Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Improved Thermoelectric Behavior of Nanotube-Filled Polymer Composites JAIME GRUNLAN, Texas A&M University, CHOONGHO YU, YEON SEOK KIM, KYUNGWHO CHOI, DASARAYONG KIM — The thermoelectric properties of single-walled carbon nanotube (SWNT)-filled polymer composites can be enhanced by modifying junctions between SWNTs using poly(3,4-ethylenedioxythiophene):poly(styrenesulfonate) (PEDOT:PSS) The resulting composites exhibit electrical conductivities up to ∼40,000 S/m without significantly altering thermopower (or Seebeck coefficient). On the other hand, thermal transport remains comparable to typical polymeric materials due to the dissimilar bonding and vibrational spectra between CNT and PEDOT:PSS. This behavior is very different from that of typical semiconductors whose thermoelectric properties are strongly correlated. SWNT-filled composites, made with an aqueous poly(vinyl acetate) emulsion (dried at room temperature followed by 80^{o}C) exhibited the best thermoelectric performance in this study. The highest thermoelectric figure of merit (ZT) in this study is ∼0.02 at room temperature, which is at least one order magnitude higher than most polymers and higher than that of bulk Si. Further studies with various polymers and nanoparticles with high thermoelectric performance could result in economical, light-weight, and efficient polymer-based thermoelectrics.

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Date submitted: 16 Nov 2009 Electronic form version 1.4