

Polymer Blend-Based Triboelectric Material for Fabricating Improved Triboelectric Nanogenerator and Method for Producing the Same

1. Technology:

This invention is towards developing an electrospun polymer blend material suitable for fabricating a flexible triboelectric nanogenerator (TENG) device towards harvesting mechanical energy into electrical energy. In this study, we fabricated a TENG using electrospun nanofiber based on polyvinylidene fluoride (PVDF)-aromatic hyperbranched polyester of 3rd generation (Ar.HBP-G3) blend as tribonegative material and non-woven polyurethane (PU) film as tribopositive material, and used it for harvesting energy under diverse conditions. The fabricated TENG was demonstrated to harvest mechanical energy suitable for portable electronics and wearable healthcare monitoring applications.

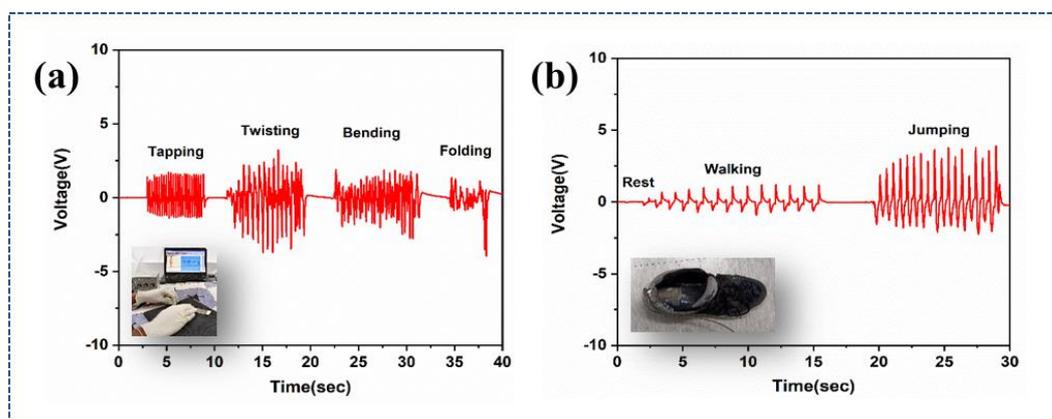


Fig. 1 Real-time monitoring of PVDF-Ar.HBP-G3 (10 wt.-%)/PU based TENG under (a). tapping, twisting, bending and folding, and (b). walking and jumping.

2. Problem Addressed:

Human-generated, low-frequency mechanical energy (body movements) can be transformed into electrical energy in wearable devices, which can effectively be used as energy harvesters. Hence, some modifications and improvement in nanogenerator device is developed as part of this invention with the need of going for flexible and eco-friendly method of fabricating such TENGs. This invention focuses at exploring PVDF-Ar.HBP (0 to 40 wt.-%) based TENGs for higher electrical output and applications. The polar β -phase of PVDF is effectively enhanced using electrospinning technique aided by the influence of dipole interaction between the functional groups present in PVDF and Ar.HBP-G3. This in turn, improved the output voltage of TENG device suitable for energy harvesting and human health monitoring applications.

3. Industrial Applications:

Previously, many toxic materials-based devices were reported for fabricating TENGs. But they are highly toxic materials and will affect the environment very harmfully. The materials used in our TENGs are non-toxic materials. In this invention, we have fabricated a TENG that generates usable output voltage, flexible, lightweight and sensitive to mechanical movements. The Ar.HBP-G3 acts as nanoscale filler and has a significant influence in improving the output voltage of PVDF based TENGs..

4. Patent Application Number: 202441044840