Supporting Information

Enhancing the endogenous triboelectricity of a polylactic acid nanofiber film by controlling the MXene content and distribution

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Table S1. The detailed calculation parameters of the “number of contacts” of PLA films under different voltages.

Sample	D/μm	N	λ/μm	ν
12 kV	1.09	22	6.46	150
15 kV	0.85	31	6.36	225
18 kV	0.83	40	6.43	371
21 kV	0.81	23	7.01	143

The total fiber length (L) is the sum of all fibers in the image at the same magnification under SEM. According to the formula , $L = N\lambda$; hence, we calculate the total fiber length by calculating the number of fibers (N) and the length of single fiber (λ). As the electrospun fiber film is composed of a stack comprising numerous fibers, the SEM image contains both the top layer fibers and upper inner fibers, which represent a typical part of the whole fiber with a certain area and thickness. SEM showed the different PLA nanofiber films with the same volume. Therefore, according to the statistics derived from the SEM results, the number of contacts in a certain volume can be calculated; thus, the whole contact number of a film can be calculated using the film size. In this study, only the contact number in the SEM view was calculated as the final “number of contacts”, because the indefinite depth shown in the SEM view could not calculate the final volume of the whole film. However, the part contact number is still effective for evaluating the generation performance of the whole film, because all samples used in the generation tests have the same area and thickness. Thus, the real “number of contacts” of the whole film can be calculated by multiplying the part contact number provided in this study with the same factor (same volume). Thus, the comparison of the part contact numbers can represent a comparison of the whole contact numbers.

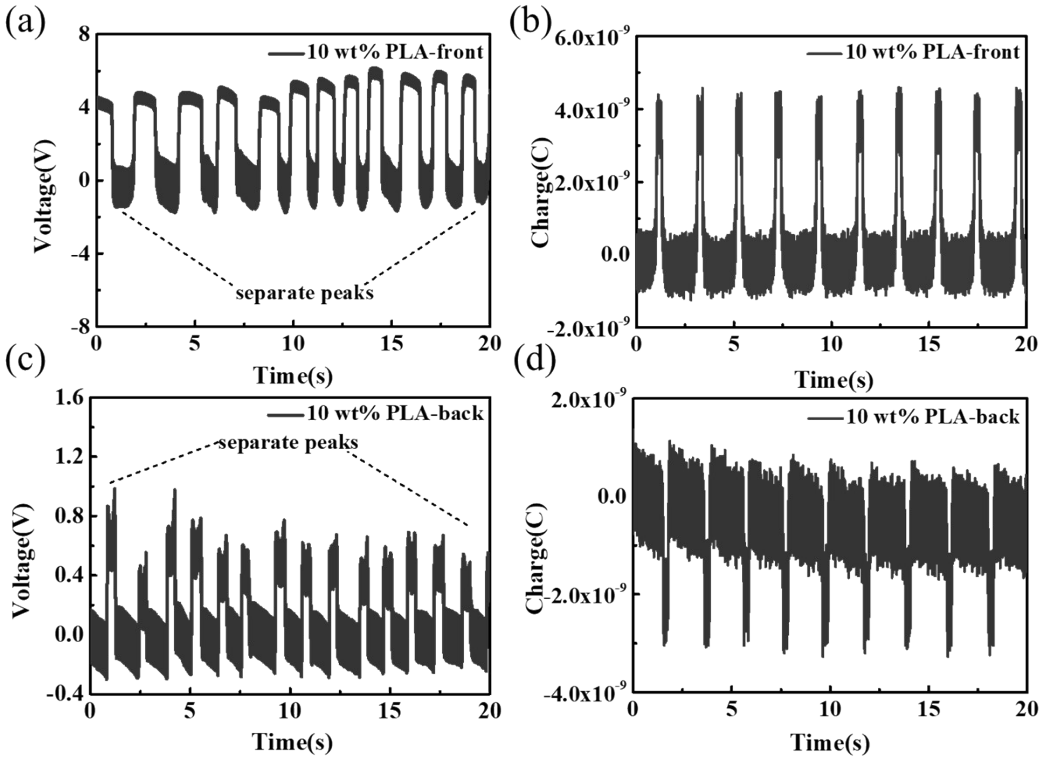

Fig. S1. The Voc and C on the positive and negative sides of PLA nanofiber film. (a) and (b) are the positive side of PLA film; (c) and (d) are the negative side of PLA film.

