

## Structural, Magnetic and Electrical Properties of Gd<sup>3+</sup> Doped CoFe<sub>2</sub>O<sub>4</sub> Nanoparticles Synthesized by Sonochemical Method

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**Abstract :** In this report, we studied the impact of Gd<sup>3+</sup> substitution on structural, magnetic and electrical properties of CoFe<sub>2</sub>O<sub>4</sub> nanoparticles synthesized by sonochemical method. X-ray diffraction pattern confirmed the formation of cubic spinel structure at low concentration of Gd<sup>3+</sup> ions, however, GdFeO<sub>3</sub> additional phase was observed at higher concentration of Gd<sup>3+</sup> ions. Raman and Fourier Transform Infrared spectroscopy study also confirmed cubic spinel structure of Gd<sup>3+</sup> substituted CoFe<sub>2</sub>O<sub>4</sub> nanoparticles. The field emission scanning electron microscopy study revealed that Gd<sup>3+</sup> substituted CoFe<sub>2</sub>O<sub>4</sub> nanoparticles were in the range of 5-20 nm. The magnetic properties of Gd<sup>3+</sup> substituted CoFe<sub>2</sub>O<sub>4</sub> nanoparticles were investigated by using vibrating sample magnetometer. The variation in saturation magnetization, coercivity and remanent magnetization with Gd<sup>3+</sup> concentration in CoFe<sub>2</sub>O<sub>4</sub> nanoparticles was observed. The variation of real and imaginary part of dielectric constant, tan δ, and AC conductivity were studied at room temperature.

**Keywords :** spinel ferrites, nanoparticles, sonochemical method, magnetic properties

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