**Abstract**

Nano structured magnetic materials have wide areas of applications in water purification, high density data storage, ferrofluids, bio-molecule separation, colour imaging, medical diagnosis, drug delivery and so forth. Among the ferro spinels, Magnesium ferrite belongs to a class of compounds having the general formula MgFe2O4 crystallizing with the spinel structure. It is a typical spinel in which the cation distribution in the crystal lattice site is very much sensitive to heat treatment due to high diffusibility of Mg2+ ions. The physical and chemical properties of ferrites are dependent upon factors such as annealing temperature, annealing time, rate of heating and rate of cooling, etc. In case of cobalt ferrite, the incorporation of cobalt ions results in an increase in coercivity, which is due to the coupling of the spins of cobalt and iron ions. Also, manganese ferrite is considered versatile and of higher significance owing to its high saturation magnetization and low power loss at high frequencies. In the present work, an attempt is made to synthesize manganese doped magnesium-cobalt mixed ferrite nanoparticles (Mg0.4Co0.4Mn0.2Fe2O4) by co-precipitation method. Magnesium chloride, Cobaltous chloride, Manganese Chloride and sodium hydroxide are used as raw materials. The synthesized nanoparticles are annealed at 600○C and are subjected to X-ray diffraction technique to calculate the average nano-crystalline size using Debye – Scherrer formula. The FT-IR spectrum of the sample is recorded and the characteristic absorption bands are observed. The morphological analysis of the sample is studied using Scanning Electron Microscope (SEM). The magnetic measurements are made using Vibrating sample magnetometer (VSM). These materials can be tested for gas sensing applications.