Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting Information

A flexible comb electrode triboelectric-electret nanogenerator with separated microfibers for self-powered position, motion direction and acceleration tracking sensor

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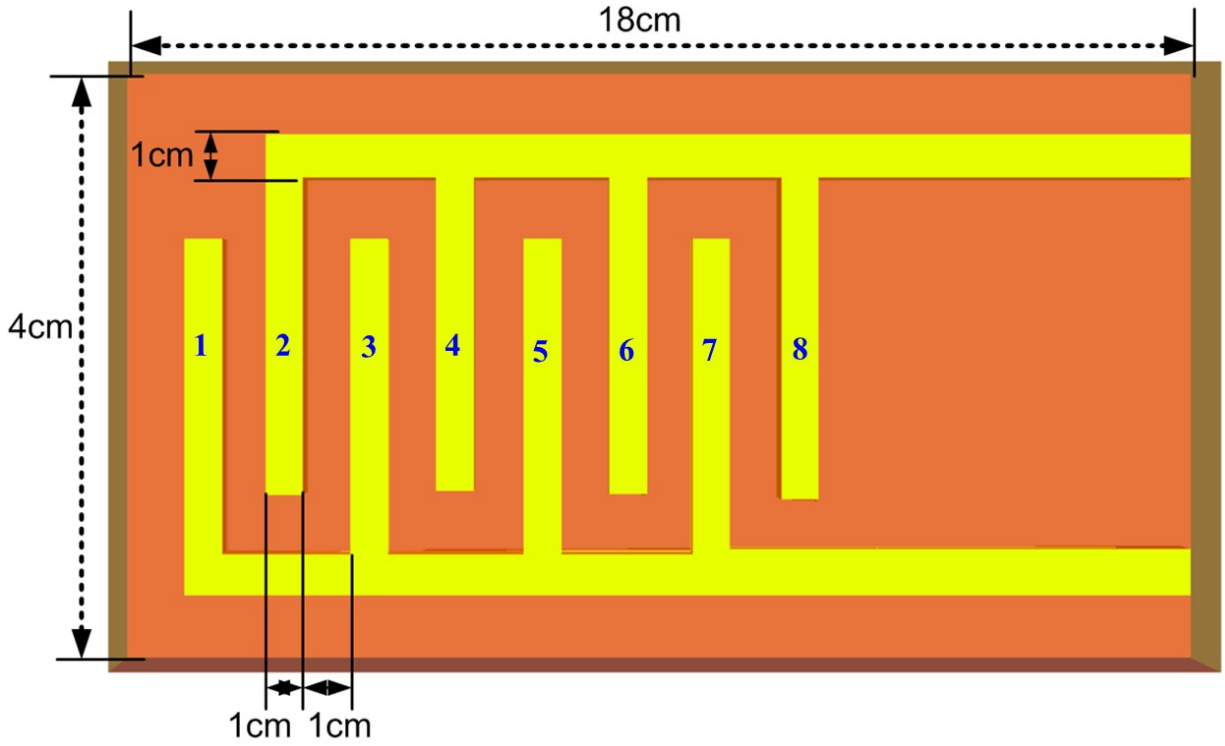

Fig. S1 Dimensions of the triboelectric-electret nanogenerator film and its numbered locations.

