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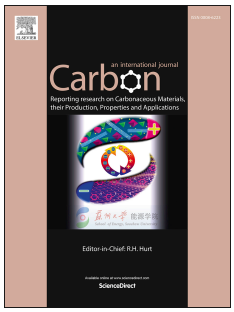

Au nanoparticle-boosted interfacial interaction enhances the electrical and thermal conductivities of carbon nanotube fibers

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Au nanoparticle-boosted interfacial interaction enhances the electrical and thermal conductivities of carbon nanotube fibers

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ABSTRAT* The enhanced interfacial interaction between carbon nanotubes (CNTs), and thus the promoted interfacial thermal transport (ITT), are keys to improve the efficiency of CNT-assembled thermo-functional devices and materials, including energy transmission medium and thermal interface materials. Here, by using the intriguing CNT fibers decorated with Au NPs as a promising platform, we attain to the underlying mechanism for the remarkably boosted ITT of CNT/Au/CNT contacts. The enhancement is ascribed to the NP-induced excitation of low-frequency phonon (LFP) modes in CNTs, a strong mechanism to redistribute LFP modes into the interfacial carbon atoms and then to activate a resonance with the LFPs of Au NPs, resulting in more heat transfer across the contact. Furthermore, the Au NP/CNT fiber also exhibits an enhanced interfacial electrical transport, owing to the extraction of highly degenerate electronic density of states near the van Hove singularities, and thus induces an equivalent p-type doping for the CNTs. The present study demonstrates a new strategy to develop multifunctional CNT fibers with enhanced electrical and thermal conductivities.

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