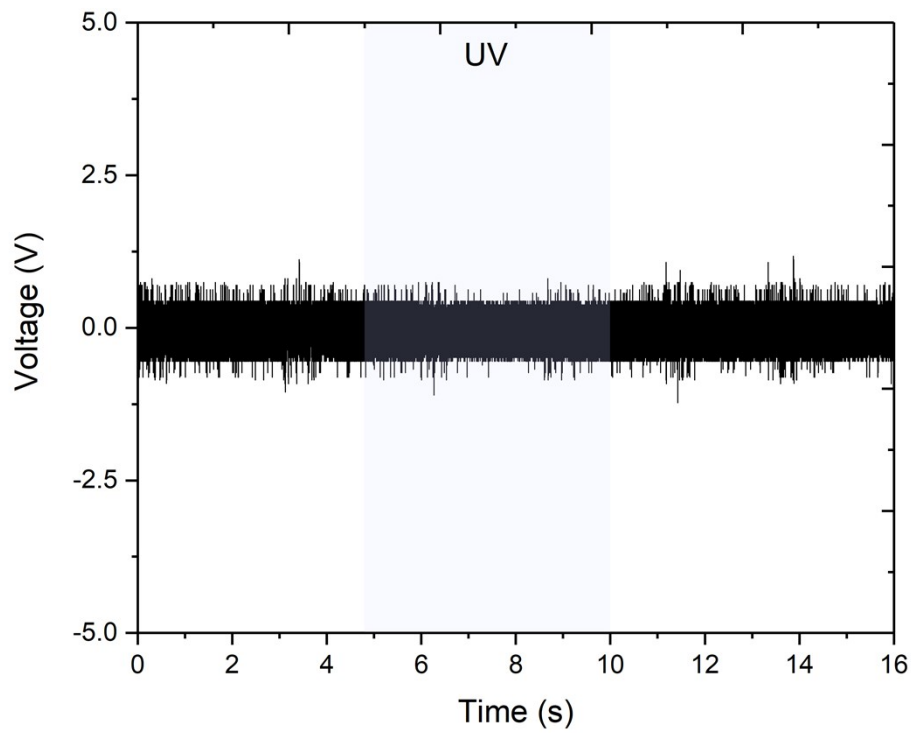


Figure S6. The Devices with structure: PET/PEDOT:PSS/perovskite NPs/Au. The voltage signal produced by the device, with intensity $50\text{mW}/\text{cm}^2$.

