Structure and magnetic analysis of chemically synthesized $Bi_{12}MnO_{20}$ nanoparticles.

L.A.S. de Oliveira[1], J.P. Sinnecker[2], M.D. Vieira[3] and C. M. Ronconi[4]

[1]IF - Universidade Federal do Rio de Janeiro, RJ, Brasil
[2]Centro Brasileiro de Pesquisas Físicas, RJ, Brasil
[3] IQ - Universidade Federal Fluminense, RJ, Brasil
[4] IQ - Universidade Federal do Rio de Janeiro, RJ, Brasil

Sillenite-type compounds display a variety of advantageous physical properties that make them very important technological materials. The current applications of sillenites are mainly in the fields of electro-optics, acoustics, and piezotechnics, where their physical properties can be exploited (1-3). Recently, however, sillenites have begun to be considered for use as dielectrics in the field of electronics, as in radio-conductive detectors due to their photo-refractive properties (4). In this present work, a simple hydroxide gel to oxide crystals conversion route has been followed for the preparation of ultra-fine $Bi_{12}MnO_{20}$ (BMO) particles at 100°C under refluxing conditions. Freshly prepared bismuth and manganese hydroxide gel is allowed to crystallize and react under refluxing and stirring conditions for 4–6 h. Particles with size less than 40nm of BMO are confirmed by X-ray diffraction (XRD). In comparison, the traditional ceramic method produces BMO (non-stoichiometric) only above 800°C. This shows the advantage of the present method. Magnetic properties were measured between 2K and 300K using a Quantum Design PPMS system with magnetic fields up to 9T. The ZFC-FC curve shows blocking temperature near 18K and a Curie temperature of about 36K. AC susceptibility measurements as function of temperature shows a frequency dependence compatible with typical nanoparticle behaviour which can be described in terms of an Arrhenius law. Coercivity (HC), remanent magnetization (MR) and hysteresis loop shape also show temperature dependence.

(1) Huignard, J. P.; Micheron, F. ,Appl. Phys. Lett. **29**, (1976), 591.
(2) Hou, S. L.; Oliver, D. S. Appl. Phys. Lett. **18**, (1971),325.
(3) Link, J.; Fontanella, J.; Andeen, C. J. Appl. Phys. **51**, (1980),4352.
(4) Valant, M.; Suvorov, D. J. Am. Ceram. Soc. **84**, (2001),2900.

Work supported by CAPES, CNPq, FAPERJ and Instituto do Milênio de Nanotecnologia.

*laso@if.ufrj.br