Enhanced Heat Transport in Nanoscaled Copper Reinforced PANI Nanocomposites

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The conducting Copper/Polyaniline nanocomposites are synthesized with the help of in-situ oxidative polymerization of aniline in the presence of copper nitrate as precursor. The Potassium Bi-iodate is used as oxidant material. The morphological characterization of as synthesized Cu-PANI nanocomposites confirms the formation of copper nanoparticles covered with Polyaniline nanoscaled fibril structures. The structural characterization like XRD of as synthesized Cu-PANI nanocomposites shows better crystallinity of synthesized products. The broadening in peaks in XRD pattern indicates that reduced size of nanoparticles. UV-Vis spectroscopic characterization confirms the formation of PANI in doped state and FTIR spectroscopic measurements confirms the interaction of copper nanoparticles with the PANI matrix due to appearance of significant blue shift. The low thermal conductivity of PANI is the main restriction to the applications of it as high dielectric constant material in energy storage devices. To obtain the higher thermal conductivity, in situ method for composites with metal nanoparticles have positives due to better and uniform dispersion in the matrix. Thermal conductivities in the synthesized nanocomposites with different concentrations of filler material are measured including pure PANI matrix in a wide temperature range of zero to 100 ˚C. The enhancement in thermal conductivity is explained with the help of existing theories for heat transfer in composite materials containing nanoscaled particles.