Boosting the Efficiency of Chitosan Bio-Waste-Derived Triboelectric Nanogenerator for Acoustic-Electric Conversion: A Rational Combination of Surface Patterning and Halloysite Nanotubes Incorporation

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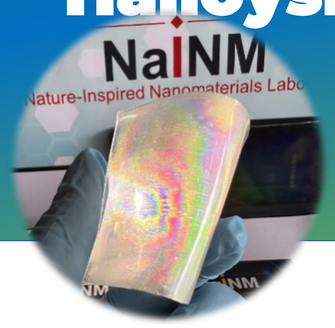
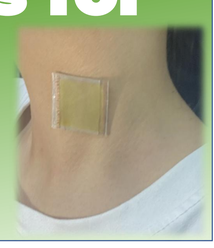
Bio-compatible nanogenerator achieved a new benchmark by Halloysite nanoparticles integration. Offering promising solutions for sustainable energy and medical applications.





Abstract

Triboelectric nanogenerators (TENGs) utilizing bio-waste-derived polymers offer sustainable solutions to plastic pollution and energy crises. Despite their potential, these TENGs often suffer from low output power and limited durability. This study enhances bio-TENG performance by introducing a Halloysite nanotubes/chitosan (CS/HNTs) nanocomposite via a micro-molding method. By pairing this composite with microbead-patterned PDMS, we significantly improve electrification performance and reliability, achieving an average power of 3.25 mW and an open-circuit voltage (VOC) of 315 V. The mb-TENG shows promise as a reliable power source for microelectronics and a self-powered wearable acoustic sensor for physiological monitoring.

Materials & Methodology

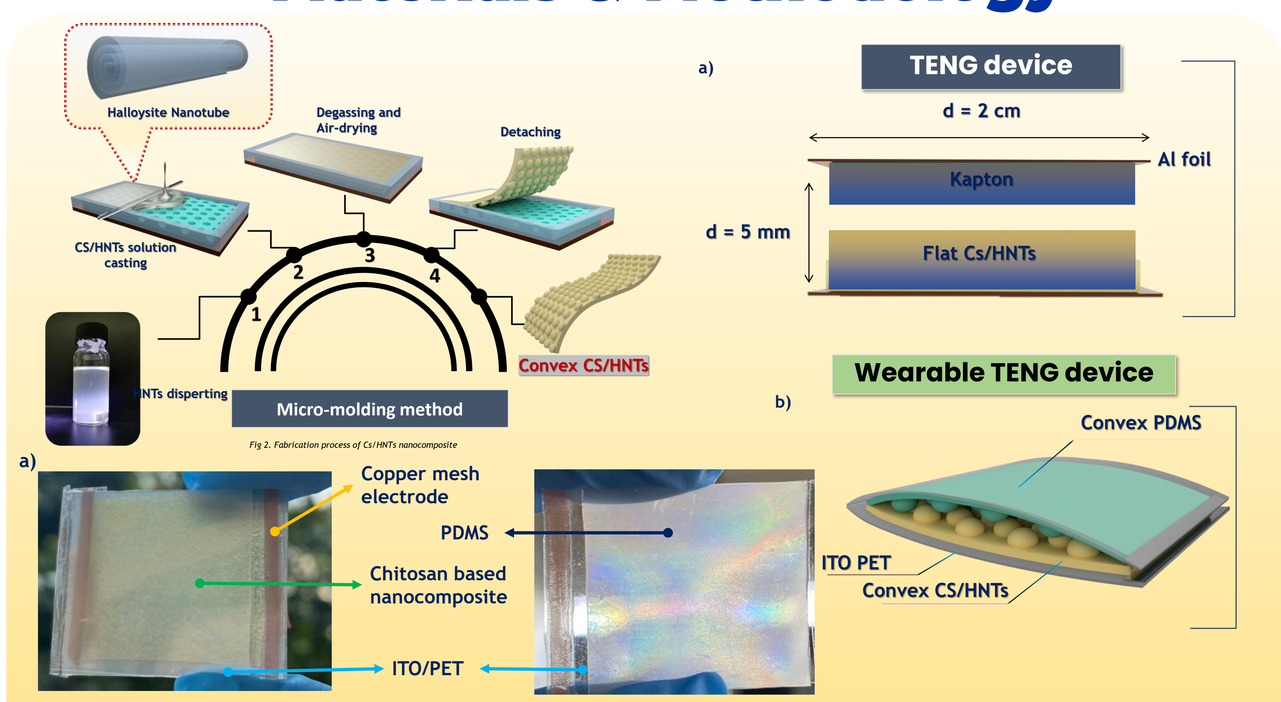
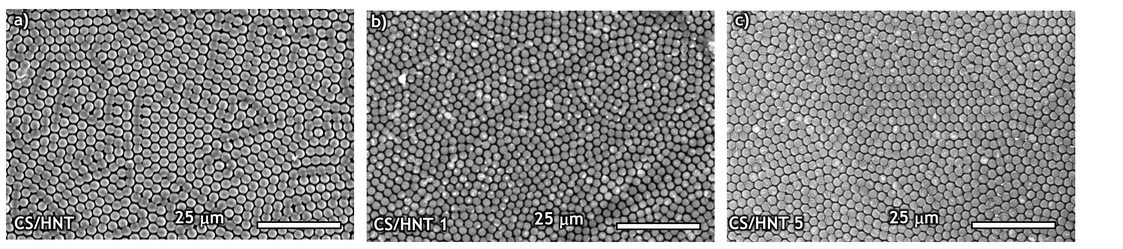


