GA09

Magnetic properties of core/shell type $BaTiO_3/\gamma$-Fe_2O_3 nanoparticles

Y. S. Koo[1], C. J. Bae[2], H. C. Kim[2], and J. H Jung*[1]

[1]Department of Physics, Inha University, 253 Yonghyun-Dong, Nam-Gu, Incheon, 402-751, Korea
[2]Korea Basic Science Institute, 52 Eoeun-dong, Yusung-Gu, Daejeon, 305-333, Korea

*Corresponding author: jhjung@inha.ac.kr, Phone: +82 32 860 7659, Fax: +82 32 872 7562

There have been lots of interests in multifunctional nano-materials due to their unique physical properties and possible application. Since there are few single-phase materials which show multifunctionality, [1] however, many researchers have concentrated on hetero-structure materials such as multilayer thin films. [2] In this context, core/shell nanoparticles could be one of the good candidates for the tailoring of multifunctionality, since they can be formed with predetermined materials as core and shell, and relatively easy access for synthesis. [3]

We have synthesized core/shell type ferroelectric/ferromagnetic $BaTiO_3/\gamma$-Fe_2O_3 nanoparticles by the ultrasound enhanced ferrite plating method with different reaction time (from 1 to 5 hrs). The microstructure of obtained nanoparticles was characterized by x-ray diffraction andscanning electron microscope. And, the magnetic properties were measured by using the superconducting quantum interferometer device magnetometer. Microstructure analyses exclusively show the core/shell type nanoparticles with ~100 nm in diameter. The grain sizes seem to be nearly the same, the thickness of shell, i.e., γ-Fe_2O_3 becomes increased with reaction time. All the nanoparticles show hysteresis behaviours at room temperature. However, detailed magnetic behaviours such as the ratio of coercive fields between 5 and 300 K, and the manner of approaching to saturation magnetization are systematically changed. We discuss the magnetic properties of $BaTiO_3/\gamma$-Fe_2O_3, in conjunction with the change of strain, hence magnetocrystalline anisotropy, at the interface between core and shell.

REFERENCES

[1] N. A. Hill, J. Phys. Chem. B **104**, 6694 (2000).
[2] H. Zheng, J. Wang, S. E. Lofland, Z. Ma, L. Mohaddes-Ardabili, T. Zhao, L. Salamanca-Riba, S. R. Shinde, S. B. Ogale, F. Bai, D. Viehland, Y. Jia, D. G. Schlom, M. Wuttig, A. Roytburd, and R. Ramesh, Science **303**, 661 (2004).
[3] V. Corral-Flores, D. Bueno-Baques, D. Carrillo-Flores, and J. A. Matutes-Aquino, J. Appl. Phys. **99**, 08J503 (2006).

GB01

Synthesis and Magnetic Properties of Barcode Nanowires

Young Keun Kim[1]

[1] Department of Materials Science and Engineering, Korea University, Anam-Dong, Seongbuk-Gu, Seoul 136-713, Korea

*Corresponding author: ykim97@korea.ac.kr, Phone: +82 2 3290 3281, Fax: +82 2 928 3584

Nanowires have selected as one of the top five areas in physics [1] because their physical properties can be easily tailored by proper chemistry. They have been the focus of research for a variety of one-dimensional nanosystems, and can offer exciting applications in nanotechnology, ranging from nanoeletronic devices to cell-separation and magnetic labeling in biomedicine. Various fabrication methods were suggested to synthesize them from metallic, semiconducting, to dielectric materials, providing novel magnetic, electrical, and optical functionalities. A template-mediated electrochemical synthesis is attractive for investigating the physics and potential practical applications in nanoscale magnetic devices, due to its readiness, convenience, and cost merit. In particular, nanowires with multilayered or barcode arrangements incorporating different material components show multiple functionalities and enhanced properties in comparison to those of their single-component counterparts. The synthesis, microstructure, and properties of barcode nanowires such as Co/Cu [2] and Fe/Au [3] systems are discussed.

REFERENCES

[1] J. Giles, Nature **441**, 265 (2006).
[2] J. U. Cho, J. H. Min, S. P. Ko, J. Y. Soh, Y. K. Kim, J.-H. Wu and S. H. Choi, J. Appl. Phys. 99, 08C909 (2006); Virtual Journal of Nanoscale Science & Technology **13**, May 15 (2006).
[3] J. H. Lee, J. H. Wu, H. L. Liu, J. U. Cho, M. K. Cho, B. H. An, J. H. Min, S. J. Noh, and Y. K. Kim, Angew. Chem. Int. Edit., *in press*.