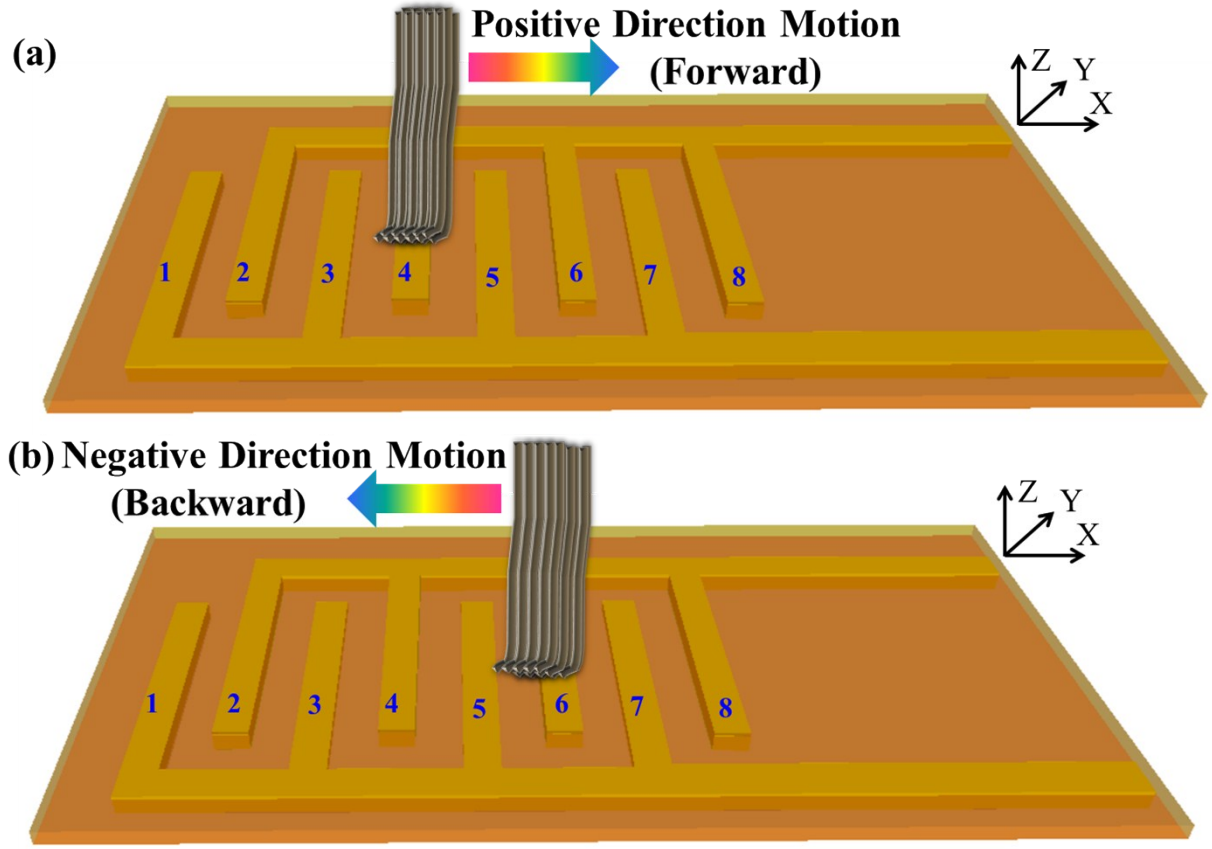

Fig. S2 (a) Microfibers object with a positive X direction motion, and (b) Microfibers object with a negative X direction motion.

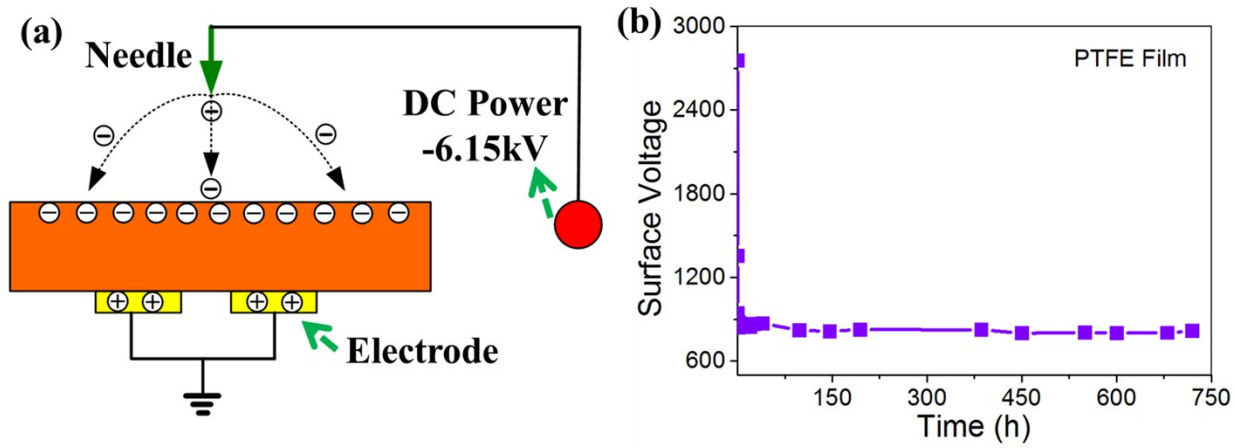

Fig. S3 (a) Corona charge platform, and (b) the surface voltage on the PTFE film with time.

