

Size Dependent Magnetic Properties of $\text{CoFe}_{2-x}\text{Gd}_x\text{O}_4$ ($x = 0.1$) Spinel Ferrite Nanoparticles Synthesized by Starch-Assisted Sol-Gel Auto-Combustion Method

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Abstract : In this work, the effect of particle size on the structural and magnetic properties of $\text{CoFe}_{2-x}\text{Gd}_x\text{O}_4$ ($x = 0.1$) spinel ferrite nanoparticles synthesized by starch-assisted sol-gel auto combustion method was investigated. The different sized $\text{CoFe}_{2-x}\text{Gd}_x\text{O}_4$ ($x = 0.1$) spinel ferrite nanoparticles were achieved after annealing at different temperature 500, 700 and 900 °C. The structural phases, crystallite size and lattice parameter of synthesized ferrite nanoparticles were estimated from X-ray diffraction studies. The field emission scanning electron microscopy study demonstrated increase in particle size with increase of annealing temperature. Raman spectroscopy study indicated the change in octahedral and tetrahedral site related Raman modes in Gd^{3+} ions doped cobalt ferrite nanoparticles. An infrared spectroscopy study showed the presence of two absorption bands in the frequency range around 580 cm^{-1} (ν_1) and around 340 cm^{-1} (ν_2); which indicated the presence of tetrahedral and octahedral group complexes, respectively, within the spinel ferrite nanoparticles. Vibrating Sample magnetometer study showed that the saturation magnetization and coercivity changes with particle size of $\text{CoFe}_{2-x}\text{Gd}_x\text{O}_4$ ($x = 0.1$) spinel ferrite.

Keywords : magnetic properties, spinel ferrite, nanoparticles, sol-gel synthesis

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