Abstract

The recent advancements in wireless technology and telecommunication system have led to a new form of environmental pollution called electromagnetic interference (EMI). These undesirable radiations emitted by an electronic device under its operation that not only affects the proper functioning of the neighboring electronic gadget but also becomes grievous to living beings. In this thesis, we address the issue of EM radiation by developing an efficient and flexible EMI shielding material to suit modern needs. Here, polymer blend system constituting polar poly(ethylene-co-methyl acrylate) (EMA) and non-polar poly (ethylene-co-octene) (EOC), the copolymers known for their superior weatherabilty, was chosen as the polymer matrix. Conductive carbonaceous filler with different morphologies: Vulcan XC 72 (VCB), Multi-walled carbon nanotubes (MWCNT) and Graphene were employed as the functional moiety. The blend composites were prepared by simple solution mixing technique for improved filler dispersion. The EMI shielding efficiency (EMI SE) of the blend composites were analyzed in the microwave X-band region. The distribution of filler particles in the blend system was investigated by aiding calorimetric studies and micrographs. The preferential localization of filler particle in the co-continuous EMA/EOC blend system aided double percolation phenomenon and thereby reduced the electrical threshold concentration. We compared the electrical conductivity and electrical threshold concentration obtained for binary blend composite with the single polymer system and the blend composite proved to exhibit improved electrical conductivity and lower electrical threshold concentration. The effect of metallic nanoparticles decoration of carbon fillers on electrical conductivity and EMI SE were analyzed. MWCNT and graphene sheets were decorated with silver nanoparticles and found to enhance the electrical conductivity and EMI SE. Hybrid filler constituting different morphology was encountered to form a co-supportive conductive pathway enhancing electrical conductivity and thus the EMI SE. Highly conductive polymer composite was also fabricated by taking the advantages of double percolated conductive network, heterostructured hybrid filler for superior EMI shielding application.

Keywords: *Conductive polymer blend composite, carbonaceous filler, electrical conductivity, double percolation, metallic nanoparticles, hetero-structured filler, hybrid filler, EMI shielding efficiency*