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Electromagnetic Interface Shielding of Graphene Oxide–Carbon Nanotube Hybrid ABS Composites

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Abstract : In the present study, multiwalled carbon nanotubes (MWCNTs) and reduced graphene oxide (RGO) were synthesized by chemical vapor deposition and Improved Hummer's method, respectively and their composite with acrylonitrile butadiene styrene (ABS) were prepared by twin screw co rotating extrusion technique. The electromagnetic interference (EMI) shielding effectiveness of graphene oxide carbon nanotube (GCNTs) hybrid composites was investigated and the results were compared with EMI shielding of carbon nanotube (CNTs) and reduced graphene oxide (RGO) in the frequency range of 12.4-18 GHz (Ku-band). The experimental results indicate that the EMI shielding effectiveness of these composites is achieved up to –21 dB for 10 wt. % loading of GCNT loading. The mechanism of improvement in EMI shielding effectiveness is discussed by resolving their contribution in absorption and reflection loss. The main reason for such a high improved shielding effectiveness has been attributed to the significant improvement in the electrical conductivity of the composites. The electrical conductivity of these GCNT/ABS composites was increased from 10-13 S/cm to 10-7 S/cm showing the improvement of the 6 order of the magnitude. Scanning electron microscopic (SEM) and high resolution transmission electron microscopic (HRTEM) studies showed that the GCNTs were uniformly dispersed in the ABS polymer matrix. GCNTs form a network throughout the polymer matrix and promote the reinforcement.

Keywords : ABS, EMI shielding, multiwalled carbon nanotubes, reduced graphene oxide, graphene, oxide-carbon nanotube (GCNTs), twin screw extruder, multiwall carbon nanotube, electrical conductivity
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