Supplementary Information

Magnetic-Assisted Triboelectric Nanogenerators as Self-Powered Visualized Omnidirectional Tilt Sensing System

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1. Relationship between *TA_1*, *TA_2* and *θ*, *φ*

TA_1 is the tilt angle of the first TENG.

TA_2 is the tilt angle of the second TENG.

θ is the rotation angle around X-axis.

φ is the rotation angle around Y-axis.

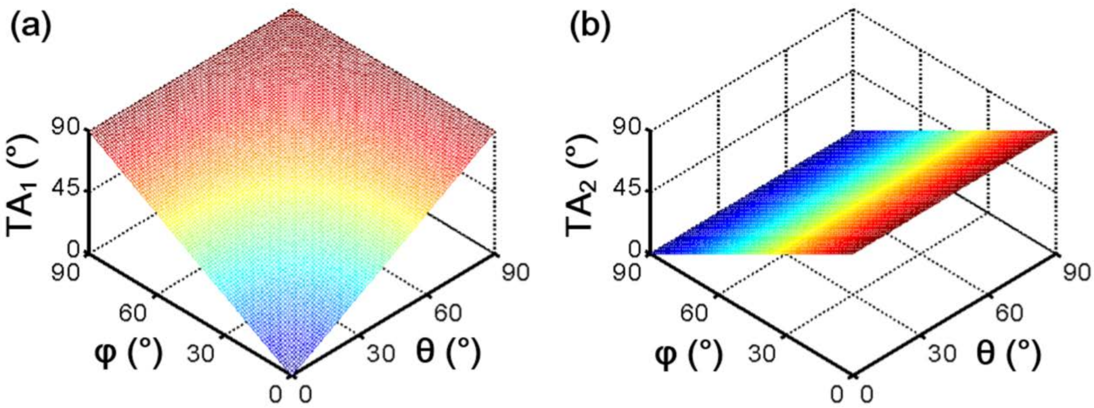

Figure S1. (a) Relationship between TA_1 and θ, φ. (b) Relationship between TA_2 and θ, φ.

