Supplementary Information (SI) for Journal of Materials Chemistry A.
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Supplementary Information for

Loop-Structured Film-Capacitor-Based High-Performance Direct-Current Triboelectric Nanogenerator with Temporary Charge Accumulation

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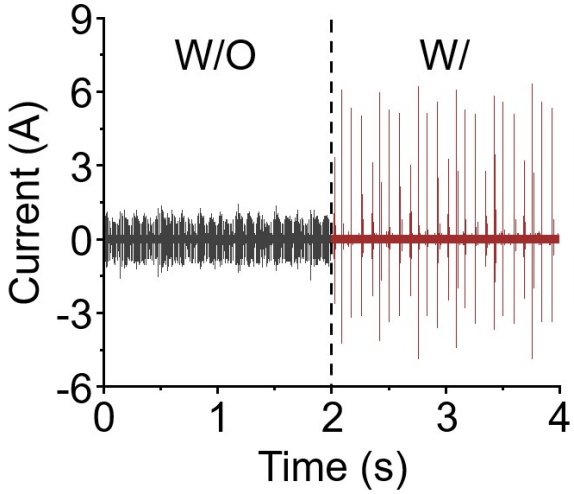
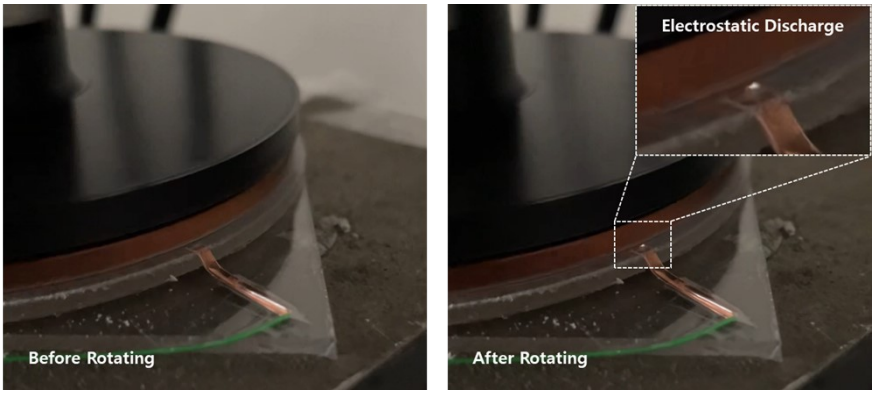
SUPPORTING INFORMATION

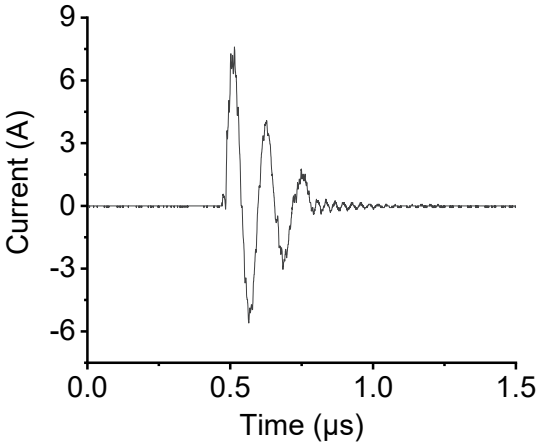
Supplementary Information 1| Photographs of DC-TENG without a loop-structured film capacitor. It was fabricated by attaching four quadrant circular copper films, which are identical to the outermost layers *E1'*, *E2'*, *E3'*, and *E4'* of the LFD-TENG top plate shown in Figure 2a.



