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Multifunctional Power Unit by Hybridizing Contact-Separate Triboelectric Nanogenerator, Electromagnetic Generator and Solar Cell for Harvesting Blue Energy

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Abstract

The complementary output of triboelectric nanogenerator (TENG) and electromagnetic generator (EMG) can be hybridized and maximized for harvesting blue energy in a broad frequency range. How to optimally design and construct the hybrid structure still remains a challenge. In this work, we proposed a multifunctional hybrid power unit for harvesting blue energy, which consists of contact-separate mode triboelectric nanogenerators (CS-TENGs), freestanding sliding mode electromagnetic generators (FS-EMGs) and commercial water-proof silicon based solar cells (WS-SCs). When harvesting ocean wave kinetic energy, the bottom magnet in FS-EMG moves forth and back driven by the wave motion and makes the top magnet shake upward or downward, thus the two triboelectric layers of CS-TENG contact and separate constantly. The magnet pairs produce the noncontact attractive force that enables the fully enclosed packaging of the TENG part, protecting it from ambient environment. The TENGs effectively harvest low-frequency (<0.5 Hz) motion and the

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