Effect of Zn substitution on variation microscopic structural and magnetic properties of MgZn ferrite

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Abstract: In this research, magnesium-zinc ferrite nanoparticles (Mg$_{1-x}$Zn$_x$Fe$_2$O$_4$) (x = 0, 0.2, 0.4, 0.5, 0.6, 0.8, 1) have been synthesized using sol-gel auto-combustion method. The X-ray diffraction analysis (XRD) revealed that the samples crystallized in a single-phase cubic spinel structure. Crystallites size of samples varies from 13nm to 29nm, also the lattice parameters and bonds length tetrahedral site (R$_A$) and octahedral site (R$_B$) of these samples have been estimated. Values of R$_A$ (R$_B$) increase (decrease) with increasing zinc content(x). The Fourier Transmission Infrared (FT-IR) spectra shows one fundamental absorption bands $\nu_1$ in the range 1000–450 cm$^{-1}$, corresponding tetrahedral complex, respectively. The scanning electron microscope (SEM) micrographs show the uniform distribution of the particles. The saturation magnetization (Ms) and coercivity are obtained from VSM data. The saturation magnetization is found to be increased up to x = 0.4 and then decreased. These variations are attributed to the increase of magnetic moment and spin canting in the B-site.

Keyword: Mg- Zn ferrite, X-ray diffraction, fourier Transmission Infrared (FT-IR), vibrating sample magnetometer (VSM)

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