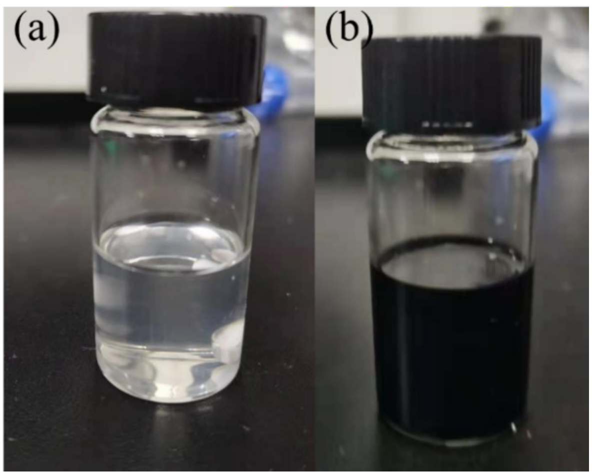

Fig. S2. The photographic images of (a) 10% PLA solution, and (b) MXene/PLA (PMX) solution.

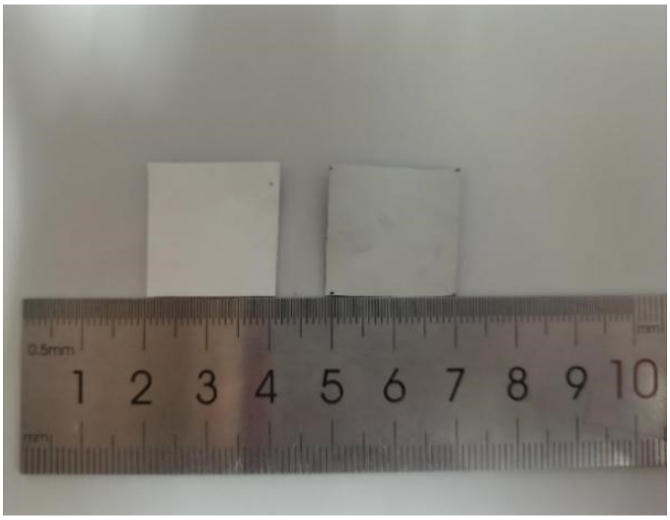

Fig. S3. The photographs of PLA (left), MXene/PLA (PMX) nanofiber films (right).