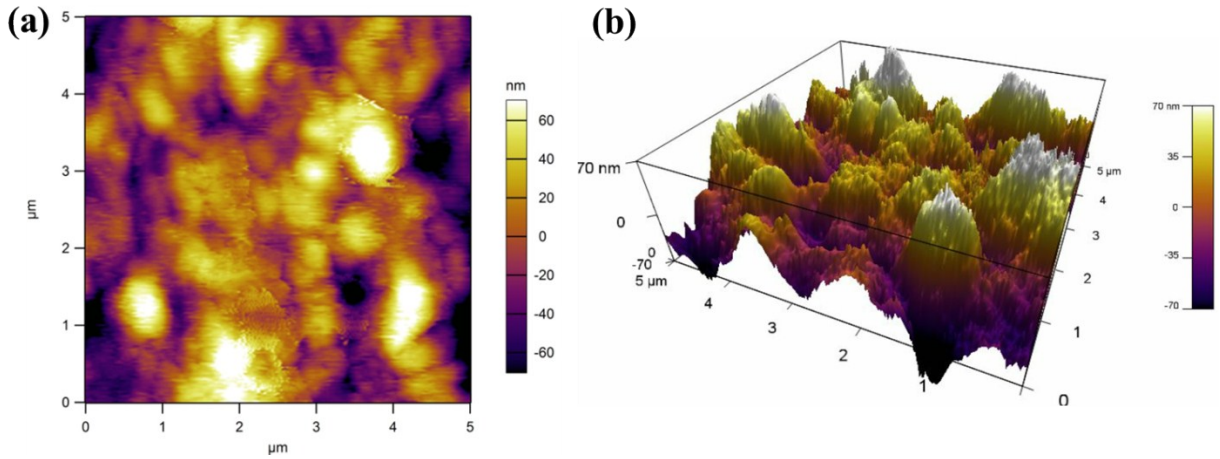

Fig. S4 Characterization of material by AFM image analysis, (a) top view of PTFE film, (b) 3D view of PTFE film.

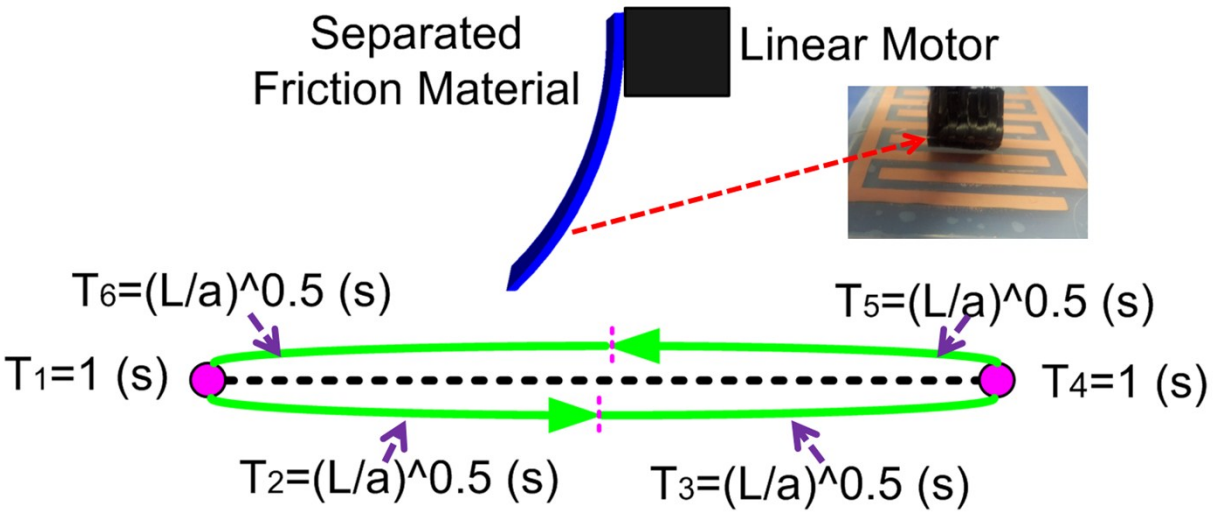

Fig. S5 Operation status of the self-powered position and acceleration sensor in a linear motor measurement system, the separated object was moving to the left side. T_1 and T_2 were a 1s pause, the time T_2, T_3, T_5, T_6 were decided by the acceleration of the linear motor system.

