

Supporting Information

Spherical Triboelectric Nanogenerator Integrated with Power Management Module for Harvesting Multidirectional Water Wave Energy

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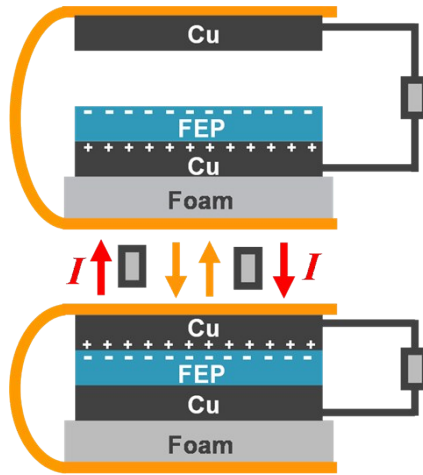


Fig. S1. Schematic working mechanism for each basic unit of the TENG.

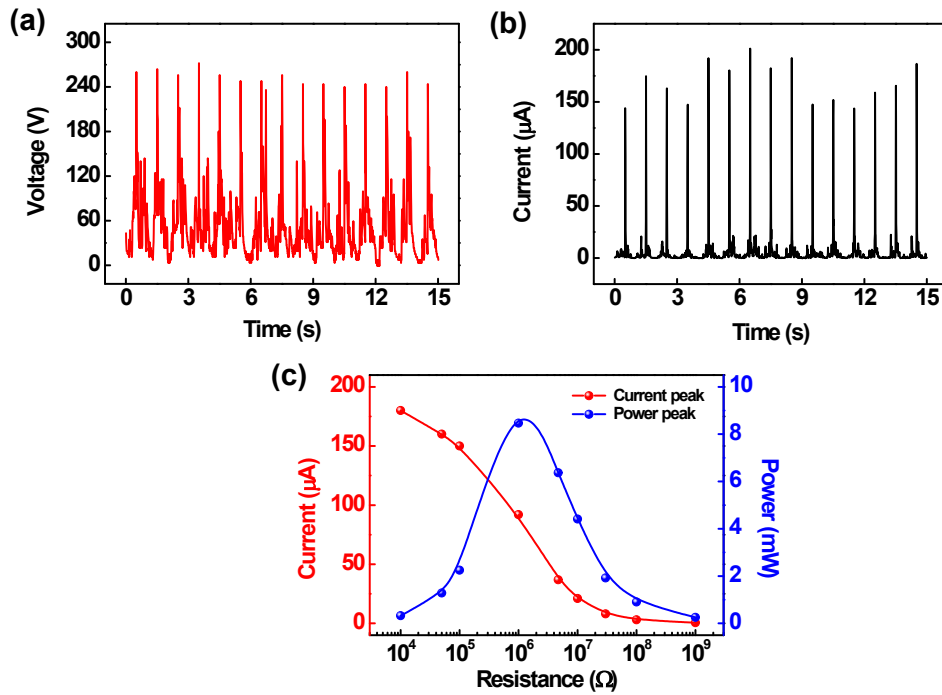


Fig. S2. (a) Output voltage, (b) output current, and (c) peak current and peak power-resistance relationships of the spherical TENG under the water waves with the frequency of 1.0 Hz and amplitude H_{out} of 2.5 V.

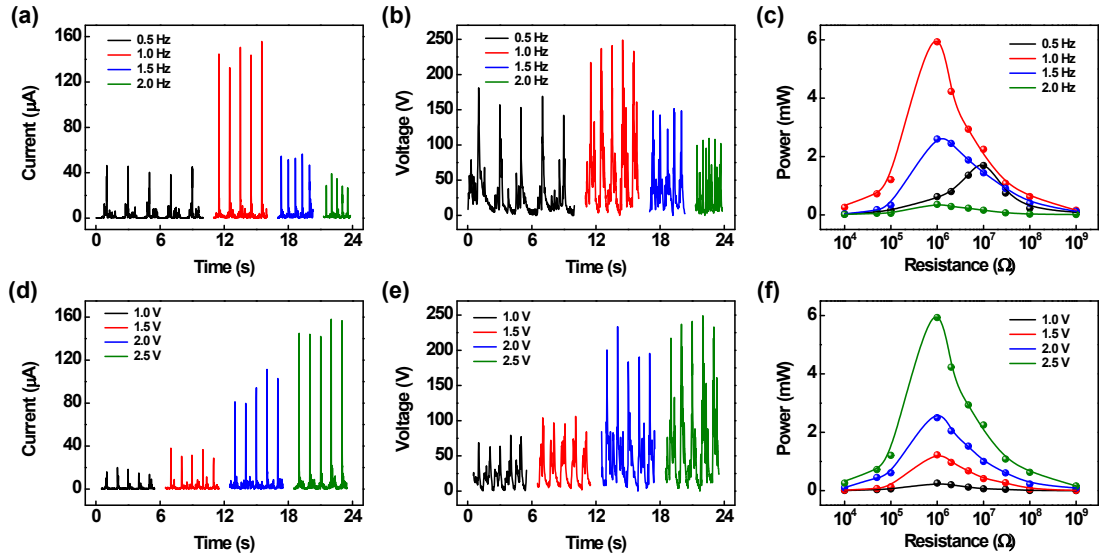


Fig. S3. (a) Output current, (b) output voltage, and (c) output power-resistance profiles of the spherical TENG as functions of the water wave frequency, when the angle α is 60° . (d) Output current, (e) output voltage, and (f) output power-resistance profiles of the TENG with respect to the water wave amplitude.