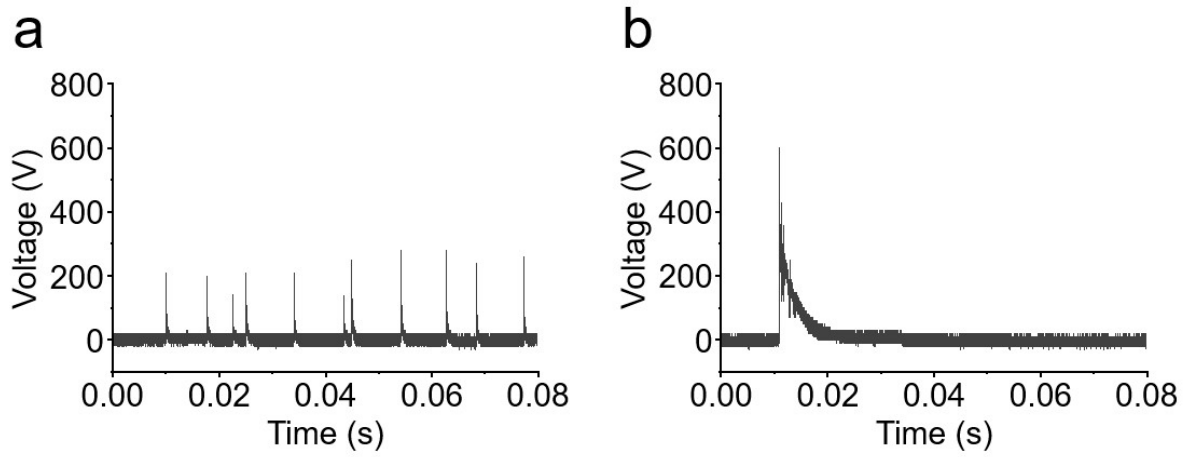
Supplementary Information 2| The current outputs of the DC-TENG with and without a loop-structured film capacitor.



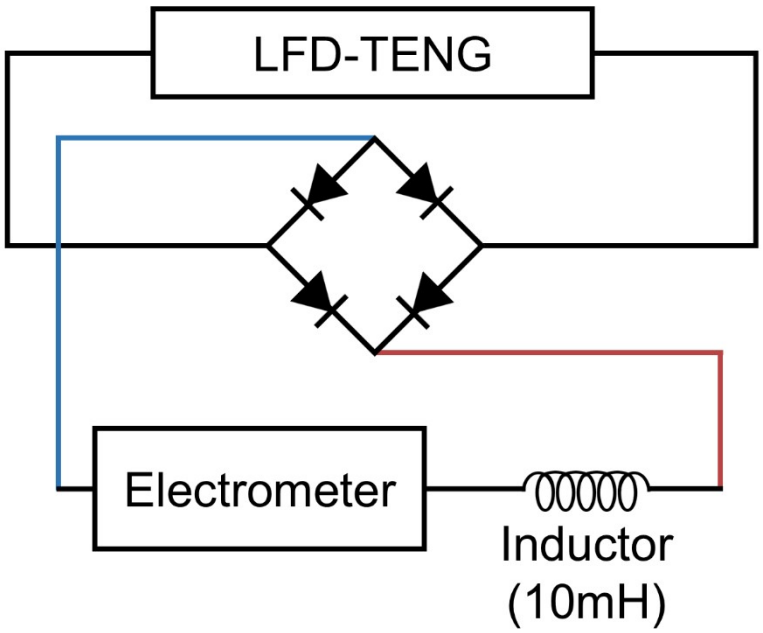
Supplementary Information 3| Photographs of LFD-TENG before rotating and after rotating.



