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Facile fabrication and performance of robust polymer/carbon nanotube coated spandex fibers for strain sensing

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Abstract

The last decade has witnessed a tremendous growth of research and development in flexible and wearable strain sensors. However, there are still some challenges associated with the fabrication of strain sensors to achieve a high sensitivity and large workable range at low cost. Here, we report on the development of a highly elastic strain sensor based on a commercial spandex fiber coated with a nanocomposite consisting of multi-walled carbon nanotubes (MWCNTs) and thermoplastic polyurethane (TPU) manufactured by a layer-by-layer (LBL) method. The sensor demonstrated outstanding performance with large workable strain, high sensitivity, excellent repeatability and regular signal responses within a wide measuring frequency range of 0.01~1 Hz. Additionally, the effect of ultraviolet irradiation on the sensor performance was also investigated. Application of the sensor in monitoring diverse human motions, such as facial micro expressions and speech recognition, are also demonstrated showing its potential for applications in wearable devices and

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