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## Cation distribution and magnetic properties of nanocrystalline Gallium substituted Cobalt ferrite.

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### Abstract

Spinel nano cobalt ferrite  $\text{CoFe}_{2-x}\text{Ga}_x\text{O}_4$  over a compositional range  $0 \leq x \leq 0.8$  was synthesized by the sol-gel method. The doping effect of Ga ions on crystalline phase, microstructure and magnetic properties were investigated. X-ray powder diffraction patterns confirm the single crystalline phase of the nanoparticles. Both Rietveld refinement and Mössbauer effect spectroscopy were used to study the distribution of cations in tetrahedral (A) and octahedral [B] sites of the spinel. They both suggest a partially inverse  $\text{CoFe}_{2-x}\text{Ga}_x\text{O}_4$ . Furthermore, the magnetic measurements show that the saturation magnetization increases for the Ga doped  $\text{CoFe}_2\text{O}_4$ . Meanwhile, the coercivity field decreases with increasing the Ga content.

Keywords: Nano ferrites; Cobalt ferrite; Rietveld refinement; Mössbauer effect spectroscopy; Cation distribution; Magnetic properties.

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