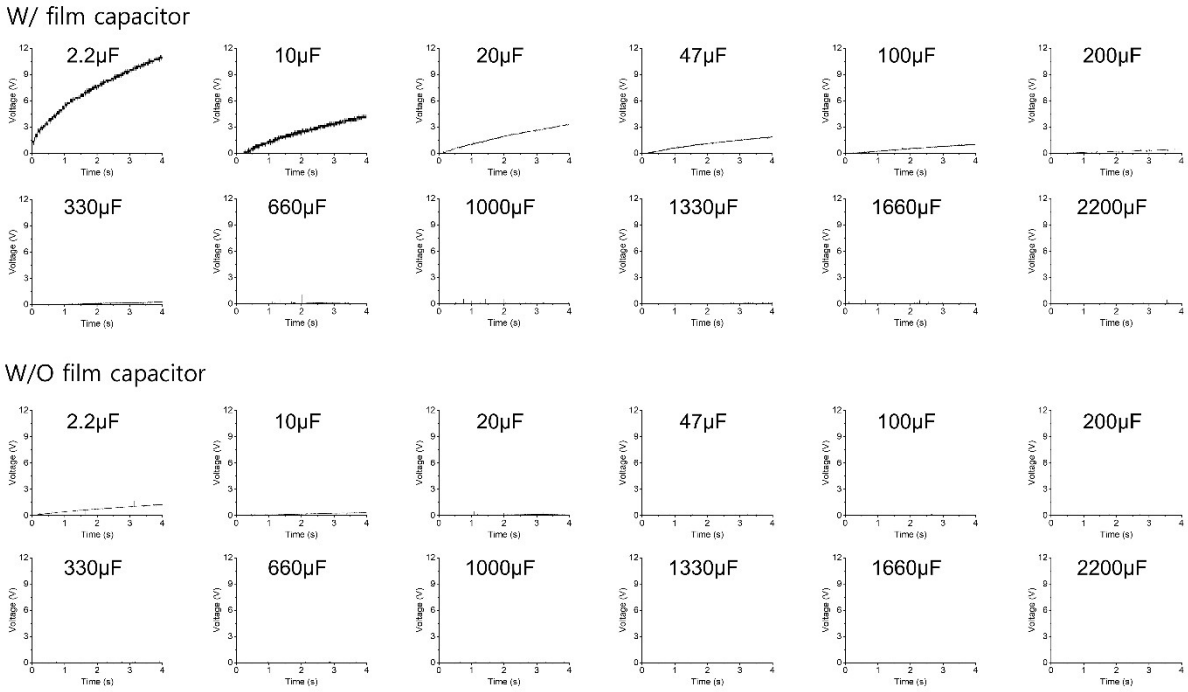
Supplementary Information 4| Extended graph of one peak current of the LFD-TENG.



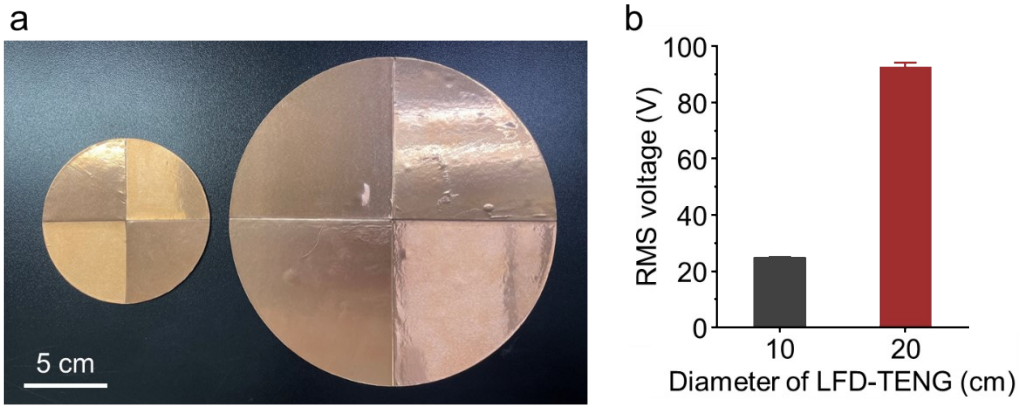
Supplementary Information 5| The voltage outputs of (a) DC-TENG without a loop-structured film capacitor and (b) DC-TENG with loop structure film capacitor (LFD-TENG) during quarter cycle (0.08 s). The integral areas for the 11 peak outputs of (a) are 0.0190365, 0.0156608, 0.0077031, 0.0172150, 0.0201169, 0.0134095, 0.0202859, 0.0419717, 0.0239490, 0.0196107, and 0.0201533 respectively, and the total area is 0.219 based on 3 significant figures. The integral area of one peak output of (b) is 1.002.