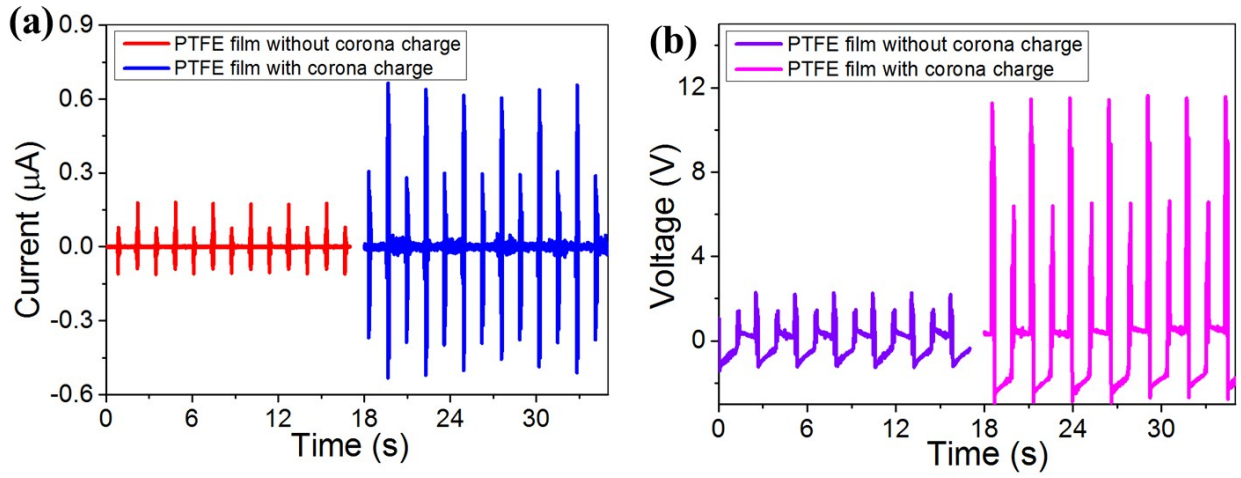

Fig. S6 Measurement results without and with corona charge of the PTFE electret film in a flexible triboelectric-electret nanogenerator with the separated object, (a) I_{sc}, and (b) V_{oc}.

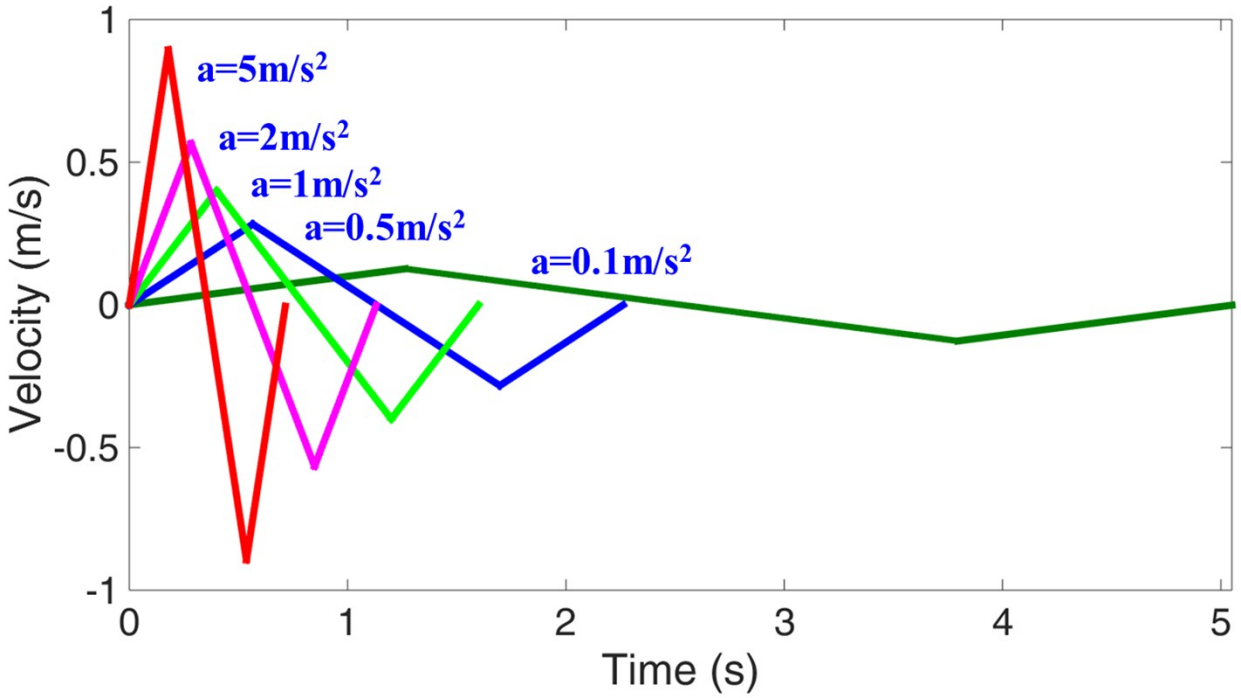

Fig. S7 Velocity in respect to the time at different accelerations.

