Microwave Shielding Performance of Nanocomposites in X-Band from 8-12 GHz

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Microwavesas part of Electromagnetic Radiations have various applications, such as navigation, air traffic control, radar, and marine functions. The use of shielding as an engineering criterion is a priority for radiation control. The present study aimed to investigate the shielding properties of electromagnetic interference (EMI) of polymer nanocomposites with different weight percentages of nano-magnetite (Fe3O4) /carbon black nanoparticle (CBN) on different thickness. Xray diffraction (XRD), scanning electron microscopy (SEM), Raman spectroscopy and transmission electron microscope (TEM) analysis were used for investigating the materials structure. Nanocomposites were successfully prepared using melt mixing. Their shielding efficiency (SE) was measured by a vector network analyzer in the frequency range of 8.2 ~ 12.4 GHz. The maximum SETotal was 36.26 dB at 8.2 GHz for a weight percentage of 15% Fe3O4 composite and 50% CBN (0.7 mm thickness). The results showed that by increasing the sample thickness from 0.7 mm to 3.2 mm, the value of SEA did increase. In addition, nanocomposites had the greatest shielding effect in the low-frequency range. It was found that the proper combination of electrical and magnetic losses causes excellent wave absorption. These findings indicated that epoxy resin with a combination of optimal weight percentage of magnetite and CBN can be used as a suitable protective shield for Microwave in low thickness.
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