

Structural, Magnetic and Electrical Properties of Gd³⁺ Doped CoFe₂O₄ Nanoparticles Synthesized by Sonochemical Method

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Abstract : In this report, we studied the impact of Gd³⁺ substitution on structural, magnetic and electrical properties of CoFe₂O₄ nanoparticles synthesized by sonochemical method. X-ray diffraction pattern confirmed the formation of cubic spinel structure at low concentration of Gd³⁺ ions, however, GdFeO₃ additional phase was observed at higher concentration of Gd³⁺ ions. Raman and Fourier Transform Infrared spectroscopy study also confirmed cubic spinel structure of Gd³⁺ substituted CoFe₂O₄ nanoparticles. The field emission scanning electron microscopy study revealed that Gd³⁺ substituted CoFe₂O₄ nanoparticles were in the range of 5-20 nm. The magnetic properties of Gd³⁺ substituted CoFe₂O₄ nanoparticles were investigated by using vibrating sample magnetometer. The variation in saturation magnetization, coercivity and remanent magnetization with Gd³⁺ concentration in CoFe₂O₄ 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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