Workshop of the COST MP0904 Action, 24-26 September, 2012, Iasi, Romania, Programme and book of abstracts, p59

Synthesis procedure and properties of $NiFe_2O_4$ – $BaTiO_3$ composites

M.M. Vijatović Petrović[1], J.D. Bobić[1], L. Curecheriu[2], J. Koruza[3], B. D. Stojanović[1]

[1]*Institute for multidisciplinary research, Belgrade University, Kneza Višeslava 1, Belgrade, Serbia*
[2]*Faculty of Physics, Alexandru Ioan Cuza University of Iasi, Romania*
[3] *Jožef Stefan Institute, Jamova Cesta 39, Ljubljana, Slovenia*

$NiFe_2O_4$ (NF) powder was prepared by auto combustion method starting from nickel and iron nitrates. After the process of self-ignition, fine precursor powder was thermally treated at 1000 ^oC for 1h forming the nickel ferrite powder [1]. XRD analysis proved the formation of well crystallized nickel-ferrite cubic spinel structure. Particle size distribution measurements showed the existence of agglomerates. SEM micrographs presented nanometer particles from 100 to 500 nm. D_{BET} calculated from specific surface area was ~ 700 nm and factor of agglomeration of obtained NF powder was ~ 27 %.

Cubic barium titanate (BT) powder was prepared by soft chemical method (modified Pechini process). Spherical particles of around 75 nm were obtained in the BT powder [2].

Composites (NF-BT) with the general formula x $NiFe_2O_4$ – (1-x) $BaTiO_3$ (x = 0.2, 0.3, 0.5) powders were prepared by mixing previously obtained powders of nickel ferrite and barium titanate in planetary ball mill for 24h. As a milling medium were used tungsten carbide balls and iso-propanol. Powder was pressed and sintered at 1170 ^oC for 4 h and from X-ray measurements the presence of NF and BT phases was detected. No secondary phases were found. Magnetic measurements of composite materials were carried out and presented in Table 1. Saturation magnetization moment of composite materials decrease with barium titanate amount and the fields at which saturation occur increase with BT content. The coercivity H_C (Oe) increases with barium titanate concentration in obtained multiferroic material.

Table 1: Saturation magnetization moment, saturation fields, residual magnetization and coercive field for NF and x$NiFe_2O_4$ – (1-x)$BaTiO_3$ (x = 0.2, 0.3, 0.5) composite materials

SAMPLE	M_{sat} (emu/g)	H_{sat} (kOe)	M_r (emu/g)	H_C (Oe)
NF	48	2.9	2.5	14
NF-BT (0.5/0.5)	22	3.7	6.7	117
NF-BT (0.3/0.7)	12	3.9	5.3	151
NF-BT (0.2/0.8)	5.6	4.8	2.3	194

Acknowledgements
The authors gratefully acknowledge the Ministry of Education and Science of Republic of Serbia for the financial support of this work (projects III45021) and COST MP0904.

[1] J. Azadmanjiri, S.A. Seyyed Ebrahimi, H.K. Salehani, Ceram Inter, 1623 (2007)
[2] B.D. Stojanovic, M.A. Zaghete, C.R. Foschini, F.O.S. Vieira, J.A. Varela, Ferroelectrics, 15 (2002)