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A highly stretchable carbon nanotubes/thermoplastic polyurethane fiber-shaped strain sensor with porous structure for human motion monitoring

Xiaozheng Wang, Hongling Sun, Xiaoyan Yue, Yunfei Yu, Guoqiang Zheng, Kun Dai*, Chuntai Liu, Changyu Shen

School of Materials Science and Engineering, The Key Laboratory of Advanced Materials Processing & Mold of Ministry of Education, Zhengzhou University, Zhengzhou, 450001, China

ABSTRACT: Highly flexible and stretchable strain sensors play an important role in the wearable electronic systems. Up to now, it is still an enormous challenge to achieve a good balance between the wide response range and high sensitivity for a resistive-type flexible strain sensor. In this work, we prepared a fiber-shaped strain sensor based on thermoplastic polyurethane (TPU) and multi-walled carbon nanotubes (MWCNTs) via a simple and cost-efficient wet-spun method. The production process can satisfy continuous and large-scale preparation. The generation of the interesting porous structure is related to the solvent exchange in solidification process and beneficial to the improvement of the sensing range. In the uniaxial stretching test, the MWCNTs/TPU fiber-shaped sensor showed an ultra-wide workable strain range (320%), a high sensitivity (gage factor of 22.2 within 160% strain and 97.1 for strain of 160-320%) and a fast response time (<200 ms). The MWCNTs/TPU composite fiber sensor exhibited

*Corresponding authors.
E-mail: kundai@zzu.edu.cn (K. Dai)