Synthesis and investigation of structural, morphological, and magnetic properties of the manganese doped zinc spinel ferrite

Avinash C. Yadav1, Parasmani Rajput2,3, Aartee Sharma4, Manvendra Kumar4

1 Department of Physics, V.B.S. Purvanchal University, Jaunpur, U.P., India, 222003

2 Beamline Development and Application Section, Bhabha Atomic Research Centre, Trombay, Mumbai 400085, India

3 Homi Bhabha National Institute, Anushakti Nagar, Mumbai-400094, India

4 Department of Physics, Institute of Science, Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore 453111, India

kmanav@gmail.com

**Abstract**. Synthesis and investigation of structural, morphological, and magnetic properties of manganese doped zinc spinel ferrite nano-composite materials are reported. The material was synthesized by the solution-gelation method followed by auto combustion using nitrate precursors. The synthesized materials were characterized by X-ray diffraction (XRD), X-ray absorption fine structure (XFAS), Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy, transmission electron microscopy and Vibrating Sample Magnetometer (VSM) to study their structural, morphological and magnetic properties. The confirmation of a single phase with the Fd3m space group of zinc ferrite was revealed by XRD. The minimum crystallite size of Mn-doped ZnFe2O4 was found to be 32.06 nm for x=0.3. Structural analysis of the prepared composites was studied by using Match3 and VESTA software, which revealed the effect of manganese on the polycrystalline structure of the fabricated composites. The FTIR spectra show two bands in the range 540-546 cm-1 and 409-432 cm-1 which confirm the formation of the spinel ferrite phase. For magnetic properties like saturation magnetization, remanence, coercivity, etc., the prepared materials were characterized with Vibrating Sample Magnetometer (VSM).