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

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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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