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Effect of Laminating Sequence of MWCNTs and Fe_2O_3 Filled Nanocomposites on Emi Shielding Effectiveness

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Abstract : Mitigation of electromagnetic interference (EMI) through thin, lightweight, and cost-effective materials is critical for electronic appliances as well as human health. The present research work discusses the design of composites that are suitable to minimize EMI through various stacking sequences. The carbon fibers reinforced composite structures impregnated with dielectric (MWCNTs) and magnetic nanofillers (Fe_2O_3) were developed to investigate their microwave absorption properties. The composite structure comprising a single type of nanofillers, each of MWCNTs & Fe_2O_3, was developed, and then their layers were stacked over each other with various stacking sequences to investigate the best stacking sequence, which presents good microwave absorption characteristics. A vector network analyzer (VNA) was used to analyze the microwave absorption properties of these developed composite structures. The composite structures impregnated with the layers of a dielectric nanofiller and sandwiched between the layers of a magnetic nanofiller show the highest EMI shielding value of 59 dB and a dielectric conductivity of 35 S/cm in the frequency range of 0.1 to 13.6 GHz. The results also demonstrate that the microwave absorption properties of the developed composite structures were dominant over reflection properties. The absence of an external peak in X-ray diffraction (XRD), marked the purity of the added nanofillers.

Keywords : nanocomposites, microwave absorption, EMI shielding, skin depth, reflection loss
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