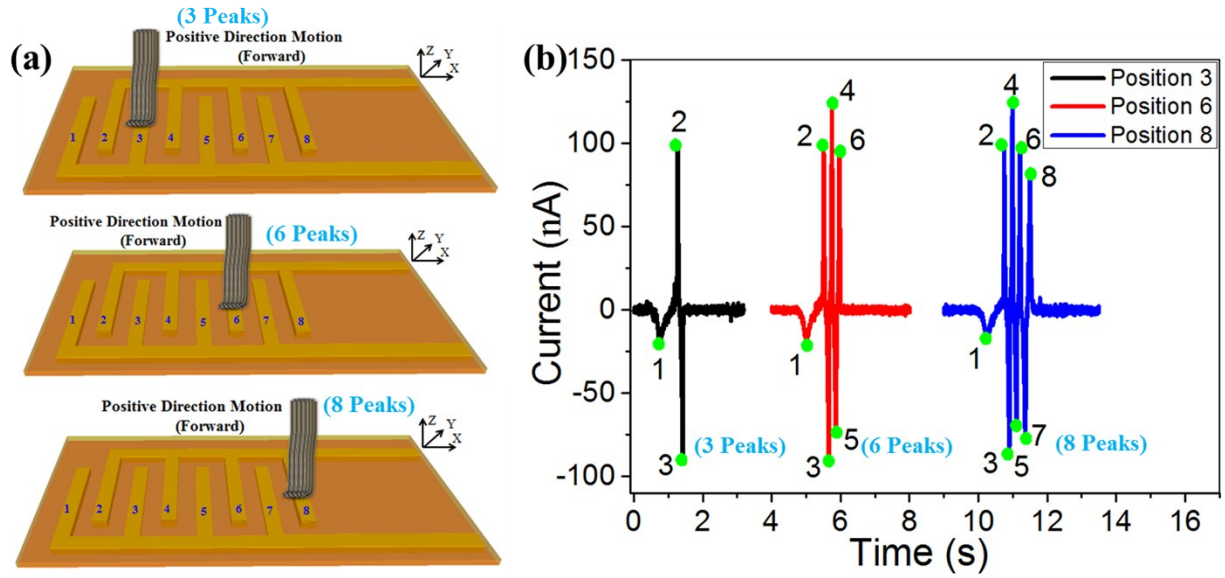

Fig. S8 (a) Schematic of the positions on flexible triboelectric-electret nanogenerator film, and (e) positions were identified by the number of peaks [48], 'position 3', 'position 6' and 'position 8'.

48 X. H. Li, C. B. Han, L. M. Zhang and Z. L. Wang, *Nano Research*, 2015, 8, 3197–3204.

Table S1. Comparison output voltage and short-current in an acceleration range of our work with the current state-of-the-art

Items	Goal	Theory	Characteristic	Acceleration or speed Range	Output-voltage and short-current
Reference [32]	Moving Object Tracking Sensor	Triboelectric	Single electrode and Al Ball	0-0.6m/s^2	50nA short-current with Maximum 0.6m/s^2
Reference [33]	Motion Tracking sensor	Triboelectric	Single electrode and PDMS Block	Not mentioned	Maximum 4V Open-circuit voltage
Reference [34]	Velocity and Trajectory Tracking	Triboelectric	Single electrode and PTFE Block	2.8cm/s-22.5m/s	6nA short-current
Reference [35]	Motion Tracking	Triboelectric	Single electrode and Al Ball	0.3m/s-1.5m/s	0.1μA short-current
Our work	Position and Acceleration Tracking	Triboelectric-Electret	Comb Electrode and Carbon Microfibers	0.1m/s^2-5m/s^2	0.6μA short-current 12V Open-circuit voltage

32 F. Yi, L. Lin, S. M. Niu, J. Yang, W. Z. Wu, S. H. Wang, Q. L. Liao,Y. Zhang and Z. L. Wang, *Adv. Funct. Mater*., 2014, **24**, 7488–7494.

