**Abstract**

Magnesium ferrites have wide range of applications in water purification, ferrofluids, bio-molecule separation, colour imaging, and gas sensing applications. The chemical, structural, and magnetic properties of these magnesium ferrite nanoparticles can be enhanced by their composition and micro structures. Hence in the present work, an attempt is made to synthesize Aluminium doped magnesium-cobalt mixed ferrite nanoparticles (Mg0.4Co0.4Al0.2Fe2O4) by co-precipitation method. Magnesium chloride, Cobaltous chloride, Aluminium 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.