Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Effective Thermal Properties and Thermal Boundary Resistances of Multiphase Composites Containing Carbon Nanotubes and Inorganic Nanoparticles FENG GONG, National University of Singapore, DIMITRIOS PAPAVASSILIOU, University of Oklahoma, HAI DUONG, National University of Singapore — Monte Carlo simulations were employed to investigate the effective thermal conductivity (K_{eff}) and thermal boundary resistances (R_{bd}) of polymer composites containing carbon nanotubes (CNTs) and inorganic nanoparticles. By considering R_{bd} between any two phases and the synergistic effect of CNTs and nanoparticles, our model more accurately predictedK_{eff} of 3-phase composites than effective medium theories (EMTs). Complex morphology of CNTs (diameter, length) and the heat transfer at interfaces (R_{bd}) were quantified to study their influences on K_{eff}. By matching the simulated K_{eff} with the measured K_{eff}, R_{bd} of polymer-CNT and polymer-nanoparticle could be estimated. The results showed that K_{eff} of composites increases when CNT fraction increases and when R_{bd} of polymer-nanofillers (CNTs and nanoparticles) decreases. CNT bundle was built to investigate its effect on K_{eff} of composites, which had not been considered in EMTs. It was found that when CNT bundles increase, K_{eff} decreases in the composites with random and parallel CNTs, whereas, K_{eff} increases in those with perpendicular CNTs.

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Date submitted: 02 Nov 2014 Electronic form version 1.4