PAPER

Structural, magnetic and catalytical properties of cobalt ferrite nanoparticles dispersed in silica matrix

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Abstract

Tendency of magnetic nanoparticles to agglomerate can be minimized by dispersing them in suitable inert matrix. This paper reports the synthesis, structural, spectral and magnetic properties of cobalt ferrite

matrix. This paper reports the synthesis, structural, spectral and magnetic properties of cobalt ferrite nanoparticles dispersed in silica matrix. Samples were characterized using x ray Diffractometry (XRD), Infrared Spectroscopy (IR), Transmission Electron Microscopy (TEM) and Vibrating Sample Magnetometry (VSM). It was observed that silica matrix retains the properties like crystal structure, cation distribution, band positions in IR spectra etc. Crystallite sizes were found to change from 15.1 nm to 17.6 nm with increased SiO_2. Magnetic properties were observed to be significantly affected due to altered inter-particle distances and change in crystallite size after dispersion in the matrix. A gradual reduction in saturation magnetization from 68.7 emu g^{-1} to 4.77 emu g^{-1} was observed with augmented SiO_2 content indicating that the magnetic properties can be tuned by varying the ferrite-silica ratio. Further, the catalytic activity of a typical sample was also studied and a maximum yield of 78% was obtained at a reaction temperature of 70 °C with isopropyl alcohol as a solvent for the synthesis of 2 Phenylbenzimidazol.