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**Conductive thermoplastic polyurethane composites with tunable piezoresistivity by modulating the filler dimensionality for flexible strain sensors**

Yanjun Zheng,<sup>a</sup> Yilong Li,<sup>a</sup> Kun Dai,<sup>a,b,\*</sup> Mengran Liu,<sup>a</sup> Kangkang Zhou,<sup>a</sup> Guoqiang Zheng,<sup>a</sup> Chuntai Liu,<sup>a,\*</sup> Changyu Shen<sup>a</sup>

<sup>a</sup>*School of Materials Science and Engineering, The Key Laboratory of Material Processing and Mold of Ministry of Education, Zhengzhou University, Zhengzhou, Henan 450001, P.R. China*

<sup>b</sup>*State Key Laboratory of Polymer Materials Engineering, Sichuan University, Chengdu, Sichuan 610065, PR China*

**ABSTRACT:** Conductive elastomer composites based strain sensors have attracted increasing attention recently. In this paper, flexible composites were prepared by incorporating thermoplastic polyurethane (TPU) with zero-dimensional carbon black (CB) and one-dimensional carbon nanotubes (CNTs), respectively. CNTs/TPU showed a lower percolation threshold (0.28 wt. %) and wider sensing range (0-*ca.* 135% strain), compared with CB/TPU (1.00 wt. % and 0-*ca.* 90% strain). CB/TPU composites exhibited a higher sensitivity with a *GF* of 10.8 under 20% strain, while CNTs/TPU showed a lower *GF* of 6.8. In cyclic loading-unloading test, both the two composites showed non-monotonic ‘shoulder peak’ behaviors. For CB/TPU, the ‘first peak’ was higher than the ‘second peak’; interestingly, CNTs/TPU presented a negative strain

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\* *Correspondence authors*

E-mail addresses: kundai@zzu.edu.cn (K. D.), ctliu@zzu.edu.cn (C. L.)

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