Electromagnetic interference shielding properties of nanocomposites for commercial electronic devices

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Abstract

A novel functional nanocomposites microwave shielding material using natural rubber (NR) loaded with binary active fillers barium hexaferrite (BF) (BaFe12O19) and carbon nanoparticle (CB) were fabricated by conventional roll milling technique. Nanocrystalline barium hexaferrite with particle size of 16 nm were successfully synthesized by hydrothermal approach at low temperature. The surface morphology of the nanocomposites was investigated using X-ray, field emission scanning electron microscopy and transmission electron microscopy. The electrical resistivity of the nanocomposites is decreased with BF loading level. The dielectric constant of the composites is decreased with increasing microwave frequency. NR/BF nanocomposites were screened for electromagnetic interference (EMI) shielding effectiveness (SE) over a frequency band of 1-12 GHz. A maximum SE value is approximately 75 dB in the frequency range of 1-12 GHz for BF content of 20 wt % and thickness of 1 mm. An excellent agreement between the theoretically predicted SE and the measured data was found. These features collectively demonstrated the potential of NR/BF nanocomposites for versatile applications in microwave shielding application and commercial electronic devices issues.

Keywords

KeyWords Plus: RUBBER; COMPOSITES; NANOPARTICLES; BAND; FREQUENCY

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