Fig 2. Fabrication process of Cs/HNTs nanocomposite

Result & Discussion



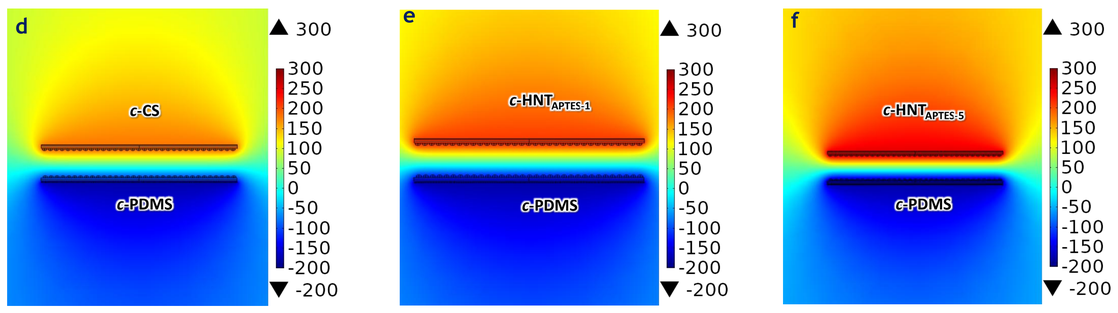
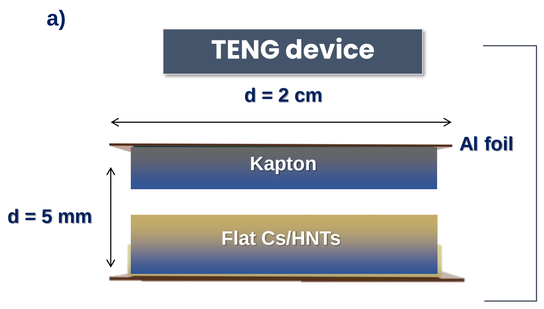


Fig 4. COMSOL Multiphysics simulation results for the electrical potential distribution of TENG with different HNTs contents.



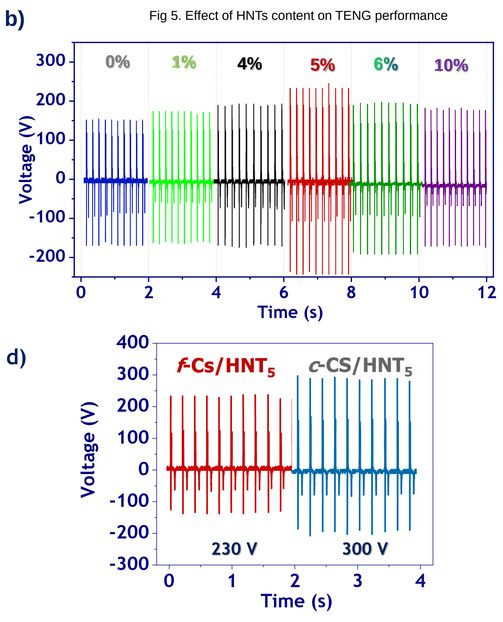
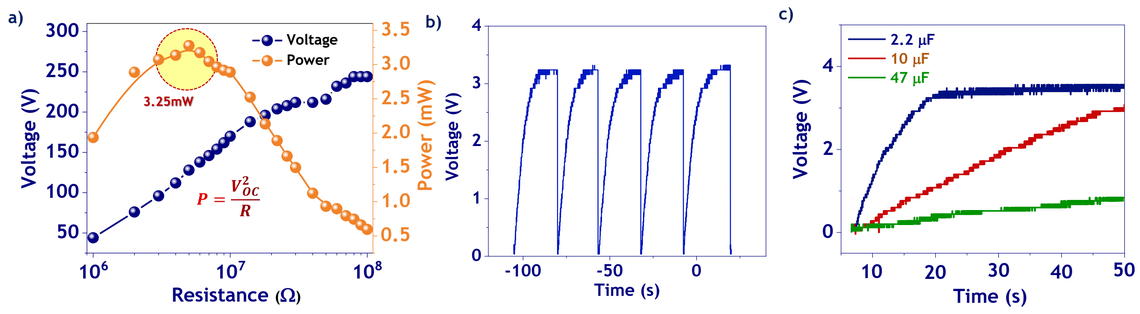


