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CTAB-Assisted Hydrothermal Synthesis and Magnetic Characterization of $Ni_xCo_{1-x}Fe_2O_4$ Nanoparticles (x = 0.0, 0.6, 1.0)

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Abstract: Nickel ferrite, $Ni_xCo_{1-x}Fe_2O_4$, NPs (where x = 0.0, 0.6 and 1.0) were successfully synthesized by a rapid and reproducible CTAB-assisted hydrothermal route. The influence of different hydrolyzing agents on the particle size and magnetic behavior of $Ni_xCo_{1-x}Fe_2O_4$ NPs was investigated. Particles showed very high phase purity and crystallinity in powder XRD analysis. Compositions of Co, Fe, and Ni in fabricated powders were also determined by AAS and results are in very good agreement with the targeted compositions. Samples hydrolyzed using NH_3 showed no significant changes in the particle size and morphology. NH_3 hydrolyzed samples were much smaller than their NaOH hydrolyzed counterparts, which was attributed to the strength and concentration of the hydrolyzing agents, NH_3 being about 6 times more concentrated than NaOH. This in turn influenced the nucleation rate thus the size of each nucleus formed. Strong temperature and Ni concentration dependence of magnetic parameters was observed. These samples are considered as promising materials for high density magnetic recording media.

Key Words: Magnetic materials, Spinels, XRD, Coercivity, Hydrothermal synthesis

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