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Synthesis of magnetical nanoparticles decorated with reduced graphene oxide as an efficient broad band EM wave absorber

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Abstract

The reduced graphene oxide (RGO)/$CoFe_2O_4$ magnetical nanocomposites have been successfully fabricated via a facile method combining co-precipitation and hydrothermal process. The TEM results show that the $CoFe_2O_4$ nanoparticles with diameters about 10-20 nm are well dispersed on the entire graphene nanosheets without aggregation. In this work, the $CoFe_2O_4$ nanoparticles were used to bring magnetic loss ability, while the graphene nanosheets were designed to bring dielectric loss ability. It could enhance impedance matching characteristic, further improving the electromagnetic (EM) wave absorption performance. Therefore, the as-prepared RGO/$CoFe_2O_4$ nanocomposites exhibit excellent EM wave absorption properties in terms of both the maximum reflection loss and the absorption bandwidth. The maximum reflection loss of RGO/$CoFe_2O_4$ nanocomposites is -53.6 dB at 11.4 GHz with the thickness of 2.5 mm and the maximum absorption bandwidth with the reflection loss below -10 dB is up to 5.0 GHz (from 12.2 to 17.2 GHz) with the thickness of 2.0 mm. And also the absorption bandwidth with the reflection loss below -10 dB is up to 13.5 GHz (from 4.5 to 18.0 GHz) with a thickness in the range of 1.5-5.0 mm. The above results all suggest that the RGO/$CoFe_2O_4$ nanocomposites can serve as an ideal candidate for an efficient broad band EM wave absorber.

Keywords: Nanocomposites; Magnetical nanoparticles; RGO; Broad band; EM wave absorption

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