Growth of Doped ZnO:GO hybrid nanostructure for piezoelectric wearable sensors and energy harvesters

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Flexible piezoelectric nanogenerators have attracted tremendous attention due to their increasing demand for powering wireless electronics and various self-powered devices. Zinc oxide (ZnO) not only exhibits good piezoelectric, semiconducting, optical and dielectric properties. but also is bio compatible and non-toxic. Aforementioned properties, particularly piezoelectricity, of ZnO are enhanced significantly with suitable doping and morphology at nanoscale which are utilized to achieve higher performance of flexible nanogenerators [1].

The present work describes the improvement of piezoelectric/ ferroelectric properties of ZnO with doping of various elements like Nd, Ho, Ce, Er, Tm, etc. which are and further enhanced by the hybridization of doped ZnO nanoparticles with Graphene Oxide (GO). Wet chemical co-precipitation and hydrothermal techniques were used to synthesize doped GO/ZnO nanocomposites and their structural, morphological, optical, dielectric and ferroelectric properties have been studied. These piezoelectric nanoparticles are used to fabricate flexible doped-ZnO/PDMS and ZnO:GO/PDMS nanogenerators with high energy harvesting performance. High output voltage (over 100V) and current density (over 2 μAcm^2) were achieved by simple finger tapping, twisting of wrist /knee, foot strokes, etc. With a force simulator, the performance of nanogenerators were studied as a function of increasing force, frequency and number of strokes [2-4].

References

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