

Effects of donor-acceptor type polymers on de-bundling of few-walled CNTs and thermoelectric properties of their composites

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Recent advances in soluble conjugated polymer/carbon nanotube (CNT) composites enabled to achieve high thermoelectric (TE) properties. However, effects of the conjugated polymers on de-bundling and electrical percolation of CNTs as well as TE properties of their composites are not fully understood yet. Here, we introduce a novel type of polymer/CNT composites consisting of a donor-acceptor (D-A) type polymer and few-walled CNTs (FWCNT). Three kinds of D-A polymers are employed to disperse FWCNTs and their photophysical, morphological, and TE properties are compared with the FWCNTs dispersed with conventional donor-only poly(3-hexylthiophene). We found that strong interaction forces and high backbone planarity of the D-A polymers facilitate effective de-bundling of FWCNTs. As results, these D-A polymer/FWCNT composite films exhibit superior electrical percolation and TE performances, and flexible TE generators are successfully demonstrated with the D-A polymer/FWCNT composites.