33 C. B. Han, C. Zhang, X. H. Li, L. Zhang, T. Zhou, W. G. Hu and Z. L. Wang, *Nano Energy,* 2014, **9**, 325–333.

34 Y. J. Su, G. Zhu, W. Q. Yang, J. Yang, J. Chen, Q. S. Jing, Z. M. Wu, Y. D. Jiang and Z. L. Wang, *ACS Nano,* 2014, **8**, 3843-3850.

35 J. K. Chen, P. Ding, R. Z. Pan, W. P. Xuan, D. P. Guo, Z. Ye, W. L. Yin, H. Jin, X. Z. Wang, S. Dong and J. K. Luo, *Nano Energy,* 2017, **34**, 442–448.

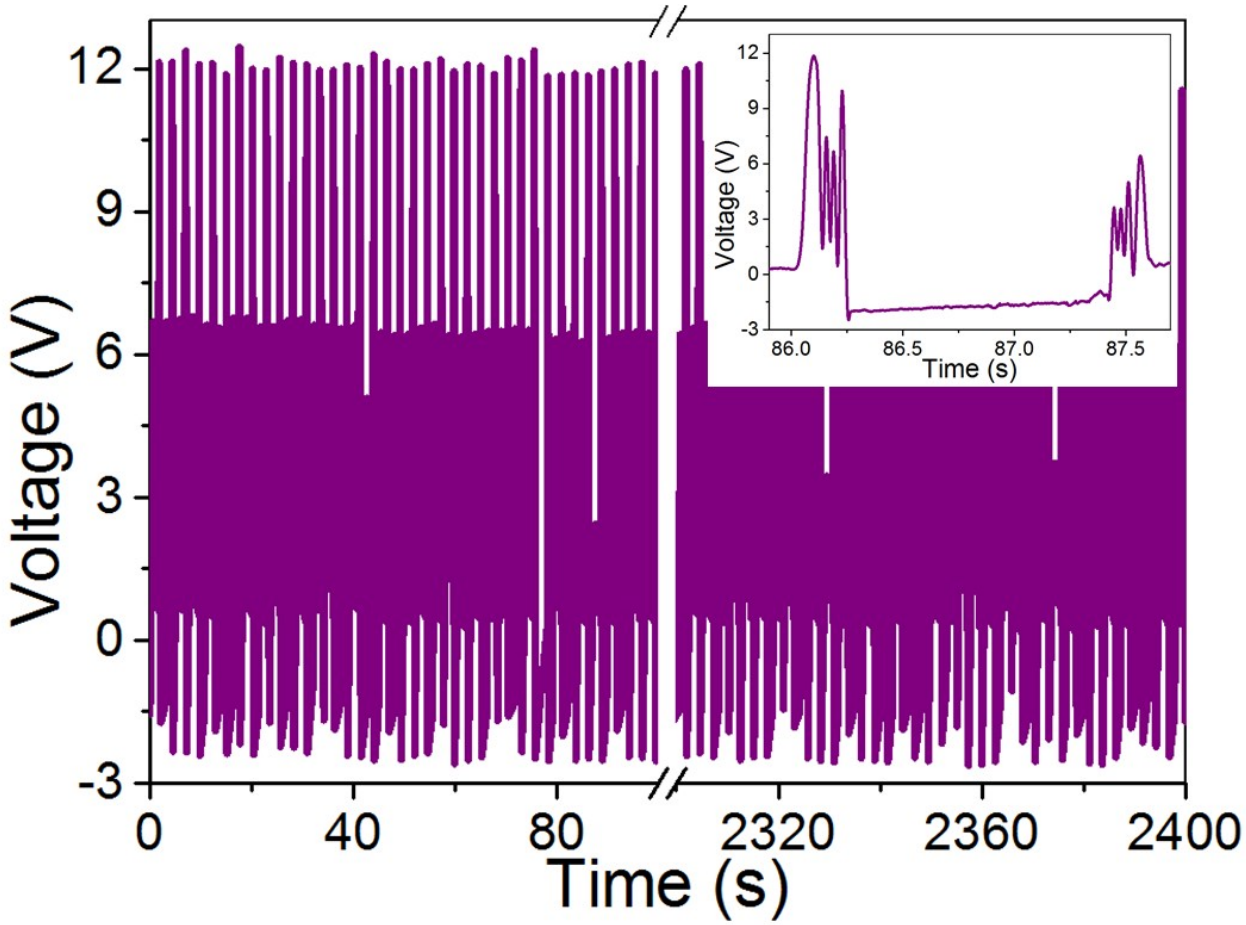

Fig. S9 V_{oc} measured for more than 2400 seconds (~1000 cycles).

