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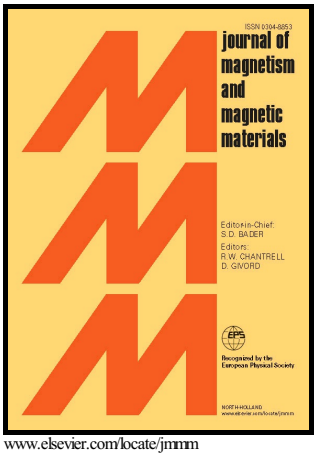

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X-band Microwave Absorbing Characteristics of Multicomponent Composites with Magnetodielectric Fillers

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Abstract

We have studied the microwave absorbing performance in the X-band (8-12.4 GHz) of epoxy composites filled with magnetic and dielectric oxides and multiwalled carbon nanotubes. To this end, pure cobalt-substituted Ba-hexaferrite and calcium titanate were synthesized with the hydrothermal method in the form of nanosized powder. Moreover, the produced powders were characterized in regard of their structural, morphological and static magnetic properties. For the electromagnetic investigation, composite samples were also prepared with various thicknesses up to 4 mm and two basic filler compositions; namely 30 wt.% of $BaCoFe_{11}O_{19}$ and 30 wt.% of the mixture $BaCoFe_{11}O_{19}$/$CaTiO_3$/carbon nanotubes. The magnetic composites show strong but narrowband reflection losses up to 27.5 dB, whereas the magnetodielectric composites with maximum losses of 15.8 dB possess wider bandwidth of operation, due to improved impedance matching. Furthermore, the characteristic frequency of the maximum losses for these quarter-wavelength absorbers was verified to be in inverse proportion to the layer thickness. These findings are supported by reflectance measurements of the samples both in waveguide and free-space.

Keywords: Barium hexaferrite, calcium titanate, carbon nanotubes, magnetic properties, microwave absorption.

1. Introduction

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