

## Study of the structural and magnetic properties of $\text{Ni}_{0.65}\text{Zn}_{0.35}\text{Cu}_x\text{Fe}_2\text{O}_4$ ferrite nanoparticle

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**Abstract:** In this study, Copper substituted Ni-Zn ferrite nanoparticles with compositions of  $\text{Ni}_{0.65}\text{Zn}_{0.35}\text{Cu}_x\text{Fe}_2\text{O}_4$   $x = (0, 0.05, 0.1, 0.12, 0.15, 0.18, 0.2)$  were prepared by a polyvinyl alcohol (PVA) sol-gel process and the structural and magnetic properties of the samples were investigated by various analysis. Results obtained from X-ray diffraction (XRD) showed that the lattice parameter and the average particles size increase with the addition of copper in the mixed NiZnCu ferrite system. Increasing in grain growth attributed to the crystal surface temperature. The average crystal size is in the range 13-26 nm. According to the FT-IR results, the shifting of the  $\nu_1$  band towards lower frequencies, may be attributed to the increase in the unit cell dimensions. The effect of copper concentration on saturation magnetization ( $M_s$ ) and coercivity ( $H_c$ ) were investigated. The saturation magnetization observed to decrease up to  $x \leq 0.1$ , and then increases linearly for further substitution. The variation of  $H_c$  can be explained on the basis of substitution  $\text{Cu}^{2+}$  ions in NiZn ferrite, surface effect and the grain growth.

**Keywords:** Sol-Gel; NiZnCu ferrite; VSM; TEM.

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