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**Effect of diamagnetic substitution on the structural, magnetic and electrical properties of NiFe2O4**

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**Abstract**
Nickel zinc ferrites, Ni1 - xZnxFe2O4 (0.0 ≤ x ≤ 1.0) have been prepared through the thermal decomposition reaction of their corresponding metal oxalates. The samples were characterized using differential thermal analysis-thermogravimetry, X-ray diffraction, Fourier transform infrared, Mössbauer spectroscopy and electrical properties measurement techniques. The X-ray diffraction patterns confirm the single-phase spinel structure for the synthesized materials. The average crystallite size was found to be ranging from 88 to 201 nm. The lattice parameters were found to increase with increasing zinc content which can be attributed to the larger ionic radius of zinc. The FT-IR measurements show two fundamental absorption bands in the high- and low-frequency range which are assigned to the vibration of tetrahedral and octahedral complexes. The highest v1-tetrahedral stretching shifts towards lower values with increasing Zn content, whereas the v2-octahedral vibration slightly changed. The cation distribution estimated using Mössbauer spectroscopy indicated that Fe3+ ions at the tetrahedral site moved to the octahedral site by the addition of zinc, and that the system varied from an inverse to a normal spinel structure. The temperature variation of ac conductivity for the samples with x ≤ 0.4 shows a ferrimagnetic-paramagnetic transition. The calculated activation energy in the paramagnetic region was found to be higher than that in the ferrimagnetic region. Plots of dielectric constant (ε') versus temperature show a normal dielectric behavior of spinel ferrites and exhibit dielectric transition temperatures (Td) which coincide with the obtained phase transition temperatures (Tc), indicating that this transition is of a magnetic nature. 

**Author Keywords**
ac Conductivity; Dielectric constant; FT-IR; Mössbauer; Nickel-zinc ferrites; XRD

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