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New electromagnetic wave shielding effectiveness at microwave frequency of polyvinyl chloride reinforced graphite/copper nanoparticles

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ABSTRACT

A novel functional nanoconducting composite from polyvinyl chloride reinforced graphite–copper nanoparticles (PVC/GCu) was fabricated in order to produce a material suitable for electromagnetic interference (EMI) shielding applications. The microstructure of the nanocomposites was investigated by means of scanning electron microscopy (SEM) and Fourier transform infrared spectroscopy (FTIR). The thermal stability of the nanocomposites could improved with the incorporation of GCu nanoparticles. The electrical conductivity increases with increasing GCu content within composites. The percolation threshold of composites is low of about 2 wt.%. Hall-effect studies indicate that increase in GCu content in the composites causes increase in carrier concentration, mobility of the carriers and the composites behave as *n*-type semiconductor. The nanocomposites showed a high dielectric constant and a high dissipation factor in the frequency range of 1–20 GHz which makes it useful in charge storing and decoupling capacitors applications. The EMI shielding effectiveness (SE) of the PVC/GCu nanocomposites was tested over a frequency range of 1–20 GHz, and 22–70 dB shielding efficiency was obtained for the composites, suggesting that they may be used as an effective lightweight EMI shielding material in aerospace and radar evasion applications.

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