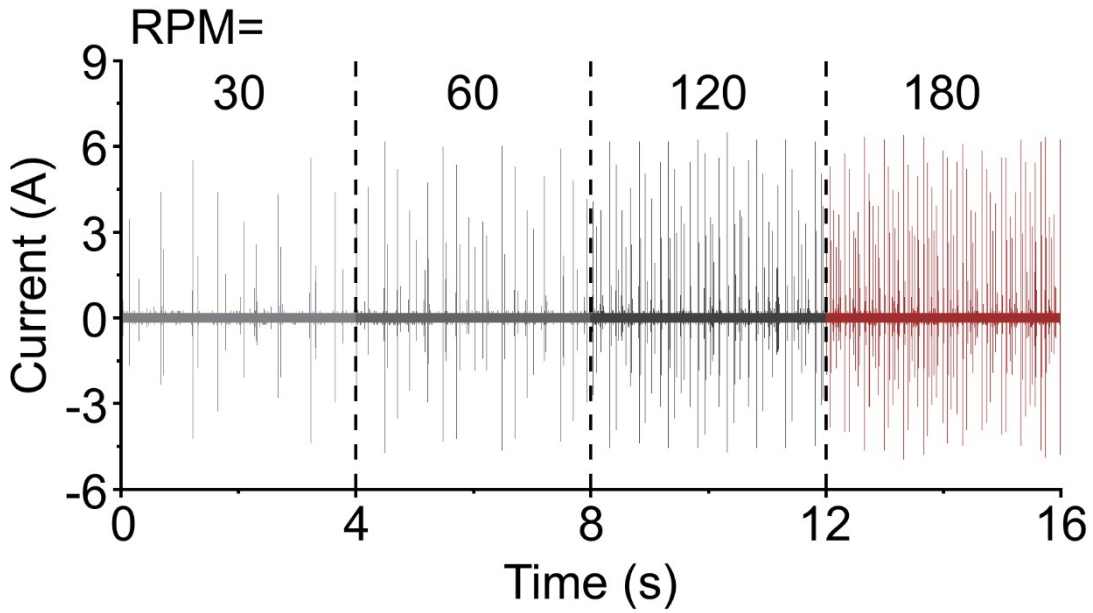
Supplementary Information 6| Rectifier circuit diagram for measuring the transferred charges of LFD-TENG and DC-TENG with an electrometer.



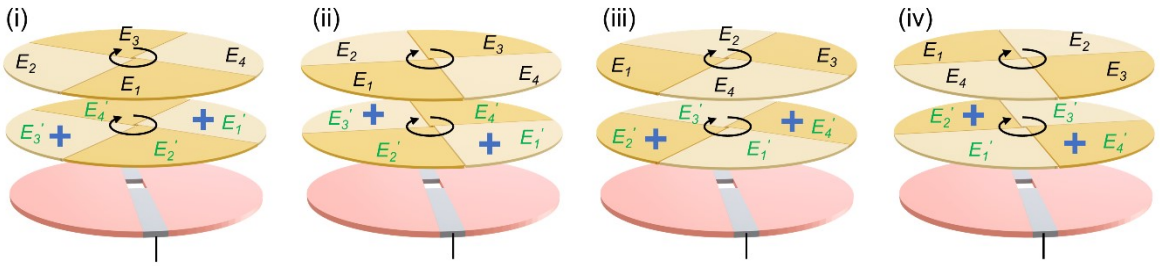
Supplementary Information 7| Rectifier circuit diagram for measuring the transferred charges of LFD-TENG and DC-TENG with an electrometer.



