Abstract

The present study introduces a systematic approach to disperse graphene oxide (GO) during emulsion Polymerization (EP) of Polyaniline (PANI) to form nanocomposites with improved electrical conductivities. PANI/ GO samples were fabricated by loading different weight percent (wt. %) of GO through modified in situ EP of the aniline monomer. The polymerization process was carried out in the presence of a functionalized protonic acid such as dodecyl benzene sulfonic acid, which acts both as an emulsifier and protonating agent. The microstructure of the PANI/GO nanocomposites was studied by scanning electron microscopy, transmission electron microscopy, X-ray diffraction, UV–Vis spectrometry, Fourier transform infrared, differential thermal, and thermogravimetric analyses. The formed nanocomposites exhibited superior morphology and thermal stability. Meanwhile, the electrical conductivities of the nanocomposite pellets pressed at different applied pressures were determined using the four probe analyzer. It was observed that the addition of GO was an essential component to improving the thermal stability and electrical conductivities of the PANI/GO nanocomposites. The electrical conductivities of the nanocomposites were considerably enhanced as compared to those of the individual PANI samples pressed at the same pressures. An enhanced conductivity of 474 S/m was observed at 5 wt. % GO loading and an applied pressure of 6 t. Therefore, PANI/GO composites with desirable properties for various semiconductor applications can be obtained by in situ addition of GO during the polymerization process.