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TRIBOELECTRIC NANOGENERATOR BASED FLEXIBLE SENSOR FOR MONITORING SWEATING CONDITION AND BODY TEMPERATURE

The conversion of mechanical energy into electrical energy through the triboelectric nanogenerator (TENG) which works on the principle of triboelectrification and charge induction, is one of the methods to harvest mechanical energy from our surroundings and biomechanical movements. The external stimuli like pressure, humidity, sweat, temperature, etc can affect the output performance of a TENG, which opens up the path for TENG as a real-time sensing application. Here we report a ZnO and ZnO/g-C3N4 based single-electrode triboelectric nanogenerator (STENG) for the sweat and temperature sensing applications respectively. For sweat sensing applications the STENG has been fabricated by using ZnO nanorod grown on a textile platform. The sensing capability of the fabricated STENG has been observed with the variation of saline water. It is observed that with the variation of the amount of saline water, the output of the fabricated STENG has been changed. The increment of output voltage due to the variation of the amount of saline water is expected due to the attachment of hydrated Cl present in saline water with ZnO. Further, the prototype of STENG has been operated upon by attaching it to a human body under biomechanical body movement. The fabricated STENG offers a limit of detection of 4.65 μL with a sensitivity of 0.016 V/μL. Similarly, ZnO/g-C3N4-based STENG has been fabricated on commercial Al substrate for temperature sensing applications. It is observed that the output voltage of the fabricated STENG varies due to the temperature variation, which signifies the applicability of the STENG as a temperature sensor. Next, for the real-time monitoring of human body temperature, the fabricated STENG has been operated under biomechanical foot movement by attaching it to a shoe insole. The fabricated STENG for temperature sensing applications offers a sensitivity of 0.18 V/OC. Finally, the wireless transmission of the data in a smartphone through a microcontroller has been demonstrated.

Keywords: Nanogenerator, ZnO, ZnO/g-C3N4, sensors.

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