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Fabrication and Electromagnetic Properties of Carbon-based Iron Nitride Composite

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Abstract

In this study, carbon-based iron nitride composite is prepared by hydrothermal synthesis, in-situ polymerization and nitriding, successively. The morphology, phase and chemical structure of the composite is characterized by scanning electron microscope (SEM), high resolution transmission electron microscopy (HRTEM), x-ray diffractometer (XRD) and Fourier transform infrared spectrometer (FTIR). The electromagnetic and microwave absorbing property of the composites is investigated using a vibrating sample magnetometer (VSM) and a vector network analyzer (VNA). The results show that the carbon-based iron nitride composite is successfully fabricated by coating Fe₄N magnetic particles with thin carbon layers. The minimum reflection loss (RL) of -44 dB is observed at 4.23 GHz (3.02 mm thickness), and the frequency band is 3.72–4.74 GHz when RL ≤ -10 dB. When the thickness is reduced to 1.00 mm, the effective bandwidth (RL ≤ -10 dB) could still reach to 4.00 GHz. In summary, the carbon-based iron nitride composite shows excellent microwave absorbing property at 2–4 GHz with relatively thin thickness.

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