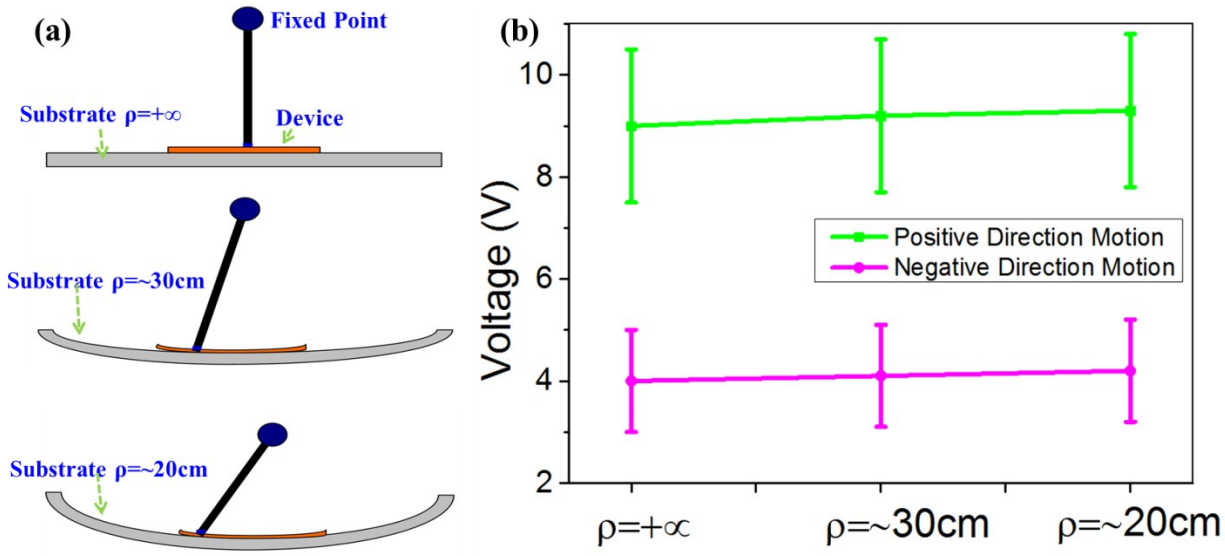

Fig. S10 (a) Flexible demonstration using three different bending states to the flexible triboelectric-electret nanogenerator, and (b) the measured voltage out from the device.

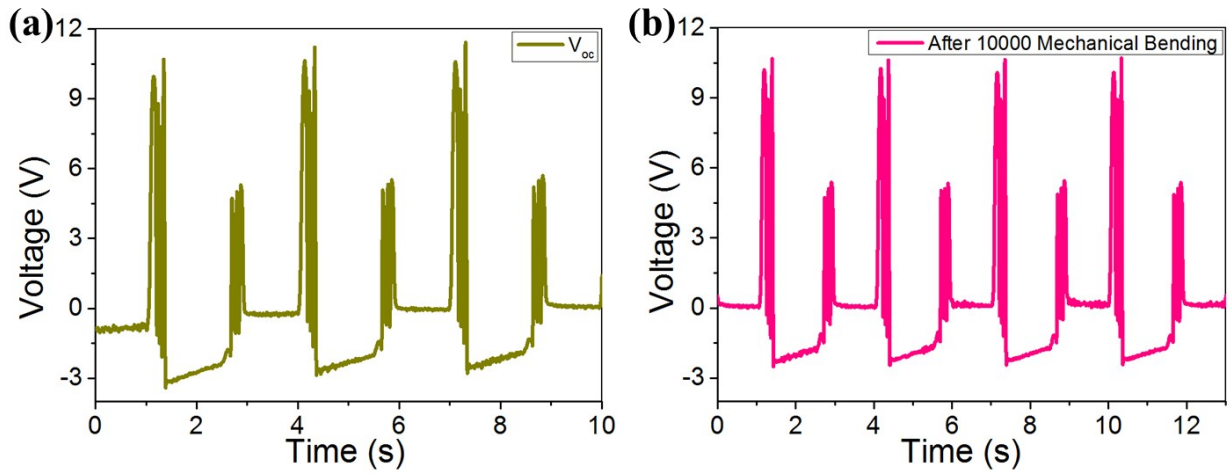

Fig. S11 V_{oc} measured of the flexible triboelectric-electret nanogenerator and its test after 10000 mechanical bending.