2. Output voltage of the two TENGs as a self-powered omnidirectional tilt sensor

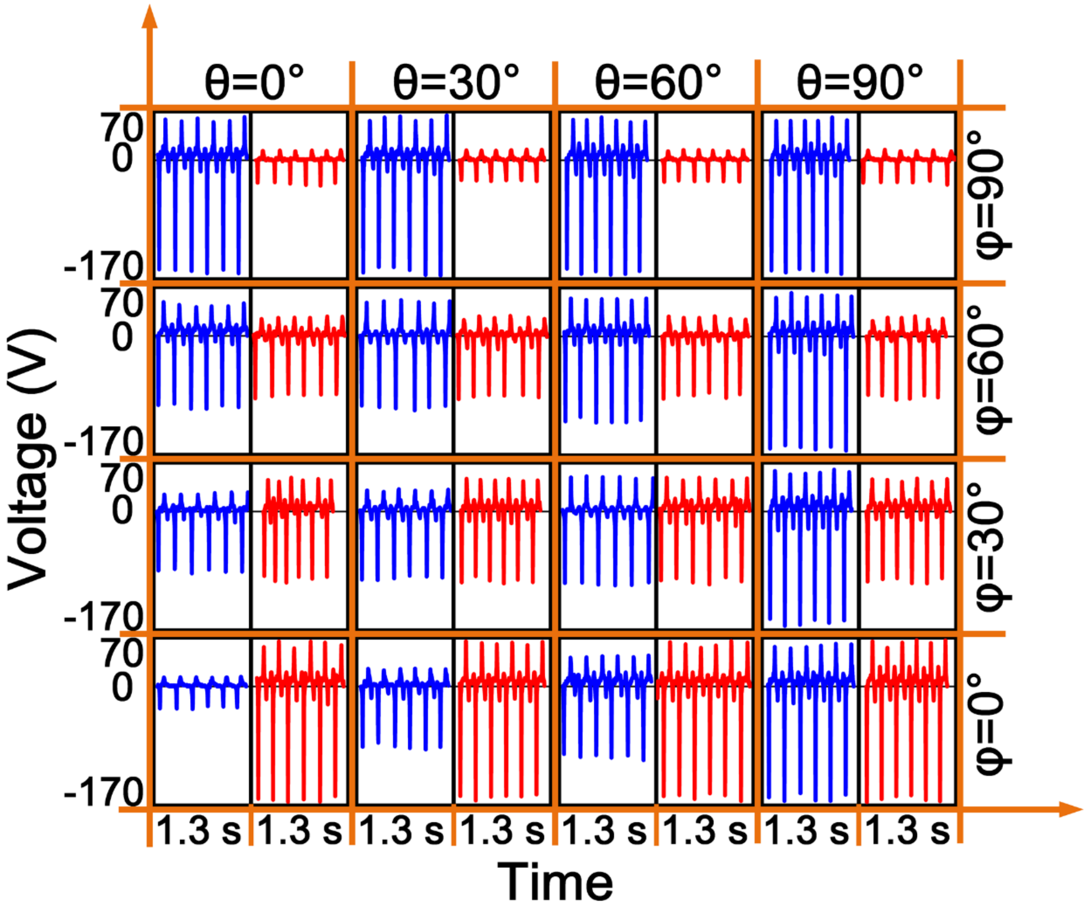

Figure S2. Detailed output voltage of the two TENGs at different tilt angles, with both θ and φ vary from 0° to 90°.

3. Supplement experimental characterization of the magnetic-assisted TENG

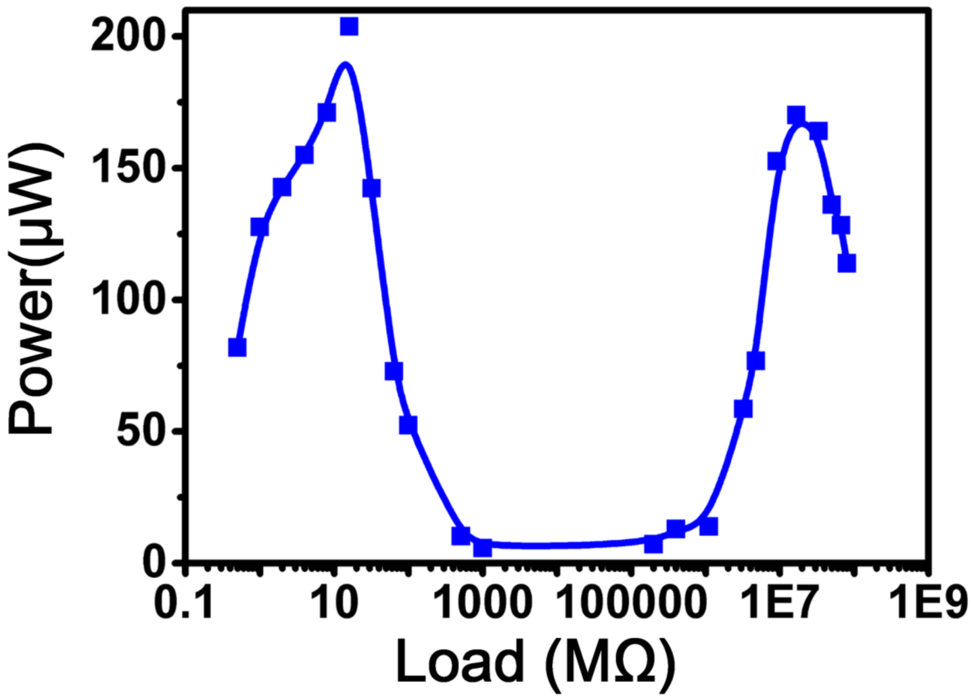

Figure S3. Total output power of the device under different load resistances.

