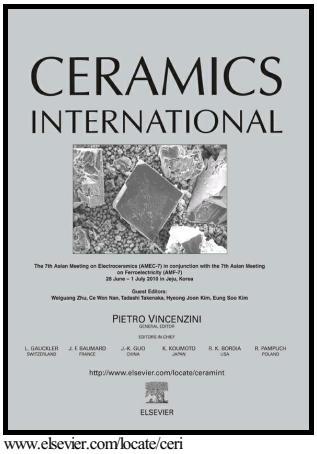

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Synthesis and characterization of yttrium iron garnet nanoparticles doped with cobalt

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Abstract

In this work, we have synthesized and characterized yttrium iron garnet nanoparticles doped with cobalt. The X-ray diffraction data showed a single phase, belonging to the cubic structure of $Y_3Fe_5O_{12}$. Rietveld refinement revealed variation of the angles and interionic distances (Fe^{3+}(*a*)-O^{2-}-Y^{3+}(*c*) and Fe^{3+}(*d*)-O^{2-}-Y^{3+}(*c*) when Fe^{3+} ions are replaced by Co^{3+} ions in the tetrahedral (*d*) and octahedral (*a*) sites of YIG. In addition, the lattice parameter *a*, decreases from 12.3846 Å to 12.3830 Å with the increasing of cobalt concentration. The analysis by Infrared and Raman spectroscopies has shown a slight stretching at lower wave numbers as the dopant concentration increased. The magnetic measurements confirm the substitution of Fe^{3+} by Co^{3+} in the *a*-sites and *d*-sites with the reduction of the saturation magnetization from 26.63 emu/g to 24.92 emu/g, for $0.000 \leq y \leq 0.030$. Changes in the coercive field varying the dopant concentration were related to the particle size and pinning centers existence.