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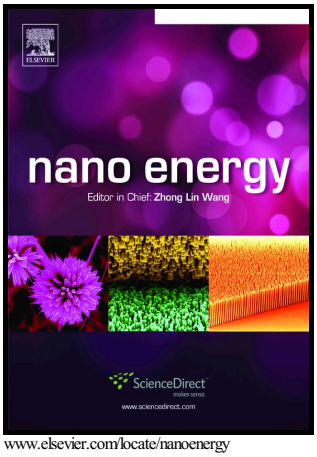

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Spring-Assisted Triboelectric Nanogenerator for Efficiently Harvesting Water Wave Energy

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ABSTRACT

Ocean waves are one of the most promising renewable energy sources for large-scope applications. Triboelectric nanogenerator (TENG) has been demonstrated to effectively harvest water wave energy possibly toward large-scale blue energy. In this work, a kind of spring-assisted TENG was designed and investigated for harvesting water wave energy. The idea of introducing spring is to store the potential energy built during mechanical triggering for multiple cycles of conversion into electricity afterward, and transform a low frequency motion into a high frequency oscillation for improving the energy harvesting efficiency. The output performance of the basic unit was optimized by adjusting the motor acceleration and spring parameters including the rigidity and length. There exists an optimized spring rigidity or spring length to produce the highest performance. By using the spring, the accumulated charge of the TENG can be increased by 113.0%, and the translated electric energy or efficiency can be improved by 150.3%. Then four optimized basic units were connected in parallel and packaged into a sealed box to harvest the water wave energy. The present work could provide an approach to improving the output performance and efficiency of TENGs in harvesting low-frequency water wave energy.

Keywords: triboelectric nanogenerator, spring-assisted, water wave energy, blue energy

[1] These authors contribute equally to this work.