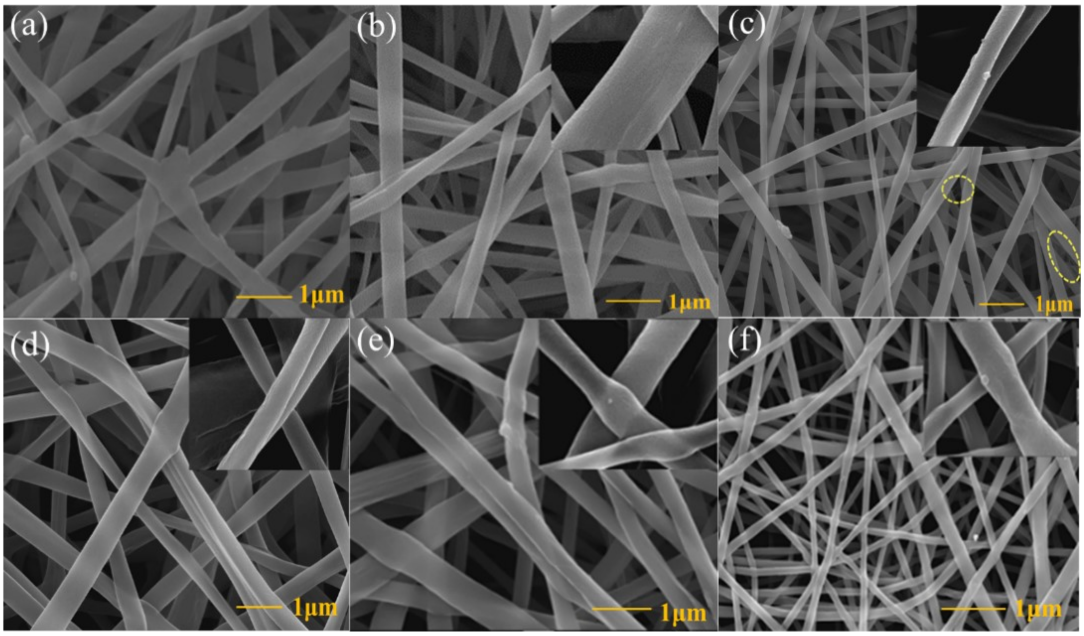

Fig. S4. SEM images of PMX nanofiber films with 0 - 2.5 wt% MXene content. (a)-0, (b)-0.5 wt%, (c)-1 wt%, (d)-1.5 wt%, (e)-2 wt%, (f)-2.5 wt%.

