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Fabrication of graphene via electrochemical exfoliation of graphite and its properties in polyaniline composites

Abstract
Graphene have drawn tremendous research interest owing to its exceptional mechanical, thermal, electrical and optical properties. One of the most applications of the graphene is to incorporate it into some polymers as the reinforcing fillers to introduce good thermal and electrical properties. The current research focuses on the synthesis and characterization of conducting nanocomposites where graphene was incorporated into polyaniline (PANI). In the present study, graphene was synthesized via electrochemical exfoliation of graphite, wherein functional graphene can be produced during the exfoliation process. The effect of electrochemical potential is one of the factors that controlling the quality of the synthesized graphene. It was found that high quality graphene can be produced with lower electrochemical potential (+5V). The result was confirmed by Raman spectra, wherein smaller I_D/I_G ratio was obtained indicated a lower degree of defects. Fabrication of conducting graphene/PANI nanocomposites by using synthesized graphene have been successfully fabricated using one-step in situ polymerization. However, one major bottleneck for the application of graphene is their poor dispersibility in polymer matrices resulting from the strong van der Waals interactions among the graphene. The precipitation and aggregation of the graphene affect the properties of the nanocomposites. The electrical conductivity of the nanocomposites was studied by the resistance meter measurement system. It was found that the electrical conductivity of PANI increased by five orders of magnitude with addition of 5 wt% graphene.