Title: Exploration through Structural, Electrical, and Magnetic Properties of Al3+ Doped Ni−Zn−Co Nanospinel Ferrites

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Abstract: The exploration of aluminum (Al3+) ion substituted nickel−zinc−cobalt (Ni−Zn−Co) nanoferrites is still at the infancy stage, although the structural, electrical, and magnetic properties have been widely investigated. Single-phase cubic nanospinel ferrites of Ni0.4Zn0.35Co0.25Fe2−xAlxO4 (0 ≤ x ≤ 0.12) with space group Fd3m were confirmed by the Rietveld refinement X-ray diffraction (XRD) data. Lattice constants displayed a declining trend with compositions x. The average particle size was found to range from 29 to 25 nm. Selected area electron diffraction (SAED) patterns were indexed according to space group Fd3m, indicating that nanoparticles are well crystallized. Samples’ modes of vibrations swung between redshift and blueshifts as detected in the Raman spectra. The saturation magnetizations (Ms) were in the range of 59.85−86.39 emu/g. Frequency-dependent dielectric constants (ε′) and ac resistivity (ρ) measurement suggested that samples were highly resistive. These resistive nanoferrites with high saturation magnetizations may function effectively for multifaceted electronic devices.