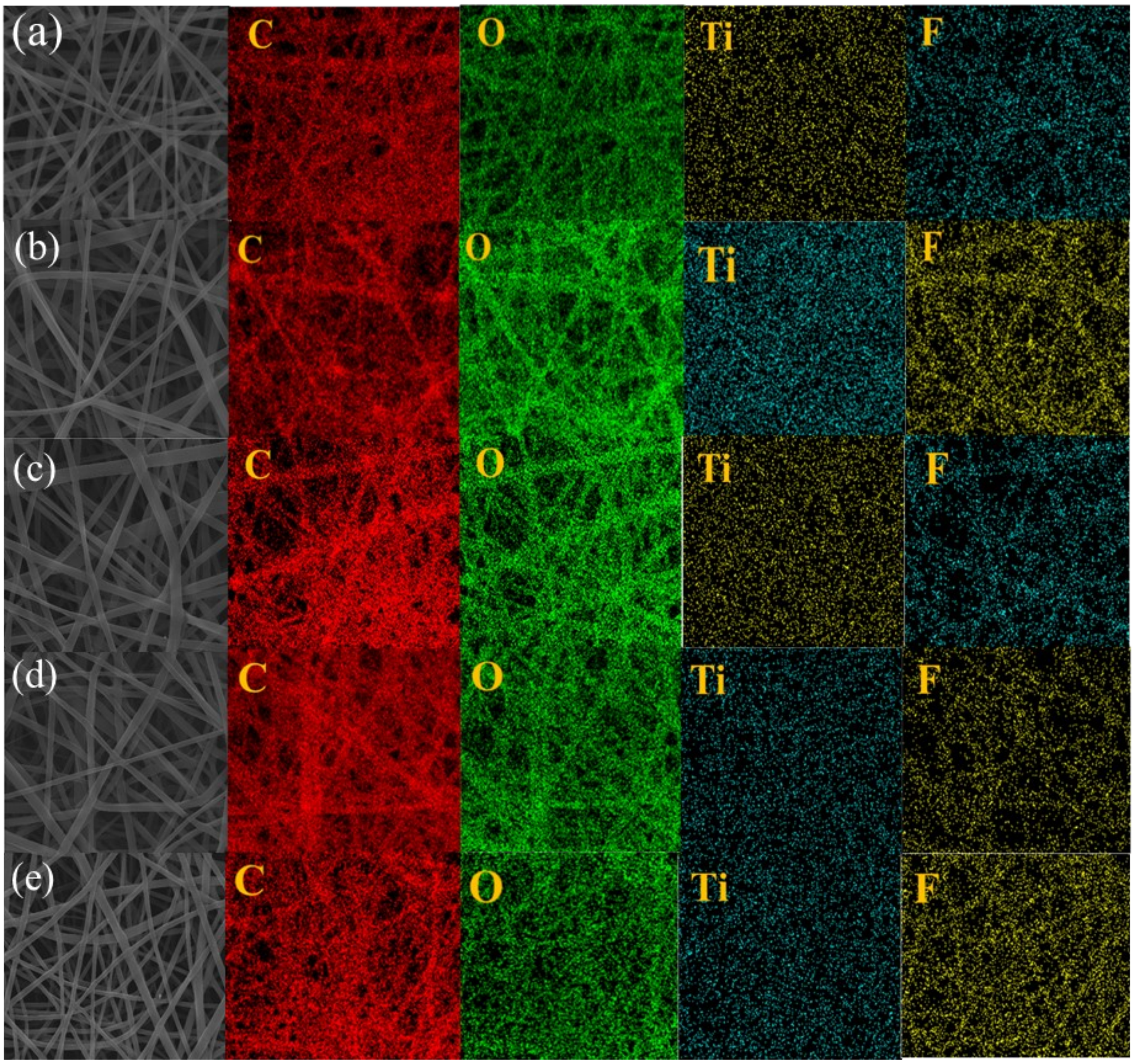

Fig. S5. EDS spectra of PMX for various wt% of MXene in PLA, (a) 0.5 wt %, (b) 1 wt %, (c)1.5 wt %, (d) 2 wt %, (e) 2.5 wt %.

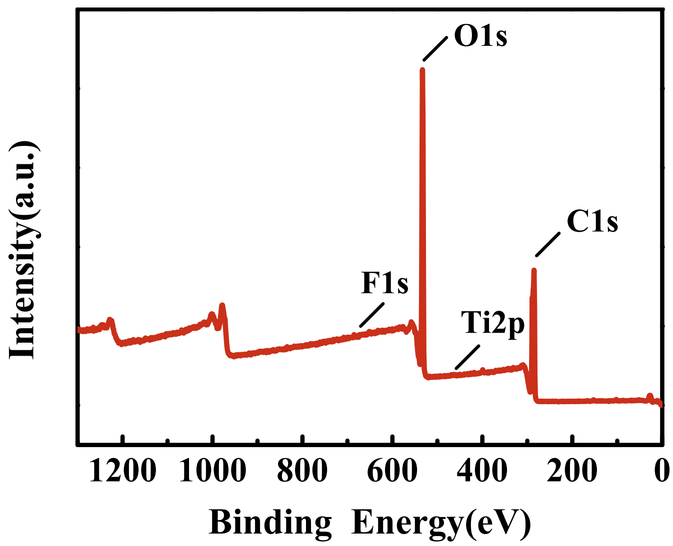

Fig. S6. The full spectrum XPS of 1wt% PMX nanofibers.

