**Abstract**

Manganese doped magnesium-cobalt mixed ferrite nanoparticles (Mg0.4Co0.4Mn0.2Fe2O4) are synthesized by co-precipitation method and are annealed at 130○C, 600○C and 900○C. The synthesized nanoparticles are characterized using X-ray diffraction (XRD) analysis, FT-IR spectral analysis, Scanning Electron Microscopy (SEM) analysis and Vibrating Sample Magnetometer (VSM) analysis. The crystallite size is found to be 17 nm and 19.6 nm for the samples annealed at 600○C and 900○C respectively. The crystallite size and lattice constant increases as the samples are annealed at higher temperatures. FT-IR analysis confirms the characteristic absorption bands at 590 cm-1 and 546 cm-1 for tetrahedral sites and 416 cm-1for octahedral sites. SEM analysis shows uniformly distributed elliptical shaped nanoparticles. The saturation magnetization, remanent magnetization and coercivity increases due to the inclusion of manganese and as the annealing temperature increases. These samples can be used for gas sensing applications.