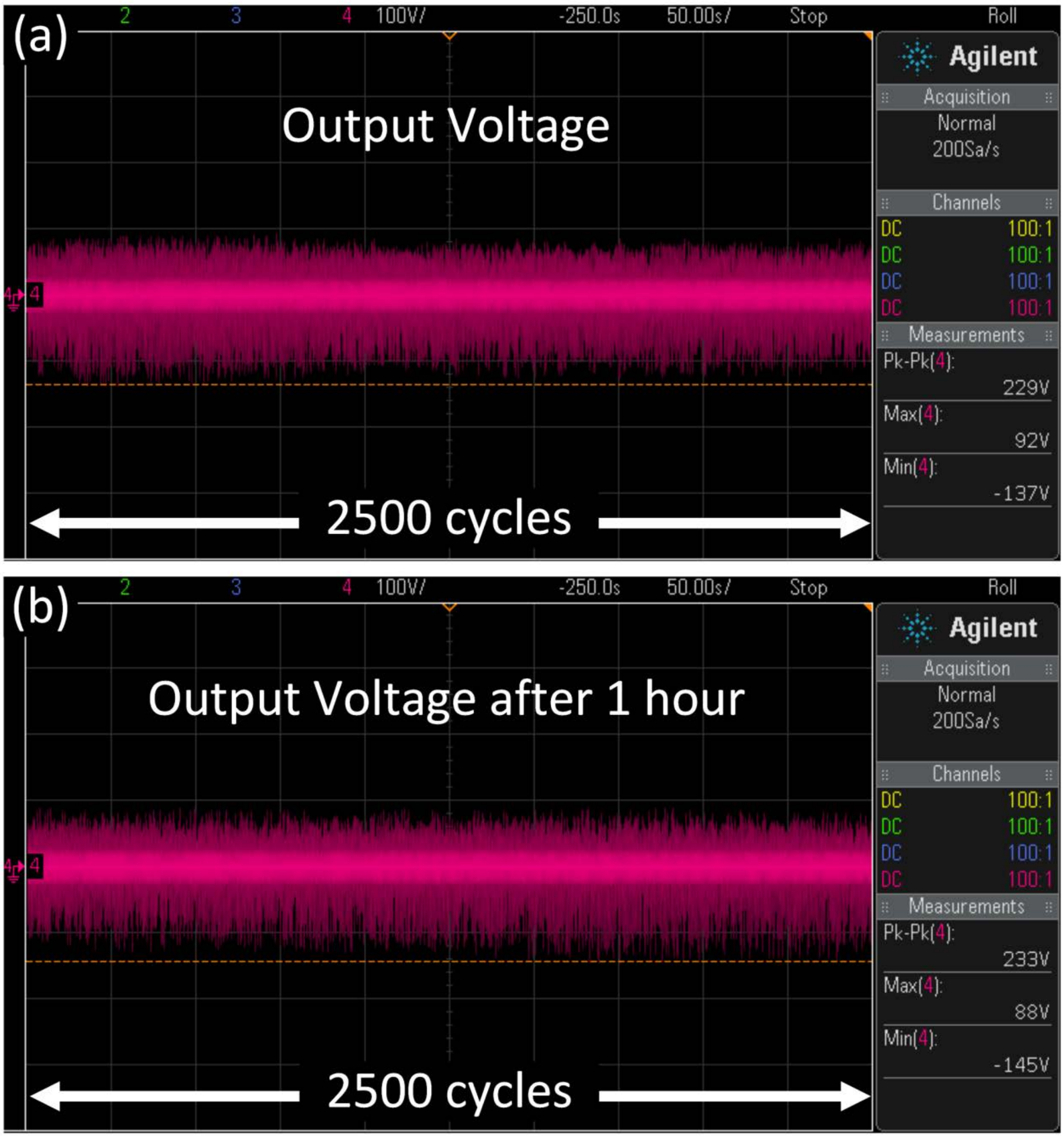

Figure S4. Stability measurement of the TENG. (a) Output voltage of the TENG at a 5 Hz external force. (b) Output voltage of the TENG after 1 hour.

