GB06

Magnetic Nano-structured Polymeric Composite Obtained Using Nano-magnetic Fluids

N. Crainic[1], Doina Bica[2], A. Torres Marques[3], N. C. Popa[2], P. J. Novoa[4], N. Correia[4], Oana Marinica[1], C. P. Moreira de Sa[5], and L. Vékás[2]

[1]"Politehnica" University of Timisoara, National Center for Engineering of Systems with Complex Fluids (NCESCF), Bd. Mihai Viteazul nr. 1, 300222 Timisoara, Romania;
[2]Romanian Academy-Timisoara Branch, Center for Advanced and Fundamental Technical Research (CAFTR), Bd. Mihai Viteazul nr. 24, 300223 Timisoara, Romania; e-mail: ncpopa(@)acad-tim.tm.edu.ro
[3]Universidade do Porto, Faculdade de Engenharia da Universidade do Porto (FEUP), e-mail: marques(@)fe.up.pt
[4]Instituto de Engenharia Mecanica e Gestao Industrial (INEGI), Unidade de Materiais Compositos (CEMACOM), Porto, Portugal; e-mail: prnovoa(@)inegi.up.pt, nuno.correia(@)inegi.up.pt
[5]Universidade do Porto, Centro de Materiais da Universidade do Porto (CEMUP), Porto, Portugal; e-mail: cmsa(@)cemup.up.pt
*Corresponding author: ncrainic(@)flumag2.mec.utt.ro, Phone/Fax: +4 0256 403700

As advanced technologies are expanding, the need for novel functional materials significantly increases. Nowadays, materials with a special combination of properties (e.g., magnetic-transparent, conductive-transparent, catalytic-magnetic, etc.) are strictly required. Materials based on nano-sized metals will surely represent an adequate solution to many present and future technological demands, since they exhibit both novel properties (e.g., plasmon resonance, superparamagnetism, etc.) and unique properties combinations ([1]).

The paper presents the possibility to create a new category of nano-magnetizable composite materials, using nano-magnetic fluids (ferrofluids) and resins ([2]). The target of these investigations is to obtain new materials having magnetic controllable properties. We prepared samples of different mixtures of resins, carrier liquids (of nano-magnetic fluids), and concentration of magnetic nano-particles.

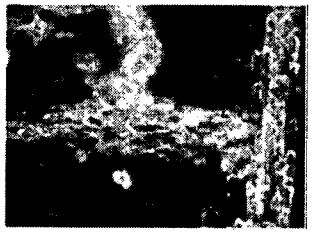

Fig. 1. Nano-magnetic composite polymerised in magnetic field.

We used nano-magnetic fluids with cyclo-hexane, and methyl-ethyl-ketone, as carrier liquids. In the cyclo-hexane carrier liquid, the Fe_3O_4 nano-particles are monolayer sterically stabilized (with oleic acid). In the methyl-ethyl-ketone carrier liquid, the magnetite nano-particles have double sterical stabilization (chemisorbed oleic acid and physically absorbed dodecyle benzene sulphonic acid).

The polymerisation process took place with and without magnetic field. We investigated the magnetic properties of these solid samples with the measurement of magnetic field parallel and perpendicular to the polymerisation magnetic field ([3]), the microstructure of the samples, and, the mechanical properties (three points bending test, elastic properties, gel time determination, etc.) corresponding to different preparation methods ([4]).

REFERENCES

[1] L. Nicolais and D. Carotenuto, (eds.): Metal-Polymer Nanocomposites, Wiley Interscience, 2005.
[2] N. Crainic, A. Torres Marques, Doina Bica, L. Vékás, P. J. Novoa, and C. P. Moreira de Sa, Mol. Cryst. Liq. Cryst. **418** (2004) pp. 29/[757]-40/[768].
[3] N. C. Popa, A. Siblini, and C. Nader, J. Magn. Magn. Mater. **293** (2005) pp. 259-264.
[4] N. Crainic, Doina Bica, A. Torres Marques, N. C. Popa, P. J. Novoa, N. Correia, Oana Marinica, C. P. Moreira de Sa, and L. Vékás, Proceedings of the 4th International Symposium on Nanomanufacturing, ISNM2006, Cambridge, November 1-3 (2006) MA USA, pp. 70-75.

GB07

Magnetic Properties of Barium-hexaferrite Prepared by the Sol-gel Method

Ngo Viet Tuan[1], Huynh Dang Chinh*[1], Nguyen Hanh[1], and Nguyen Chau[2]

[1]Department of Inorganic Chemistry, Hanoi University of Technology, 1 Dai Co Viet, Hanoi, Vietnam
[2]Centre for Materials Science, Vietnam National University of Hanoi, 334 Nguyen Trai, Hanoi, Vietnam
*Corresponding author: chinhhd-fct(@)mail.hut.edu.vn, Phone: +84 4 868 0110, Fax: +84 4 868 6583

A hard magnetic barium ferrite has relatively large saturation magnetization, high coercive force and high resistivity as well as excellent properties in a nano particles can be used for many application such as microware absorption, high-density magnetic and magneto-optic recording media··· Most of the research has studied the magnetic properties of Ba-ferrite, Sr-ferrite and Sr-substituted Ba-ferrite. However, the magnetic properties of La-substituted Sr-ferrite have not been reported. Therefore, in this work, synthesis conditions and magnetic properties of $La_{0.05}Sr_{0.95}Fe_{12}O_{19}$ have been studied by X-ray diffractometry, scanning electron microscopy and vibrating sample magnetometer. Samples were prepared by a sol-gel method that has been advantageously used for the synthesis and control of nano-crystalline particles at the lower annealing temperature.

It may be said that the sol-gel technology is a suitable method for preparing the nanocrystalline single phase hexagonal $La_{0.05}Sr_{0.95}Fe_{12}O_{19}$ at low temperature with these conditions as ions ratio at 1.5 and pH range 6-7. In comparison with the conventional solid state reaction the temperature necessary for the production of single phase compounds is much lower by the homogeneous mixed at atomic level. After pre-decomposing the xerogel into ultrafine compounds at 550 °C, the ultrafine single phase $La_{0.05}Sr_{0.95}Fe_{12}O_{19}$ can be obtained at low temperature. The magnetization, coercive force and particle size are dependent on the annealing treatment of heated xerogel. The hexagoal $La_{0.05}Sr_{0.95}Fe_{12}O_{19}$ sample prepared at 900 °C for 3h exhibits the large hysteresis loop with the saturated magnetization of 70.3 emu/g, remenance of 34.7 emu/g, and high coercive force H_c of 6689.5 Oe, which are values of the potetial application for the microware absorption.

REFERENCES

[1] Ruthner M.J., Proc. of ICF.7, Bordeaux-France, 9/1996, C1.53-56
[2] Sohn S.B., Choi S.Y., Shim I.B., J. Magn. Magn. Mater., **239** (2002) 533
[3] Roy R., Amer J., Ceram.Soc. **39** (1956) 145
[4] Maggio P. Peccini US Pate N° 3.330.697 July 11, 1967