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Designing, modeling and manufacturing of lightweight carbon nanotubes/polymer composite nanofibers for electromagnetic interference shielding application

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ABSTRACT

Lightweight conductive multi-walled carbon nanotubes (MWCNTs) / polyvinyl alcohol (PVA) composite nanofibers were prepared by electrospinning process with an aim to investigate the potential of such nanofibers as an effective electromagnetic interference (EMI) shielding material. The influence of MWCNTs content, thickness, and frequency on the EMI shielding of conductive MWCNTs/ PVA composite nanofiber has been investigated. These experiments were designed by response surface methodology (RSM) and quadratic model was used to calculation of the responses. The predicted responses were in good agreement with the experimental results according to RSM model. The RSM analysis confirmed that MWCNTs content and thickness were the main significant variables affecting the absorption shielding effectiveness. Moreover, the sample thickness has no significant influence on the reflection shielding effectiveness. The RSM model predicted the 31.5 dB value of the highest absorption with low reflection (8.8 dB) at conditions of 7.7 wt% MWCNTs content, 3 mm of the sample thickness, and 12 GHz of incident EM wave frequency. The obtained RSM results confirmed that the selected RSM model presented suitable performance for evaluating the involved variables and prediction of EMI shielding parameters.

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