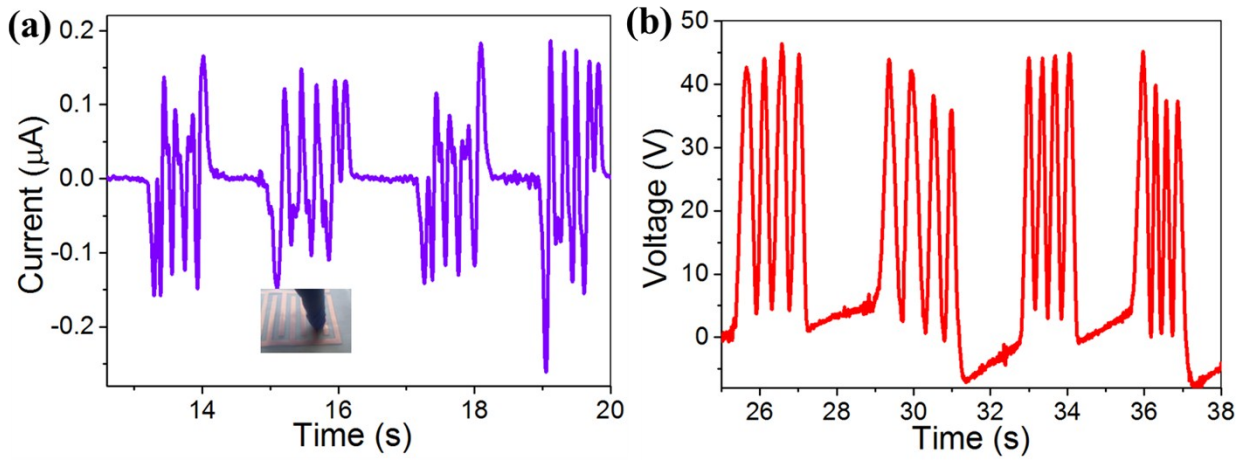

Fig. S12 Finger wearing with glove for sliding application, (a) I_{sc} with a finger sliding and (b) V_{oc} with a finger sliding.

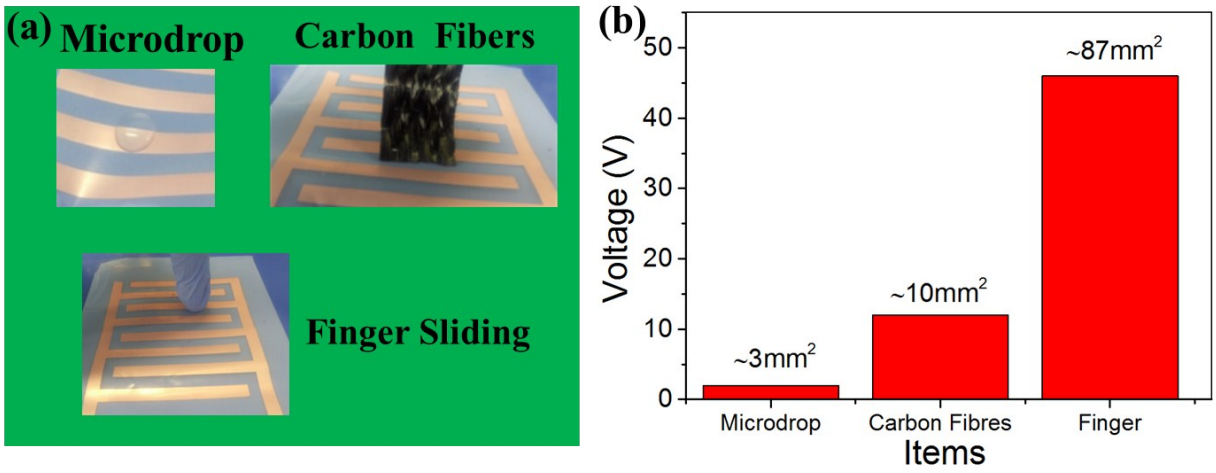

Fig. S13 Separated triboelectric materials objects for comparison, (a) three triboelectric status, and (b) V_{oc} from the mentioned status.

Video S1. Flexibility demonstration of a triboelectric-electret nanogenerator film.