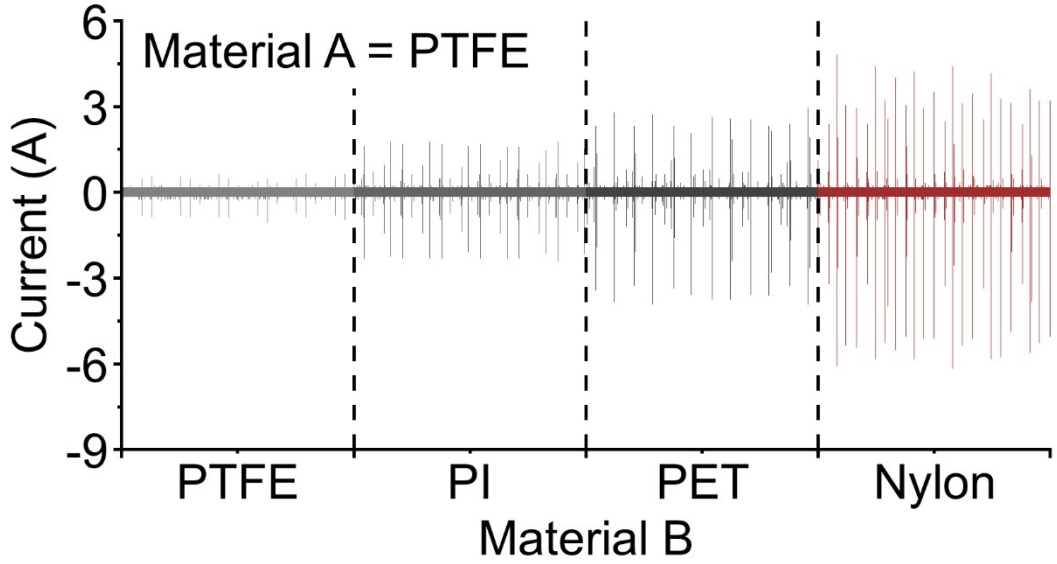
Supplementary Information 8| Rectifier circuit diagram for measuring the transferred charges of LFD-TENG and DC-TENG with an electrometer.



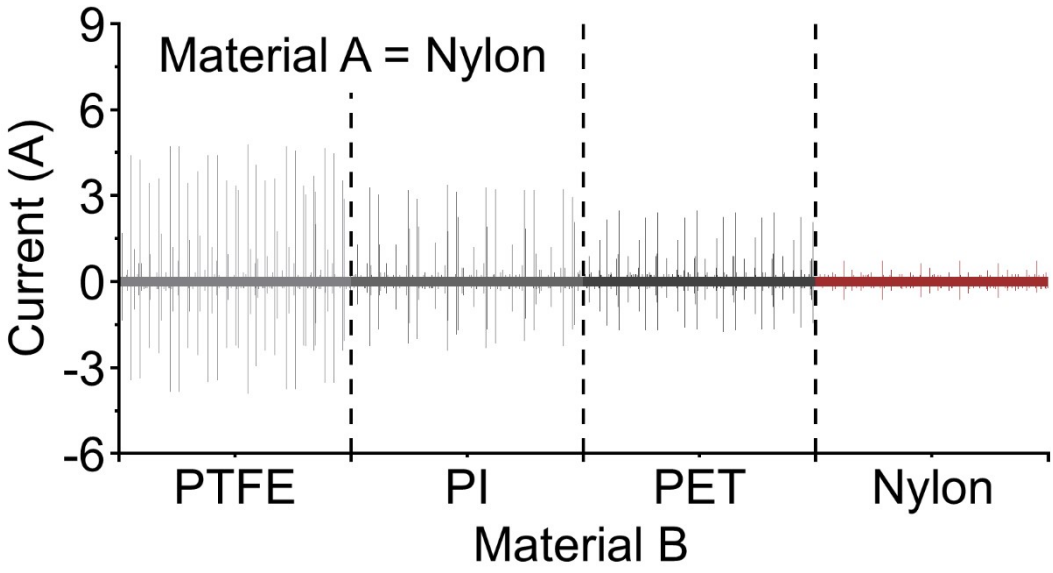
Supplementary Information 9| The current outputs of the LFD-TENG with different rpm inputs (30, 60, 120, and 180) for 4 seconds.



