

Abstract:

In this work we study the structural and electrical properties of Ce^{3+} -substituted cadmium cobalt ferrites having composition $\text{Cd}_{0.35}\text{Co}_{0.65}\text{Fe}_{2-x}\text{Ce}_x\text{O}_4$ with $x = 0.00, 0.01, 0.02, 0.03, 0.04$ and 0.05 , which were prepared by co-precipitation method. The structural properties have been investigated with XRD and FTIR techniques. The IV characteristics have also been studied of Ce^{3+} substituted nano-particles. The XRD patterns confirm the growth of single phase spinel structure of our samples. The crystallite size calculated from XRD results was in the range of 21.6 – 34.7 nm. The lattice parameter was found in the range of 8.47 - 8.67Å. The Current-Voltage characteristics show that resistivity of samples decreases with increasing temperature which confirms their semiconductor nature. The IR studies confirm the structure of the synthesized samples. The absorption bands observed around 442 cm^{-1} and 546 cm^{-1} are associated with the tetrahedral (A-site) and octahedral (B-site) stretching vibrations. The elemental compositions measured from EDX are in close agreement with the expected stoichiometric ratios of the reactant solutions. It is also explored that electrical resistivity increases with the increase of cerium substitution and it is in the range of 1.584×10^7 - $42.83 \times 10^7\ \Omega\text{-cm}$. In UV-Vis spectra, the observed peak indicates that nanocomposites are photoactive compounds and their potential to use in optoelectronic applications. These nanoparticles also have applications in magnetic recording media, security switching and high frequency applications.