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**Effect of Aluminium Substitution in Magnetically Affluent Inverse Spinel Ferrites Studied Via 57Fe-Internal Field NMR**

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**Abstract**

Ferro/ferrimagnetic materials are of fundamental interest due to their variety of applications. The structural and magnetic properties change significantly with different synthesis procedures. Here, we report the synthesis, X-Ray Diffraction (XRD), Vibrating Sample Magnetometry (VSM), and Nuclear Magnetic Resonance (NMR) studies of spinel nickel ferrites doped with non-magnetic cations like cadmium and aluminium. The spinel ferrites like Ni0.7Cd0.3Fe2-xAlxO4 (x = 0, 0.1, 0.2) are synthesized using one step auto combustion technique. The X-ray diffraction measurements confirm the formation of these systems in pure phase. In the present study we have used the modified home-built NMR spectrometer to study 57Fe NMR in these ferro magnetic materials. The difference in the Fe3+ bonding at the octahedral (B-site) and the tetrahedral (A-site) sites result in the different hyperfine fields yielding Internal Field (IF) NMR frequencies at two different frequencies. The substitution of the non-magnetic Al3+ results in increasing in the line width of the NMR spectra corresponding to the octahedral site (B-site). Further, the NMR spectra corresponding to A-site decreases (both in terms of line width and area) due to the decrease in the ferrimagnetic contribution at that site. Change in the local environment around Fe3+ ion present at B-site is very well observed using 57Fe NMR technique.

**Keywords:**

Spinel ferrites, Nickel cadmium ferrite, 57Fe ZFNMR, Spin echo, Hyperfine field

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