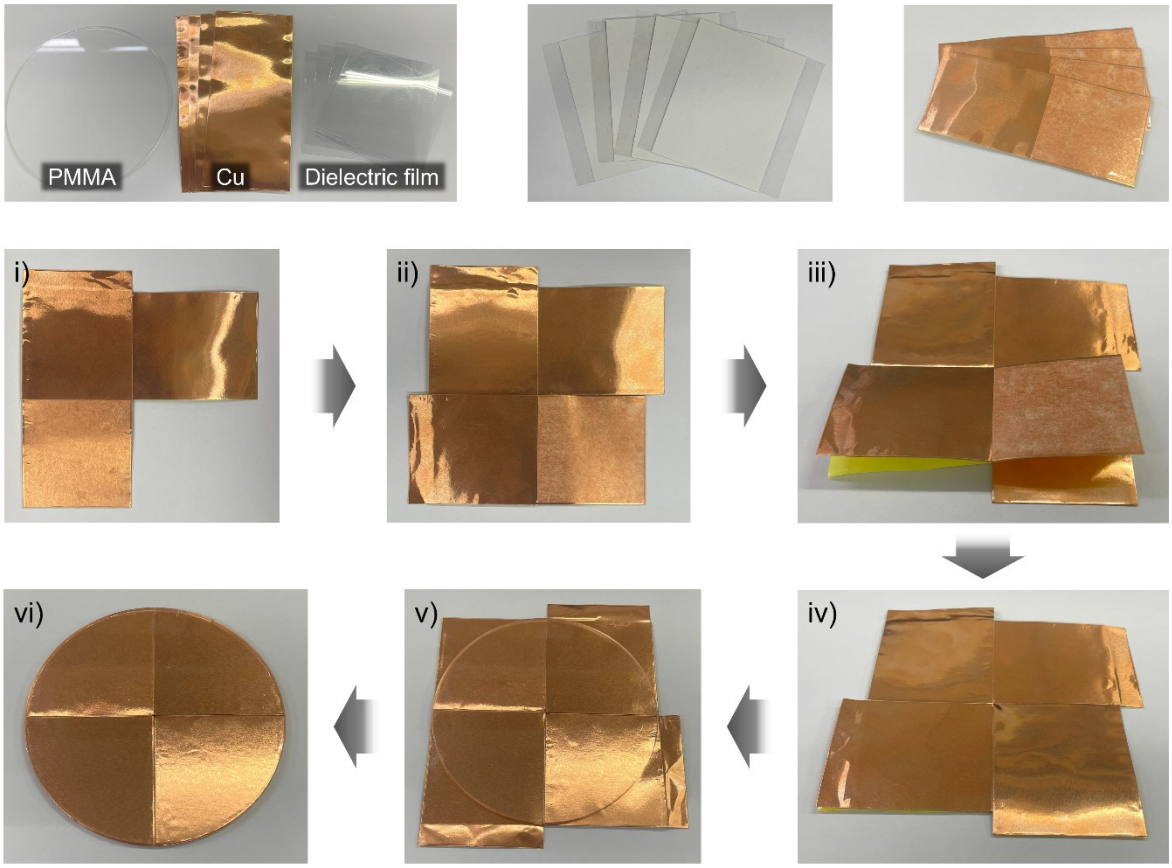
Supplementary Information 10| Working mechanism of LFD-TENG when same material is used for Material A and Material B



Supplementary Information 11| The current outputs of the LFD-TENG when Material A of the triboelectric layer of the bottom plate was fixed as PTFE and different materials were used for Material B. Each output was measured for 4 seconds.



Supplementary Information 12| The current outputs of the LFD-TENG when Material A of the triboelectric layer of the bottom plate was fixed as nylon and different materials were used for Material B. Each output was measured for 4 seconds.



Supplementary Information 13| Photographs of materials and steps in manufacturing the LFD-TENG's loop-structured film capacitor-attached rotator (Figure 1c).

Supplementary Video 1| 3000 LEDs powered by LFD-TENG

Supplementary Video 2| Thermo-hygrometer operated by LFD-TENG