

Electromagnetic interference (EMI) shielding and microwave absorption properties of nickel ferrite NiFe₂O₄/ PANI-PTSA nanocomposite

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Abstract

The Nanocrystalline nickel ferrite & conducting polymer {NiFe₂O₄/PANI-PTSA} was prepared by {sol-gel/ chemical oxidative polymerization} method. Morphology analytical techniques for the nanoparticle size structure of the specimens {(NiFe₂O₄/PANI-PTSA) = NF, PNF1, PNF2, and PNF3}, were characterized by X-ray diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR) and vector network analyzer (VNA). The electromagnetic absorption properties (R.L) of the nanocomposite that aggressively depend on the complex relative for both the permittivity ($\epsilon' - j\epsilon''$) and the permeability ($\mu' - j\mu''$) have been calculated from scattering parameters (S₁₁ and S₂₁) using the Nicholson–Ross–Weir method as a function of frequencies. Results showed that the specimen PNF3-(3:1), 2.1 mm thickness provide best absorption of reflection loss (R.L); – 19.5 dB (99 % power absorption) at 8.3 GHz, – 25.19 dB (> 99.68% power absorption) at 9.5 GHz, and – 59.086 dB (99.99 % power absorption) at 10.7 GHz, and hence this nanocomposite can be used as an excellent electromagnetic interference (EMI) for shielding and microwave absorption such as radar or other various military applications in X-band (8-12 GHz).

Biography

Jameel M. A. Sulaiman currently works at the College of Dentistry - Dental Basic Sciences, University of Mosul. He completed B.Sc. in Physics College of Education, University of Baghdad, Baghdad- Iraq 1982. He completed M.Sc. in Physics / College of Science / University of Mosul, Mosul-Iraq, 2005. His Ph.D. in applied physics, (Thesis: “Preparation and Characterization of PANi / Ferromagnetic/ Ferroelectric Composites for Electromagnetic Shielding Behavior”), University of Technology, Dept. of Applied Sciences, Baghdad- Iraq, 2018.



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