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A high-performance tubular nanogenerator for self-powered water level monitoring systems

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Abstract

Herein, we report a flowing water-based high-performance tubular nanogenerator for green energy harvesting and self-powered water level monitoring systems. The tubular nanogenerator, made of a copper electrode, makes direct contact with the flowing water and harvests triboelectric charges through the contact electrification process. The power generation is primarily based on the volume effect of the flowing water through the single-electrode tubular nanogenerator. Here, the T-NG avoids the influence of dielectric layer thickness on the output and harvests energy through the bulk effect. A T-NG with a 10 cm length and 10 mm diameter produces a high output voltage and current of 140 V and 124 μ A, respectively. The sustainable power generation of tubular nanogenerators is studied by continuously flowing the water for 10 hours. Finally, a LabVIEW-based self-powered water level monitoring system demonstrates the practical application of the power generated by the tubular nanogenerator. Further, the power generated by the tubular nanogenerator is stored in a 3.3 V/200 mAh lithium-ion battery for building a self-powered wireless water monitoring system.

Keywords: Flowing water, Tubular nanogenerator, Sustainable power, Self-powered sensors, Water level monitoring



Fig. 1. Demonstration of a LabVIEW based self-powered water level monitoring system.

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