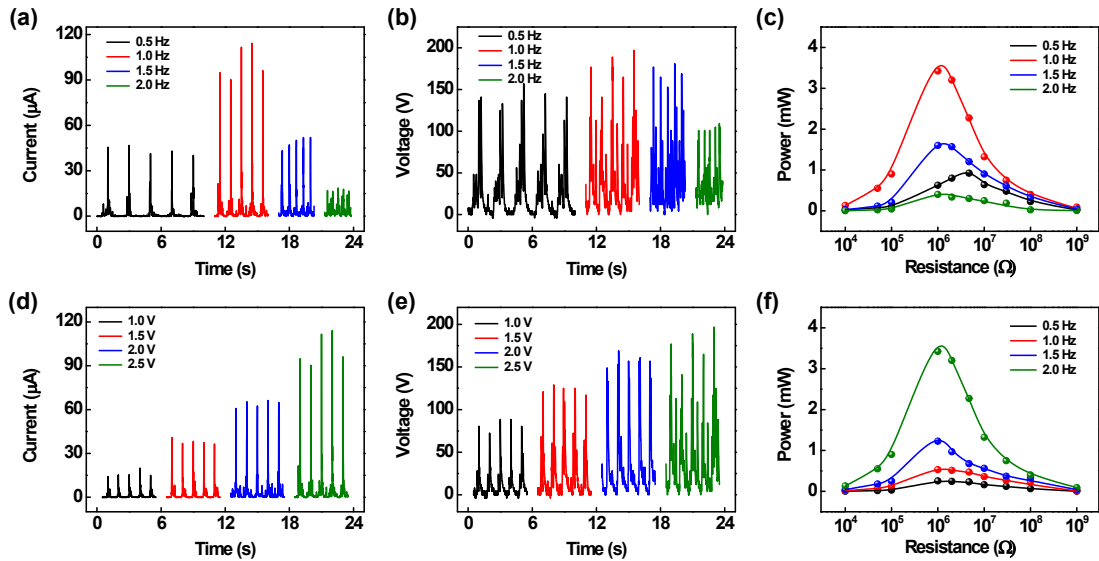


Fig. S4. (a) Output current, (b) output voltage, and (c) output power-resistance profiles of the spherical TENG as functions of the water wave frequency, when the angle α is 45° . (d) Output current, (e) output voltage, and (f) output power-resistance profiles of the TENG with respect to the water wave amplitude.

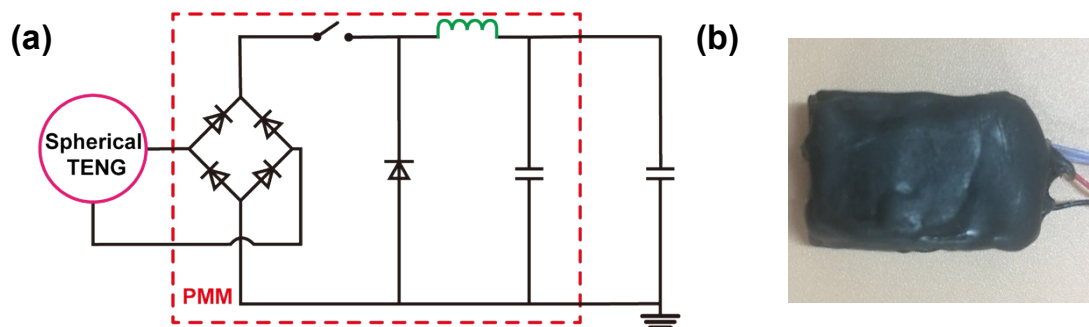


Fig. S5. (a) The circuit layout and (b) top-view photograph of the power management module.

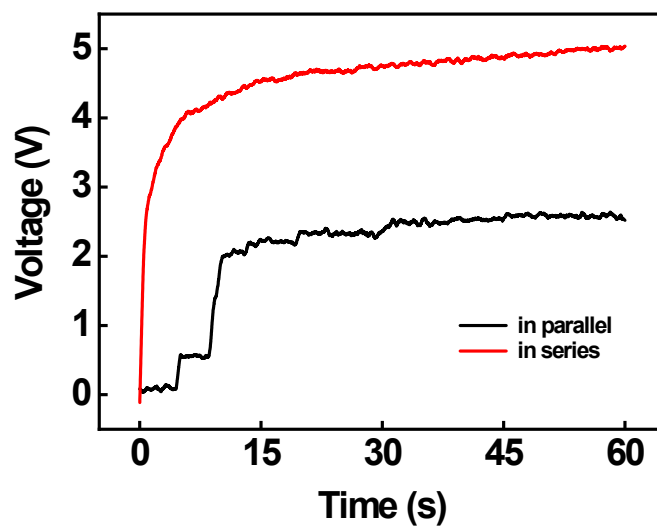


Fig. S6. Comparison of the output voltage between the parallel and series connections under the water waves with the frequency of 1.0 Hz and amplitude H_{out} of 2.5 V. The threshold voltage for turning on the switch S in the PMM is relatively high.

Movie S1. A digital thermometer was successfully powered by the spherical TENG integrated with the PMM.

Movie S2. A water level detection/alarm device was successfully driven by the spherical TENG integrated with the PMM.