Physico-chemical nanomaterials science

Structural and magnetic properties of Li-Zn ferrite nanoparticles

S. Raghuvanshi[1], S. N. Kane[1], F. Mazaleyrat[2], A. Pasko[2], T. R. Tatarchuk[3]

[1] *School of Physics, D. A. University, Khandwa Road, Indore-452001, India*

[2] *SATIE, ENS Paris-Saclay, CNRS, Universite Paris-Saclay, 61 Av. President Wilson, 94230, Cachan, France*

[3] *Department of Theoretical and Applied Chemistry, Vasyl Stefanyk Precarpathian National University, 57, Shevchenko Str., Ivano-Frankivsk, 76018, Ukraine*
E-mail: tatarchuk.tetyana@gmail.com

Magnetic properties of Li-based spinel ferrites can be tuned by a suitable substitution, e.g. Zn^{2+}. Low cost, high saturation magnetization (M_s) etc. makes Li-Zn ferrite promising for electromagnetic absorbers, microwave devices, where control on magnetic properties is needed. Present work reports the effect of Zn substitution on structural and magnetic properties of single-phase nanocrystalline $Li_{0.5-x/2}Zn_xFe_{2.5-x/2}O_4$ (x = 0–1.0), prepared by sol-gel auto-combustion method and annealed at 450 °C for 3 hours. It was structurally characterized by Cu-K_α X-ray diffraction (XRD) measurements, and a vibrating sample magnetometer was used to obtain M_s and coercivity (H_c). Antistructure modeling was also done to get the concentration of active centers in tetrahedral (A) and octahedral (B) sites. XRD patterns were Rietveld-refined to obtain structural parameters. Structural, magnetic data are summarized in Fig. 1. XRD reveals formation of *fcc* spinel structure with grain diameter 26.6 to 53.8 nm. Observed linear increase in experimental lattice parameter (a_{exp}) is due to the replacement of Li^{1+} by Zn^{2+} ion with dissimilar ionic radii (Zn^{2+} > Li^{1+}). Changes that affect magnetic properties are observed in: i) cationic distribution (Fe^{3+} migration from A site to B site); ii) ionic radii of A and B sites, bond angles and inter-ionic distances between cations. Obtained M_s (11.4–67.3 Am^2/kg) and H_c (4775–11937 A/m) are of use for soft magnetic applications. Detailed results will be presented.

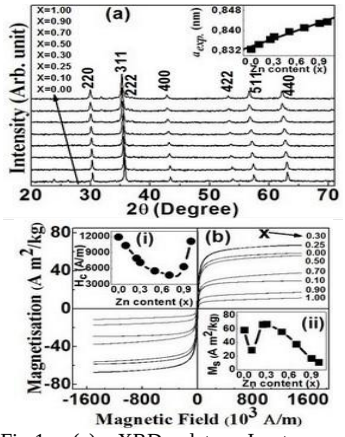

Fig.1: (a) XRD data. Inset: a_{exp} variation with Zn. (b) Hysteresis loops. Inset: (i) H_c vs Zn; (ii) M_s vs Zn.