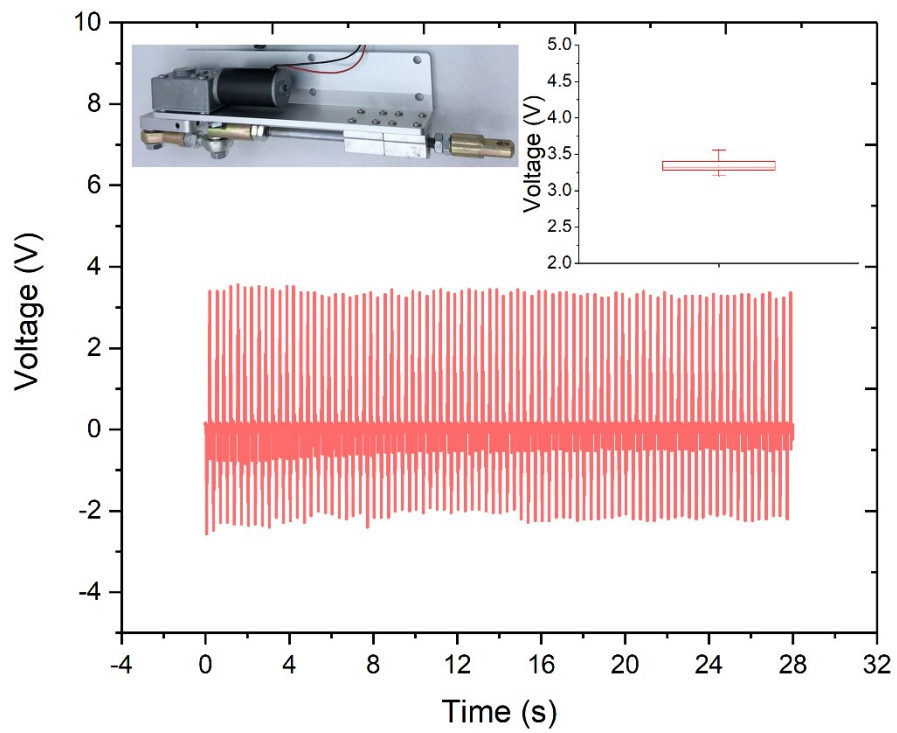


Figure S7. The Devices with structure: PET/PEDOT:PSS/perovskite NPs/Au. Voltage stability test (middle), statistical results (top right) and source of mechanical force(top left).

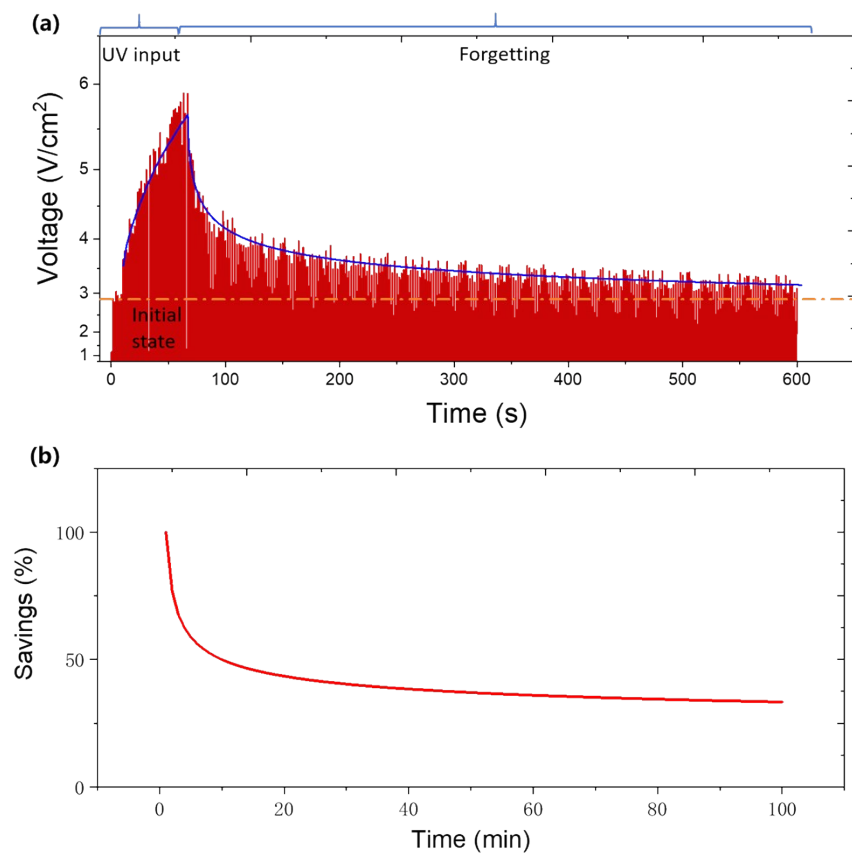


Figure S8. (a) The entire reaction loop. The voltage signal reflects the sensitivity of the UV irradiation. (b) Ebbinghaus's forgetting curve.

