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High temperature response capability in carbon nanotube/polymer nanocomposites

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Abstract

High temperature response capability is critical for multifunctional carbon nanotube polymer nanocomposites. In this work, a CNT/polymer nanocomposite with high temperature coefficients of resistance (Average value=-3%/K, Peak value=-7%/K, Response range=323K~473K) was fabricated successfully. By developing a percolation network model, this work reveals theoretically that the observed high temperature response is mainly resulted from glass transition of polymer matrix. During this process, the electron transport at CNT junctions switched from quantum tunneling to thermally activated hopping. The simulation results also reveal that the temperature response capability can be further improved (Average value=-4.7%/K, Peak value=-10%/K, Response range=380K~500K) by using Polytetrafluoroethylene as polymer matrix with 0.5wt.% CNT loadings. These highly sensitive, low cost

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