Nanocomposites and nanomaterials

Magnetic properties of nanocrystalline *Mg* substituted *Li* ferrites obtained by the sol-gel auto combustion method

J.S. Kaykan[1], L.S. Kaykan[2]

[1] *Vasyl Stefanyk Precarpathian National University, 57 Shevchenko str., 76018 Ivano-Frankivsk, Ukraine, e-mail: julia.kaykan@ukr.net*

[2] *G. V. Kurdyumov Institute for Metal Physics of the N.A.S. of Ukraine, 36 Academician Vernadsky Boulevard, UA-03680 Kyiv-142, Ukraine*.

Ultra fine particles of magnesium-substituted lithium ferrites of the general formula $Li_{0.5}Fe_{2.5-x}Mg_xO_4$ $(0.0 < x < 1.0)$ were synthesized by low-temperatures citrate zol-gel auto combustion method.

With increasing concentration of magnesium, magnetic characteristics of the systems (Table) are changing nonmonotonous with the maximum value for the system $Li_{0.5}Fe_{1.9}Mg_{0.4}O_4$.

Magnesium concentration, x	Molar mass, μ	Coercive force, Hc	Initial permeability, Mr	Magnetization saturation, Ms	Anisotropy ratio, K 10^3	Effective magnetic moment m_{ef}	Mr/ Ms
0.2	200.78	3289.7	55.93	61.72	211	2.23	0.91
0.4	194.46	2829.3	110.6	119.8	532	3.93	0.98
0.6	188.16	3763.9	88.94	92.23	362	3.11	0.96

This phenomenon can be explained by the fact that ferrites resultant magnetic moment is determined by the AB sublattice interaction. The magnetic moments of tetrahedral and octahedral sublattices generally oriented antiparallel. Therefore, the resulting magnetic moment is defined as the difference between magnetic moments of octahedral and tetrahedral sublattices. With the substitution, as shown cationic distribution, magnesium ions are redistributed by a sublattice as 8:2 (8 ions go to tetrahedral sublattice) so the resulting magnet ion balance was in favor of the octahedral sublattice. Reduction of magnetic parameters in the sample x = 0.6, compared with x = 0.4, apparently associated with the general decrease in the number of magnetic ions.

1. *Aravind G., Raghasudha M., Ravinder D., Vijaya Kumar R.* Magnetic and dielectric properties of Co doped nano crystalline Li ferrites by auto combustion method // J. of Magn. and Magn. Mat. – 2016. – **406**. – P. 110-117