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PARTICLES

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SYNTHESIS, STRUCTURAL, DIELECTRIC AND MAGNETIC PROPERTIES OF POLYOL ASSISTED COPPER FERRITE NANO PARTICLES

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ABSTRACT

Nanocrystalline copper ferrite CuFe_2O_4 is synthesized by co-precipitation method in ethylene glycol as chelating agent, using sodium Hydroxide as precipitator at pH 8. The as synthesized CuFe_2O_4 is annealed at temperatures of 350°C , 700°C , and 1050°C for 2 hours respectively. The thermal analysis of the synthesized sample is done by TG technique. It is shown that at 260°C ethylene glycol has evaporated completely and after 715°C , spinel ferrite is formed with a cubic structure. The calculated lattice parameters are in agreement with the reported values. FTIR spectra of CuFe_2O_4 nano particles are as synthesized and annealed at 1050°C and recorded between 400cm^{-1} and 4000cm^{-1} . It shows that when the temperature increases ethylene glycol gradually evaporates. Finally, nano crystalline single phase spinel ferrite is obtained. X-ray diffraction (XRD) and electron diffraction (EDS) studies show that the sample is indexed as the face centered cubic spinel structure. Scanning electron microscopy (SEM) and transmission electron microscopy (TEM) indicated that the particles are flaky and spherical with the crystallite size in the range of 25 nm to 34 nm. From the dielectric studies, the dielectric constant decreases as the frequency increases. Low value of dielectric loss at higher frequencies suggests that the material is suitable for high frequency applications. AC conductivity increases with frequency. The magnetic properties of the samples are measured using a vibrating sample magnetometer (VSM) at room temperature, which shows that the sample exhibited a typical super paramagnetic behavior at low temperature. The saturation magnetization, remanant magnetism, and coercivity increases with applied field.

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