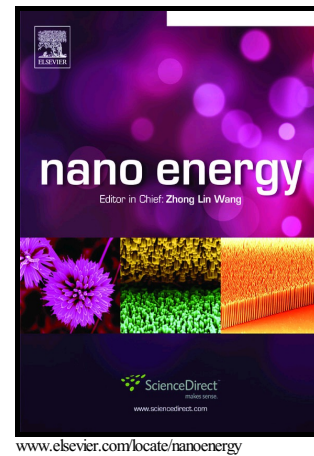


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Electric Impulse Spring-Assisted Contact Separation Mode Triboelectric Nanogenerator Fabricated from Polyaniline Emeraldine Salt and Woven Carbon Fibers

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Electric Impulse Spring-Assisted Contact Separation Mode Triboelectric Nanogenerator Fabricated from Polyaniline Emeraldine Salt and Woven Carbon Fibers**Ravi Kumar Cheedarala, Abu Naushad Parvez, Kyoung Kwan Ahn***

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Abstract

In this article, we used modified woven carbon fiber mat (wCF-COOH), as one of the contact-electrification Triboelectric Nanogenerator (TENG) friction layer to generate high open circuit voltage (V_{oc}) and short circuit current (I_{sc}). We designed the contact-separation mode TENG which is functional using spring structure. The oxidation of wCF into wCF-COOH by Piranha solution followed by coupling of aniline through electrostatic interactions and in-situ oxidative polymerization to get woven carbon fiber-polyaniline emeraldine salt (wCF.PANIES) composite is a novel approach. The wCF-PANIES composite displays the surface resistivity of $0.324 \Omega.m$ and serves as a friction layer to generate charges by harvesting energy through vertical contact-separation mode TENG against PVDF membrane. The dynamic interactions of novel wCF-PANIES and PVDF membrane produced high V_{oc} of 95V, and I_{sc} of $180 \mu A$, respectively. In particular, wCF-PANIES-TENG has shown an enhancement of 498% of V_{oc} with respect to wCF-COOH-TENG due to availability of PANI layer. In addition, it was observed that the proposed wCF-PANIES-TENG has shown the output power of 12.4 mW at 5Hz, and the rectified current upto $180 \mu A$. The novel wCF-PANIES is the potential candidate for fulfilling the need of optimized energy harvesting device as an alternate material option for contact-separation mode TENGs.

Graphical Abstracts

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