

Investigation of Magnetic and Magneto-Optical Properties of Copper Cobalt Ferrite Nanoparticles

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Abstract : In this study, copper cobalt ferrite nanoparticles were synthesized by the chemical formula $Co_{1-x}Cu_xFe_2O_4$ and ($x = 0, 0.2, 0.4, 0.6, 0.8, 1$) by co-precipitation method. The X-ray diffraction pattern of the samples confirmed the single-phase spinel structure of the fabricated nanoparticles, and the average size of the crystals was calculated from the entire width of the diffraction peak with the highest intensity and Scherrer's equation. Using transmission electron microscope images, the nanoparticle size was about 10 nm. The magnetic properties of copper cobalt ferrite nanoparticles were measured by Alternative Gradient Force Magnetometer (AGFM), and it was seen that with increasing substitution of copper Cations instead of cobalt Cations in the samples, the amount of induction decreased and the saturation magnetization first increased and then decreased. In order to investigate Faraday's effect on copper-cobalt ferrite nanoparticles, the transmittance values were measured using a laboratory experiment and their graphs were plotted in terms of the applied magnetic field, all of which were in agreement with the theory. In addition, transmittance was investigated for two angular positions of the analyzer at -45° and $+45^\circ$ in different fields.

Keywords : magnetic nanoparticles, Ferrite co-precipitation, Faraday rotation, magneto- optical property

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