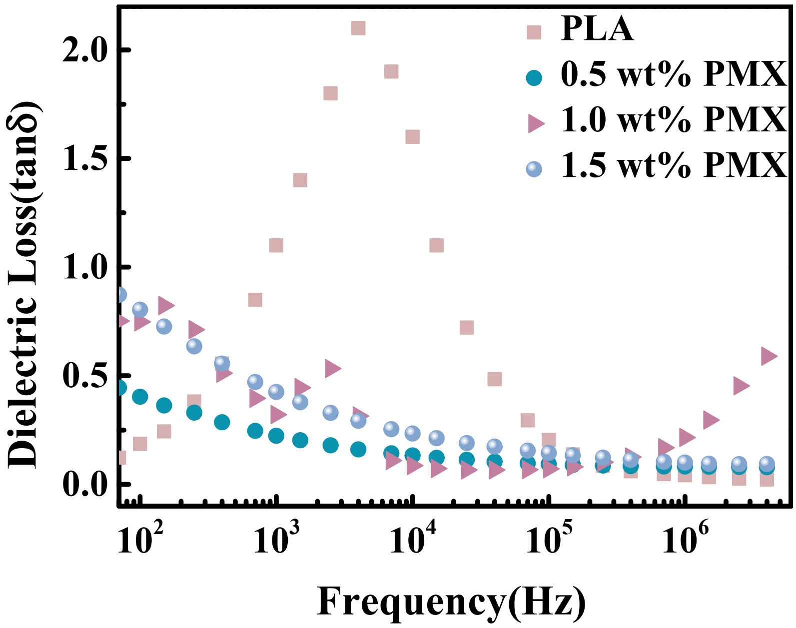

Fig. S7. The dielectric loss diagram of PMX films with different MXene content.

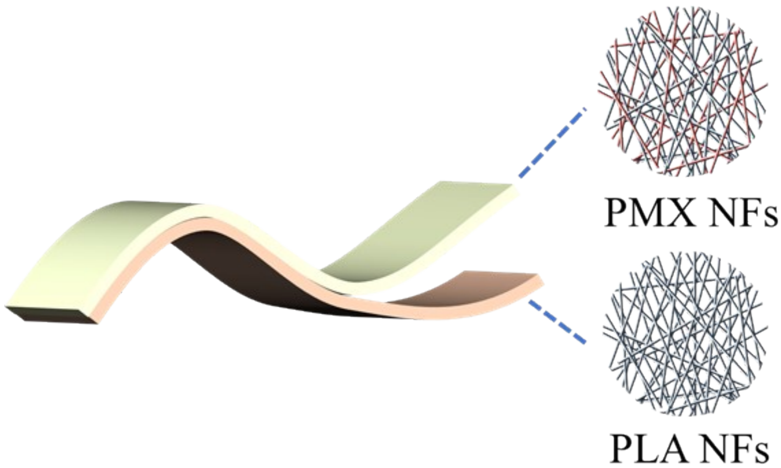

Fig. S8. The structure diagram of D-M bilayer film.

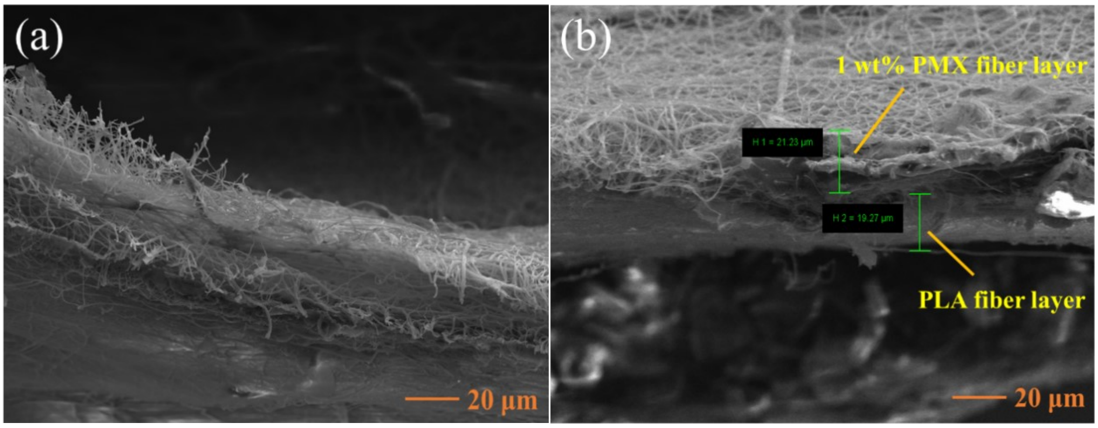

Fig. S9. The cross section of D-M bilayer film.

