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Optimizing the electromagnetic wave absorption performance of designed hollow CoFe2O4/CoFe2@C microspheres by carbon reduction

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Abstract

Whereas core-shell typed absorbers present some superiorities like abundant interfaces toward attenuation of electromagnetic wave (EMW), but versatile approaches including Snoek limits, electron mobility, oxygen vacancies to further contribution are often not stressed in previous reports. In this article, rational design on the hollow CoFe2O4/CoFe2@C architecture has been successfully conducted by a sequential process of hydrothermal treatment, calcination and in-suit polymerization. Results exhibit that the high Hc is associated with this unique multipolar morphology. And Ms is also enhanced due to reduction process, which generates extensive oxygen vacancies in original lattice structure. In such complex systems, dielectric loss plays the dominant part in attenuation, where conduction loss mainly derived from CoFe2 contributes greatly. Analysis of the RL verifies the excellent absorption performance with the effective absorption band (EAB) of 5.9 GHz at 2.17 mm, and the optimized RL is up to -51 dB with 30 wt% loading. The improved Ms aiming to enhance μr are integrated with enriched conduction loss/relaxation, determining the high-efficient dissipation, while the impedance matching can be further tuned by controlling the thickness of carbon layers. Therefore, this multi-favorable-factors design definitely shed light on novel structure for new absorbers.

Biography

Jianwen Ge is a doctor of Northeast University, mainly engaged in absorbing electromagnetic waves.

Publications

1. Liquid–liquid extraction of Eu(lll) using synergic mixture of 1-phenyl-3-methyl-4-trifluoroacetyl-2-pyrazolin-5-one and crown ethers
2. Facile synthesis of hierarchically porous rGO/MnZn ferrite composites for enhanced microwave absorption performance
3. Optimizing the electromagnetic wave absorption performances of designed Fe3O4@SiO2@MnO2 hybrids
4. Enhanced electromagnetic wave absorption of hybrid-architectures Co@ SiOxC
5. Facile synthesis of hierarchically porous rGO/MnZn ferrite composites for enhanced microwave absorption performance

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