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Nanofibrous Membrane Constructed Magnetic Materials for High-efficiency Electromagnetic Wave Absorption

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ABSTRACT

With the rapid advancement of modern technology, electromagnetic (EM) wave absorption materials become more and more indispensable to daily life and even national strategic areas. However, how to fabricate such materials in a manner of high-efficiency and broad frequency range remains a challenge and highly desired. Here, we proposed a new route to produce high performance EM wave membranes by combined techniques of electrospinning, stabilization and carbonization processes. $NiFe_2O_4$ nanoparticles and multiwall carbon nanotubes (MWCNTs) were respectively selected as the effective magnetic material and dielectric material to construct the highly flexible $NiFe_2O_4$/MWCNTs doped carbon nanofibers (CNFs). The fabricated composite membrane exhibits superior EM wave absorption behavior in a wide frequency range. For the EM wave absorption performance in C-band (4-8 GHz), X-band (8-12 GHz) and Ku-band (12-18 GHz), the reflection loss (R_L) exceeding -20 dB are obtained in the frequency range of 5.36-18 GHz at a sample thickness of 2-5 mm. Similarly, the R_L value of 45.60 dB can be realized for $NiFe_2O_4$/MWCNTs CNFs with a bandwidth of 12.96 GHz at a thickness of 2.5 mm. The as-synthesized $NiFe_2O_4$/MWCNTs CNFs nanofibrous membrane can be a promising