4. Fabrication process of the polyimide wrapped copper electrode

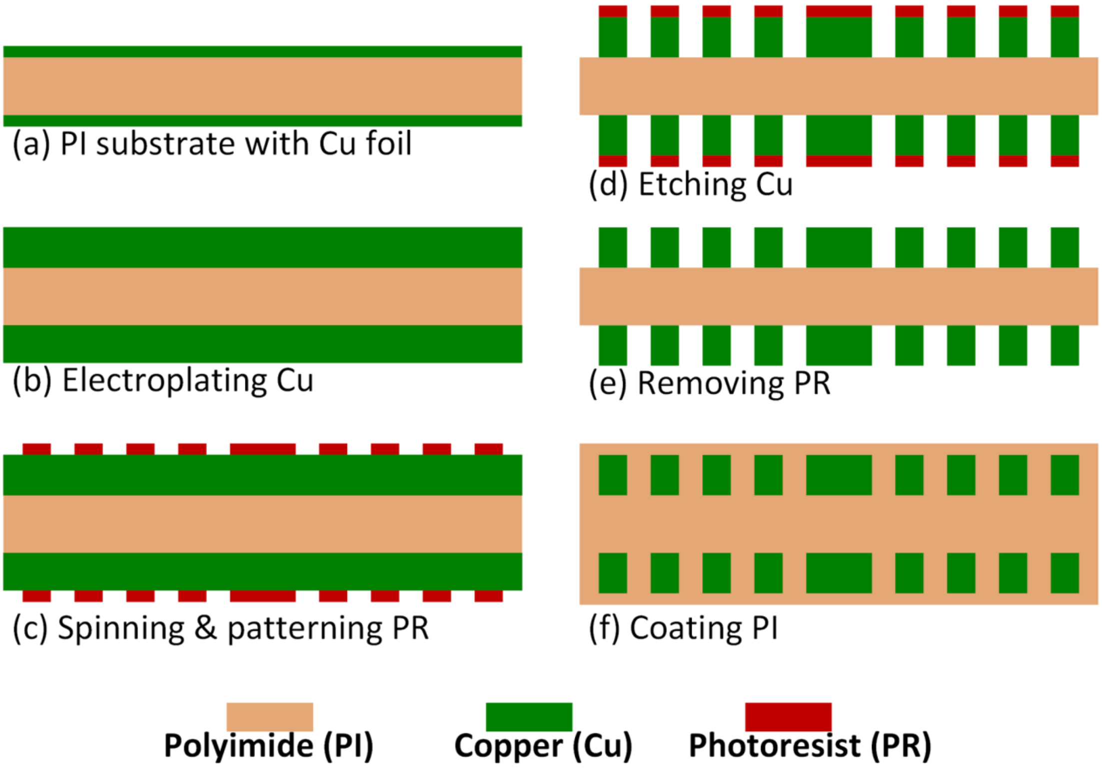

Figure S5. Cross-section view of the fabrication process.

5. Simulink model of the magnetic-assisted TENG and self-powered tilt sensor

Table S1. Parameters used in the Simulink model.

Parameter	**Value**
Magnetization of the magnets	890000 A/m
Vacuum permeability	$4\pi\times10^{-7}$ T
Height of the two magnets	0.5 mm
Radius of the two magnets	5.0 mm
Top mass	400 g
Acceleration of gravity	9.8 m/s^2
Friction coefficient	0.15
Initial gap distance	3 mm

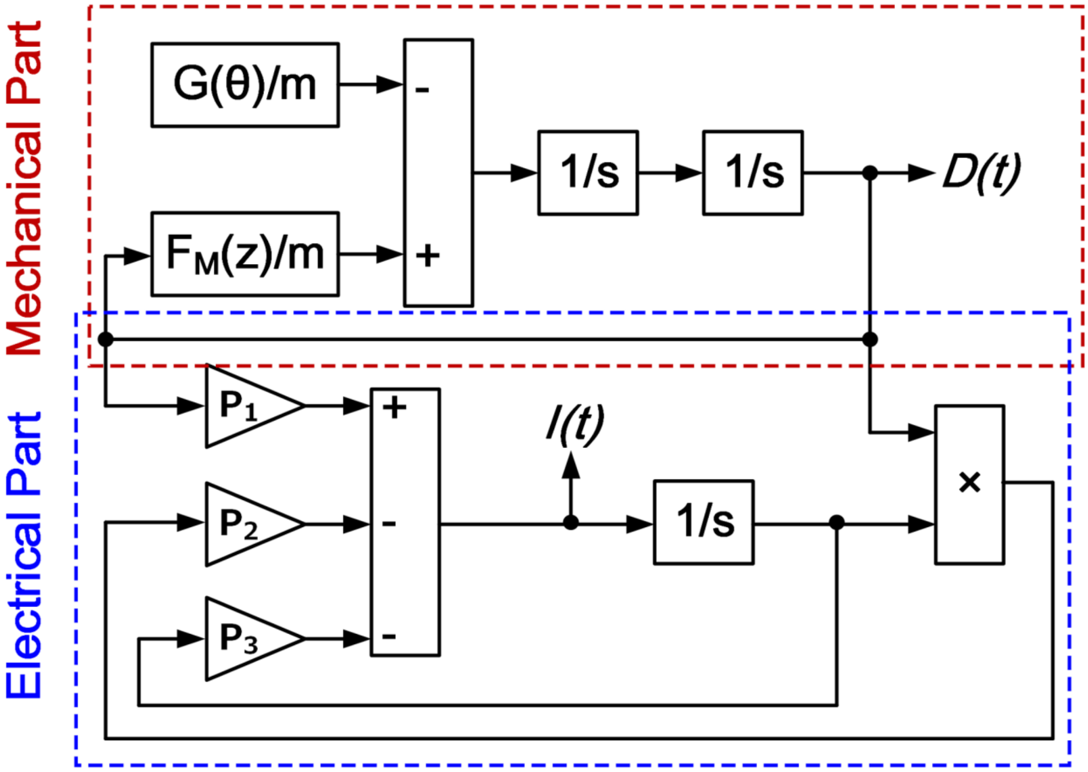

Figure S6. Simulink model of the TENG as a self-powered tilt sensor.