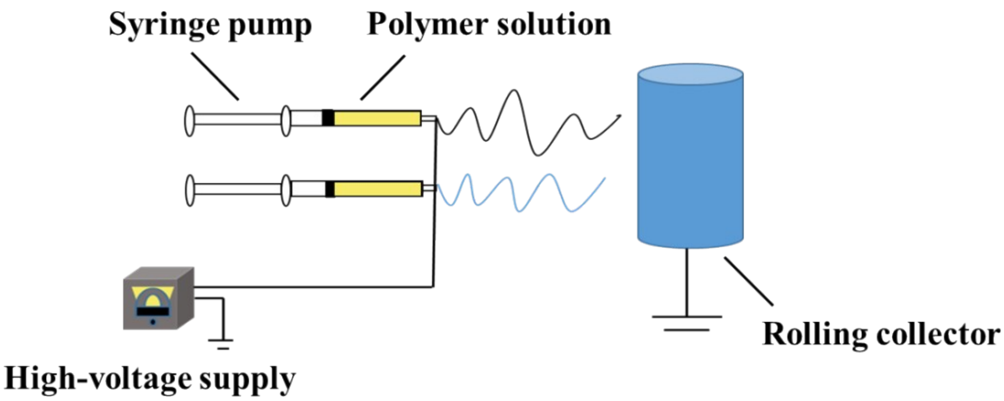

Fig. S10. The preparation schematic diagram of B-M film.

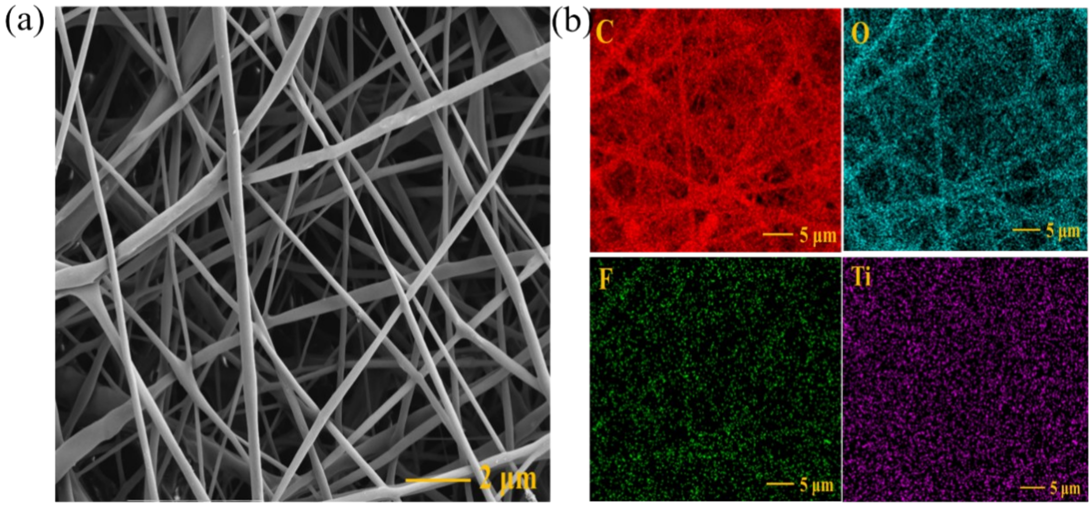

Fig. S11. (a) The SEM and (b) EDS spectras of B-M film.