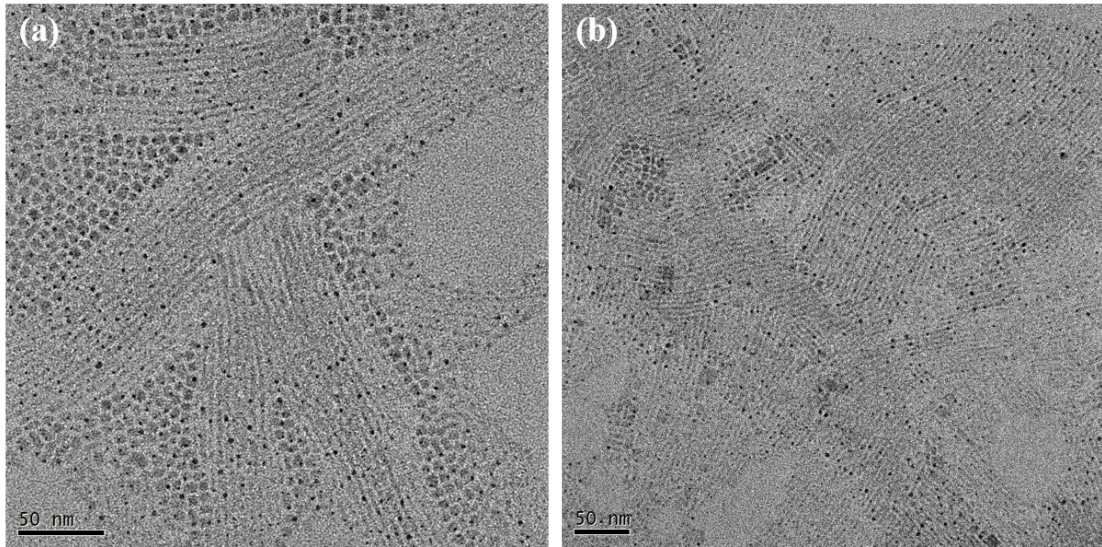


Figure S9. Transmission electron microscopy (TEM) image

Title	Journal/ Date	Function					
		Material	Application	Input	Output	Power	Structure
Self-Powered Tactile Sensor with Learning and Memory (DOI: 10.1021/acsnano.9b07165)	ACS Nano/ Nov 2019	PI:rGO	Synapse (STP LTP PPF) Tactile Sensor	Mechanical force	Voltage signal	Self- powered	Vertical contact TENG
Configurable Resistive Response in BaTiO ₃ Ferroelectric Memristors via Electron Beam Radiation (DOI: 10.1002/adma.201907541)	AM/ Feb 2020	BaTiO ₃	Memristor	Light stimulation	Current signal	External power	Triode
Photoelectric Synaptic Plasticity Realized by 2D Perovskite (DOI: 10.1002/adfm.201902538)	AFM/ May 2019	Perovskite	Optoelectronic Synapse (STP LTP PPF)	Light stimulation	Current signal	External power	Triode
Artificial Synapses Based on Multiterminal Memtransistors for Neuromorphic Application (DOI: 10.1002/adfm.201901106)	AFM/ April 2019	MoS ₂	Synapse (STP LTP PPF)	Electrical stimulation	Current signal	External power	Triode
Optoelectronic Perovskite Synapses for Neuromorphic Computing (DOI: 10.1002/adfm.201908901)	AFM/ Jan 2020	Perovskite	Optoelectronic Synapse (STP LTP PPF)	Light stimulation	Current signal	External power	Diode
Dual-Phase All-Inorganic Cesium Halide Perovskites for Conducting-Bridge Memory-Based Artificial Synapses (DOI: 10.1002/adfm.201906686)	AFM / Sep 2019	Perovskite	Synapse (STP LTP PPF) Tactile Sensor	Electrical stimulation	Current signal	External power	Diode
Gating-induced reversible HxVO ₂ phase transformations for neuromorphic computing (DOI:10.1016/j.nanoen.2019.104268)	Nano Energy/ Jan 2020	HVO ₂	Synapse (STP LTP PPF)	Electrical stimulation	Current signal	External power	Triode
Self-powered artificial synapses actuated by triboelectric nanogenerator (DOI: 10.1016/j.nanoen.2019.03.079)	Nano Energy/ Jan 2019	PDVT10 Ion-gel	Synapse (STP LTP PPF) Tactile Sensor	Mechanical force	Current signal	Self- powered	TENG Triode
This work		Perovskite	Optoelectronic Synapse (STP LTP PPF) Tactile Sensor	Mechanical force and Light stimulation	Voltage signal	Self- powered	Single-electrode TENG

Table S1. Comparison of recent related research and our work.

Video S1. Test environment and device working process.