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Triboelectric Nanogenerators based on biodegradable Sodium Alginate/ZnO-Co3O4 polymer nanocomposites

Abstract: The design and development of the flexible wearable triboelectric nanogenerator has attracted a lot of interest in the application of self-powered multifunctional electronic devices. The present work aims to develop polymer composite films for designing self-powering nanogenerator. In this work, Sodium Alginate (SA)-based nanofiller composite films are proposed as a highly triboelectric material for improving the performance of TENGs in mechanical energy harvesting applications. ZnO-Co3O4, with a high surface area greatly improved the electroactive β-phase formation.

The XRD study reveals that the crystallinity structure of the composite has improved, leading to increased triboelectricity. It also demonstrates that the composite's dielectric constant has improved, indicating that the developed material's storage capabilities have improved. The as-prepared SA/ZnO-Co3O4 based TENGs showed an excellent output performance. The increased output performance is due to the increase of the β-phase fraction, polymer dipole moment alignment, filler alignment dispersion, filler dispersion, and the interfacial interaction between the polymer chains and the ZnO/Co3O4 particles. This research effectively used ZnO/Co3O4 nanoparticles to improve the efficiency of TENG's energy harvesting, providing the way to a new class of tribomaterials. The nanocomposite additionally possesses a high dielectric constant, which makes it suitable for energy storage applications.

Keywords: Triboelectric nanogenerator; Zinc oxide, Cobalt oxide, Nanocomposite

Biography: Dr. Jolly Bhadra is a material scientist by profession. Currently, she is serving as a Senior Module Development and Publication Specialist in Young Scientist Center, Qatar University. Along with the routine duties, she is also mentoring several STEM workshops. During her research career, she had wide experience in the synthesis of varieties of materials, such as polymers, conducting polymers, hydrogels, metal ions and nanoparticles.

She has also gained exposure in a large number of characterization methods for morphological, electrical, mechanical, thermal and rheological studies. Additionally, she has had hands on experience on the fabrication of electronic devices, including Field Effect Transistor (FET), thermo-electric generator, super-capacitor and chemical gas Sensors. During her research career, she has published more than 55 journal papers and several conference papers and book chapters including both scientific and STEM. She has been part of 6 UREP, 3 QNRF-NPRP projects and 4 Qatar University research grants as LPI/PI.