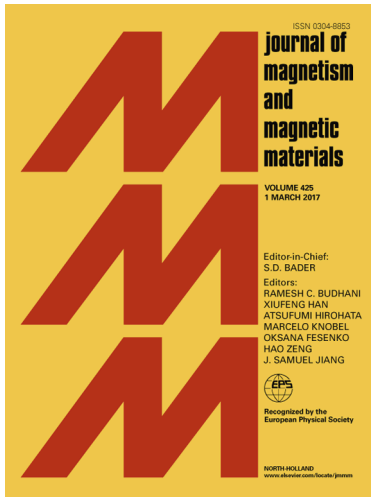

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PII: S0304-8853(17)32478-2
DOI: https://doi.org/10.1016/j.jmmm.2017.10.097
Reference: MAGMA 63313

To appear in: *Journal of Magnetism and Magnetic Materials*

Received Date: 8 August 2017
Revised Date: 23 October 2017
Accepted Date: 24 October 2017

Please cite this article as: D. Zheng, T. Liu, L. Liu, Y. Xu, Design on the wide band absorber with low density based on the particle distribution, *Journal of Magnetism and Magnetic Materials* (2017), doi: https://doi.org/10.1016/j.jmmm.2017.10.097

Design on the wide band absorber with low density based on the particle distribution

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Abstract: In order to widen the absorbing band, an equivalent gradient structure absorber was designed based on the particle distribution. Firstly, the electromagnetic parameter of the absorbent with uniform dispersion was tested using the vector network analyzer in 8-18 GHz. Three different equivalent materials of the spherical, square and hexagon empty shape were designed. The scattering parameters and the monostatic reflection loss (RL) of the periodic structural materials were simulated in the commercial software. Then the effective permittivity and the permeability was derived by the Nicolson-Ross-Weir algorithm and fitted by Maxwell-Garnett mixing rule. The results showed that the simulated reflectance and transmission parameters of equivalent composites with the different shapes were very close. The derived effective permittivity and permeability of the composite with different absorbent content was also close, and the average deviation was about $0.52+j0.15$ and $0.15+j0.01$ respectively. Finally, the wide band absorbing material was designed using the genetic algorithm. The optimized RL result showed that the absorbing composites with thickness 3 mm had an excellent absorbing property (RL<-10 dB) in 8-18 GHz, the equivalent absorber density could be decreased 30.7% compared with the uniform structure.

Keywords: absorbing materials, carbonyl irons, particle distribution, periodic structure; material design

1. Introduction

Radar absorbing materials (RAM) have been used widely to solve the electromagnetic scattering and radiation problems, such as the absorbing structure in the military applications surface and the absorbing patch in the cellphone [1-3]. Oftenly the absorbing material was made of two parts, the absorbent particle and the adhesive, meanwhile the absorbent was the main factor on determining the absorbing property. The absorbent characteristics included the particle shape, the material type, the particle crystalline phase, the particle size, and the particle distribution [4-6]. In order to obtain the absorber of good absorbing

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