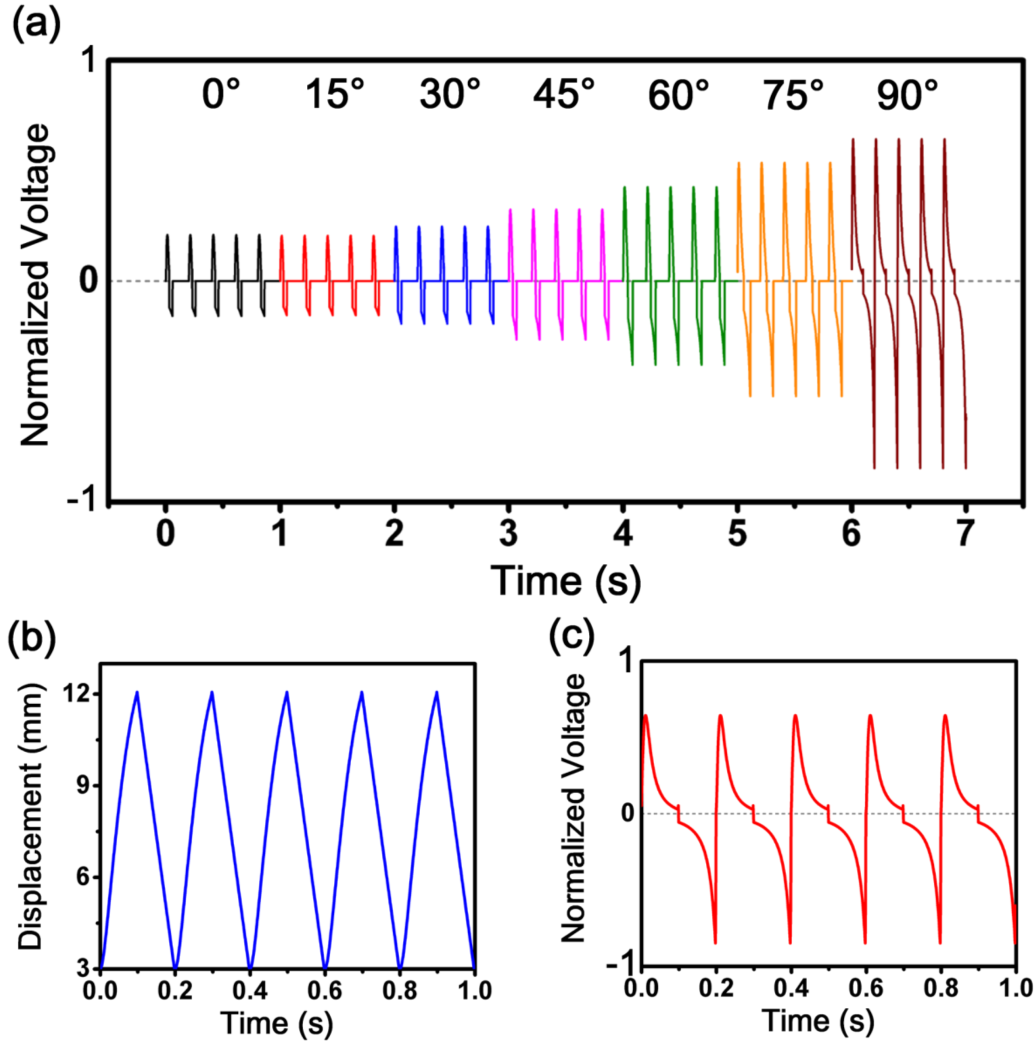

Figure S7. Theoretical output by the Simulink model. (a) Calculated output voltage at different tilt angles. (b) Time domain displacement at the tilt angle of 90°. (c) Time domain normalized voltage at the tilt angle of 90°.