

## Impact of Gd<sup>3+</sup> Substitution on Structural, Optical and Magnetic Properties of ZnFe<sub>2</sub>O<sub>4</sub> Nanoparticles

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**Abstract :** In this report, the impact of Gd<sup>3+</sup> substitution in ZnFe<sub>2</sub>O<sub>4</sub> spinel ferrite nanoparticles on structural, optical and magnetic properties was investigated. ZnFe<sub>2-x</sub>Gd<sub>x</sub>O<sub>4</sub> (x=0.00, 0.05, 0.10, 0.15, 0.20) nanoparticles were synthesized by honey-mediated sol-gel combustion method. X-ray diffraction, Raman Spectroscopy and Fourier Transform Infrared Spectroscopy confirmed the formation of cubic spinel ferrite crystal structure. The morphology and elemental analysis were studied using field emission scanning electron microscopy (FE-SEM) and energy dispersive X-ray spectroscopy, respectively. UV-Visible reflectance spectroscopy revealed band gap variation with concentration of Gd<sup>3+</sup> substitution in ZnFe<sub>2</sub>O<sub>4</sub> nanoparticles. Magnetic property was studied using vibrating sample magnetometer at room temperature. The synthesized spinel ferrite nanoparticles showed ferromagnetic behaviour. The evaluated magnetic parameters such as saturation magnetization, coercivity and remanence showed variation with Gd<sup>3+</sup> substitution in spinel ferrite nanoparticles. This work was supported by the Ministry of Education, Youth and Sports of the Czech Republic - Program NPU I (LO1504).

**Keywords :** sol-gel combustion method, nanoparticles, magnetic property, optical property

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