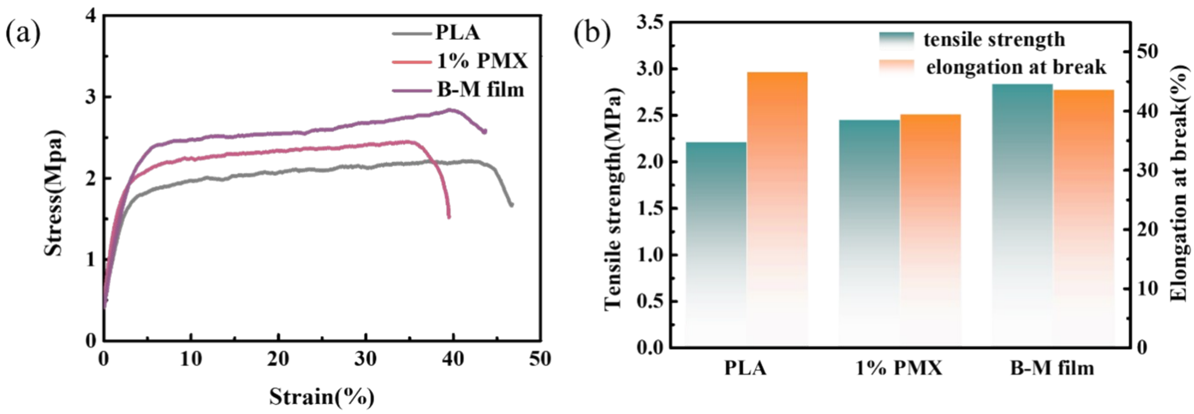

Fig. S12. (a) Stress-strain curves, (b) tensile strength and elongation at break of PLA, 1%PMX and B-M nanofiber films.

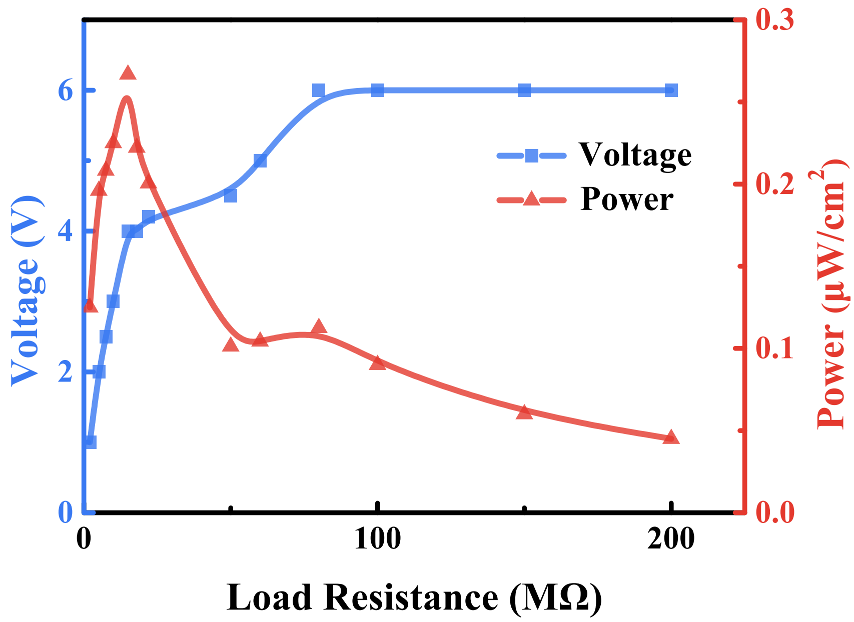

Fig. S13. The output voltage (Voc) and output power of PLA nanofiber film.

Table S2. Comparison of output performance of the B-M endogenous TENG with PENGs reported in the literature.

Material	preparation method	electrode	Voc/V	Isc	μW/cm²
PVDF/$MgCr_2O_4$	electrospinning	Cu	1.05		0.51
KNNS-BNKZ	electrospinning	Cu	10		0.5
PVDF-TrFE/BCZT	electrospinning	copper-clad Kapton	10	0.75μA	2.91
$BaTiO_3$ nanofiber(vertically)/PDMS	electrospinning	Cu	2.67	261.4nA	0.184
BTO@HBP@PMMA	electrospinning	Cu	3.4	0.32μA	5.25
PVDF-MWCNT	solution coating	Ag	12	30nA/cm2	
Li Ta-KNN/PVDF	electrospinning	Au	5.6		9.7
Annealed ZnO:PDMS	co-precipitation method	Cu	5	6μA	9.55
oriented PVDF	electrospinning	Al	14		1.22
fish bladder	electrospinning	Cu/Ag	10	51nA	4.15
ZnO NRs/PAN	electrospinning	Cu	6.5		10.8
PVDF-MoS_2	electrospinning	Cu	13.8		0.16
this work (MXene/PLA)	electrospinning	carbon paper	15	0.65μA	4.55