

Structural and Magnetic Properties of CoFe₂O₄:Nd³⁺/Dy³⁺/Pr³⁺/Gd³⁺ Nanoparticles Synthesized by Starch-Assisted Sol-Gel Auto-Combustion Method and Annealing Effect

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Abstract : In this work, we investigated the structural and magnetic properties of CoFe₂O₄:Nd³⁺/Dy³⁺/Pr³⁺/Gd³⁺ nanoparticles synthesized by starch-assisted sol-gel combustion method. X-ray diffraction pattern confirmed the formation of cubic spinel structure of rare-earth ions (Nd³⁺, Dy³⁺, Pr³⁺, Gd³⁺) doped CoFe₂O₄ spinel ferrite nanoparticles. Raman and Fourier Transform Infrared spectroscopy study also confirmed cubic spinel structure of rare-earth ions (Nd³⁺, Dy³⁺, Pr³⁺, Gd³⁺) substituted CoFe₂O₄ nanoparticles. The field emission scanning electron microscopy study revealed the effect of annealing temperature on size of rare-earth ions (Nd³⁺, Dy³⁺, Pr³⁺, Gd³⁺) substituted CoFe₂O₄ nanoparticles and particles were in the range of 10-100 nm. The magnetic properties of rare-earth ions (Nd³⁺, Dy³⁺, Pr³⁺, Gd³⁺) substituted CoFe₂O₄ nanoparticles were investigated by using vibrating sample magnetometer. The variation in saturation magnetization, coercivity and remanent magnetization with annealing temperature/ particle size of rare-earth ions (Nd³⁺, Dy³⁺, Pr³⁺, Gd³⁺) substituted CoFe₂O₄ nanoparticles was observed. Acknowledgment: This work was supported by the Ministry of Education, Youth and Sports of the Czech Republic - Program NPU I (LO1504).

Keywords : starch, sol-gel combustion method, rare-earth ions, spinel ferrite nanoparticles, magnetic properties

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