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Magnetoelastic properties of terbium substituted cobalt ferrite

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Abstract:

The magnetic properties of terbium substituted cobalt ferrites $\text{CoFe}_{2-x}\text{Tb}_x\text{O}_4$ ($x = 0, 0.05, 0.1, 0.15$ and 0.2) prepared by conventional solid state method are studied. The coercivity showed marked increase up to $x = 0.1$ and saturation magnetization decreased with increasing terbium content. Magnetostriction measurements did not show much decrease in the maximum value of strain but significant increase in the slope of magnetostriction was observed for $x = 0.15$ with moderate magnetostriction of around 144 ppm. The observed magnetic and magnetostrictive properties can be explained on the basis of structural and microstructural changes arising because of terbium substitution.

Keyword: Magnetostriction, Ferrite, Rare earth

1. Introduction

Spinel ferrites have been used for long time for various high frequency applications such as in transformers and in telecommunications [1-2]. Cobalt ferrite $\text{Co}^{\text{II}}\text{Fe}_2^{\text{III}}\text{O}_4$, is an inverse spinel where in the trivalent Fe ions preferentially occupy both the tetrahedral and octahedral sites whereas the divalent Cobalt ions occupy the octahedral site. It possesses high magnetocrystalline anisotropy and high magnetostrictive strains [3]. It has showed remarkably promising magnetostrictive strains which make it a suitable material for stress sensing

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