

ABSTRACT

In this study, pure cobalt ferrite (CoFe_2O_4) nanoparticles and $\text{Co}_{1-x}\text{Cu}_x\text{Fe}_2\text{O}_4$ nano spinel ferrite samples with different Cu^{+2} doping contents were successfully synthesized via the precipitation method. The impact of replacing divalent cobalt (Co^{2+}) ions by divalent copper (Cu^{2+}) ions on the microstructure, optical and magnetic properties of the produced $\text{Co}_{1-x}\text{Cu}_x\text{Fe}_2\text{O}_4$ nano spinel ferrite samples was studied. X-ray diffraction (XRD) and Fourier transform infrared (FTIR) spectra exposed the consistency of a single cubic phase with the evidence of CuO phases for $x \geq 0.2$. XRD and energy dispersive X-ray spectroscopy studies affirmed the integration of Cu^{2+} ions within CoFe_2O_4 host lattice. Transmission electron microscopy (TEM) analysis showed the crucial role played by Cu^{2+} added to CoFe_2O_4 in controlling the particle size distribution of $\text{Co}_{1-x}\text{Cu}_x\text{Fe}_2\text{O}_4$ nano spinel ferrite samples in agreement with XRD analysis. Optical energy gap investigated by UV-Vis spectroscopy were found to range from 1.77 eV to 2.2 eV. Magnetic properties investigated by the vibrating sample magnetometer technique illustrated that the doping with copper can be an effective way to control the magnetic properties of $\text{Co}_{1-x}\text{Cu}_x\text{Fe}_2\text{O}_4$ nano spinel ferrite samples.