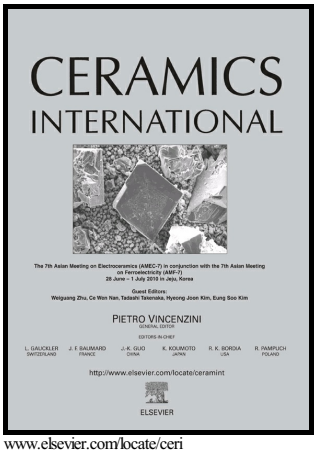

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Abstract

A low-temperature co-fired In^{3+} ion doped Mg-Cd ferrite ($Mg_{0.8}Cd_{0.2}Fe_{2-x}In_xO_4$ with $0 \leq x \leq 0.15$) with a 3wt% Bi_2O_3 additive was synthesized using a solid-state reaction method. X-ray diffraction reveals that the samples contain both a spinel ferrite phase and a $CdIn_2O_4$ dielectric phase. Following In^{3+} ion doping, the saturation magnetization increases first but then decreases. Coercivity, on the other hand, decreases first before it increases. The combined effects of In doping together with the addition of Bi_2O_3 endowed the compound materials with excellent magnetic permeability and dielectric permittivity. Using 3wt.% Bi_2O_3, the magnetic permeability increases first from 16 to 26.5, and then decreases to 15.6, while the dielectric permittivity increases from 19 to 32. The equivalent permeability and permittivity appears when x=0.10. The real parts of both permeability and permittivity are about 26, and the material had low loss-tangents (both magnetic and dielectric). This indicates that this ferrite is an excellent material to be used in miniature antennas.

Keywords

Mg-Cd ferrite, In_2O_3 doping, magnetic permeability, dielectric permittivity, antenna substrate

Introduction

The trend towards miniaturization of electronic devices, especially for mobile communication, creates increasing pressure to reduce the size of antennas [1-3]. Hence, antenna miniaturization is one of the most important challenges for antenna