Fig 5. Effect of morphology on TENG performance



Application

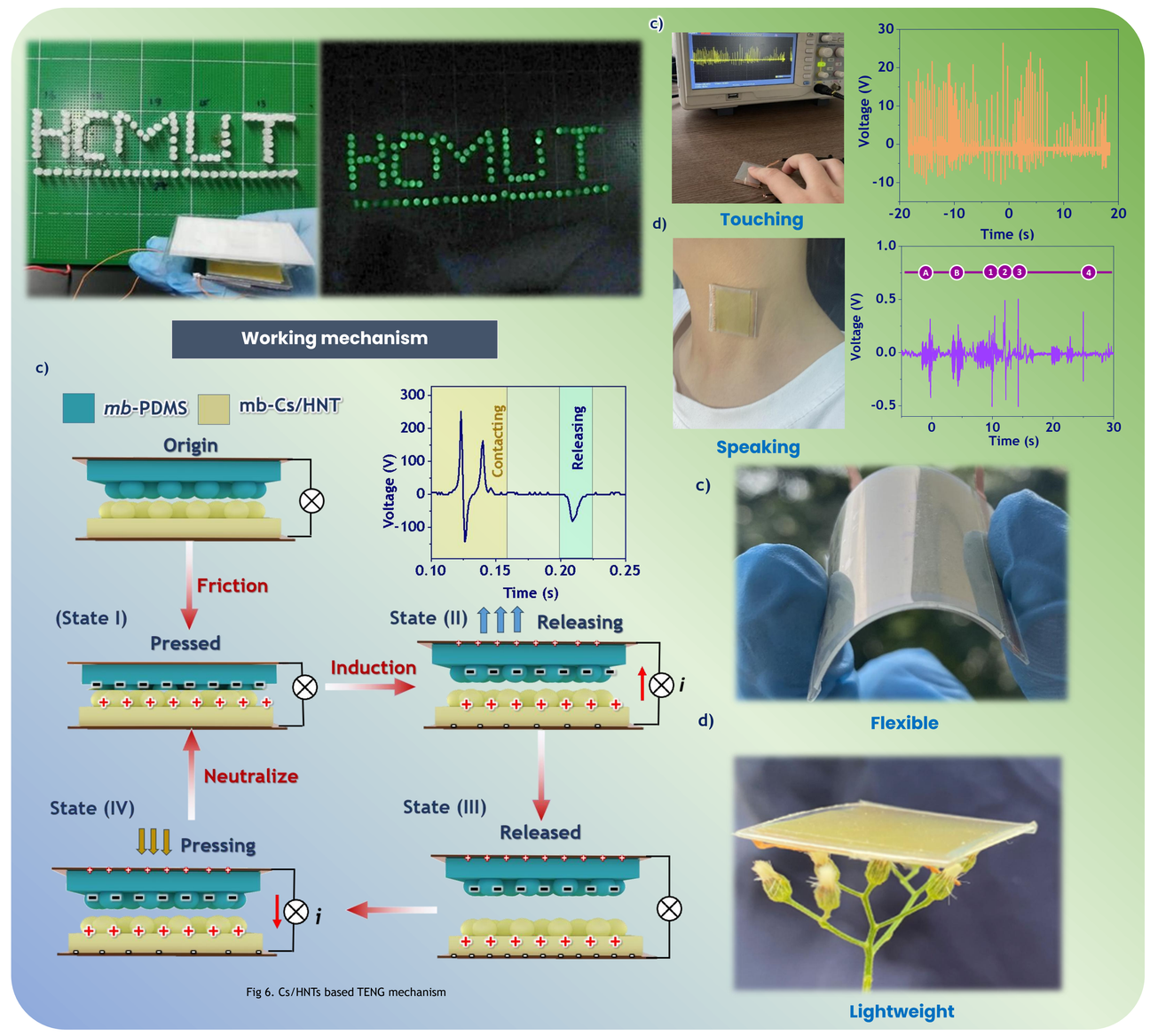


Fig 6. Cs/HNTs based TENG mechanism

Reference

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