**Abstract**

Ceria / CeO2 / Cerium nanoparticles are fluorite-structured rare earth oxide. Cerium oxide is an important material which finds applications as polishing agents, sunscreens, solid electrolytes, and automotive exhaust catalysts. Nano structured CeO2 is very attractive due to its improvements in the redox properties, transport properties and surface to volume ratio with respect to bulk materials. In the present work, CeO2 nanoparticles and Fe doped CeO2 (CeO2 + x mole% of Fe, where x= 1, 2, 3, 4 and 5) have been prepared by co-precipitation method. All the prepared samples were characterized for its structural, optical and magnetic properties by XRD, FTIR, SEM, UV-Vis and VSM analysis respectively. The absence of secondary peaks and cubic fluorite structures were confirmed by XRD and a complete solid solution was achieved between Fe and Ce in all the prepared samples. Uniform spherical like structures was observed from SEM micrographs. Scherrer’s formula was used to calculate the crystallite size and there is no much variation by the incorporation of Fe in CeO2 matrix. UV-Vis spectral analysis was carried out using DRS method and the absorption coefficient, direct band gap was calculated for all the prepared CeO2 nanoparticles. The pristine CeO2 is diamagnetic in nature. The doping of Fe in CeO2 induces ferromagnetism in CeO2 and the hysteresis area increases till 3 mol% of Fe and decreasing for further increase in concentration. Hence to induce a ferromagnetic property in CeO2 nanoparticles 3 mol% of Fe is optimum.