

GA05

Structural and Magnetic Properties of $(A_{0.5}Zn_{0.5})Fe_2O_4$ (A = Mn, Co, Ni)

Ferrite Nanoparticles

Duong The Bao¹, Hoang Nam Nhat¹, Nguyen Chau¹, Bui Doan Huan² and Huynh Dang Chinh^{*2}

¹Centre for Materials Science, Vietnam National University of Hanoi, 334 Nguyen Trai, Hanoi, Vietnam

²Department of Inorganic Chemistry, Hanoi University of Technology, 1 Dai Co Viet, Hanoi, Vietnam

*Corresponding author: chinhd-fc@mail.hut.edu.vn, Phone: +84 4 868 0110, Fax: +84 4 868 6583

$(A_{0.5}Zn_{0.5})Fe_2O_4$ (A = Mn, Co, Ni) ferrite nanoparticles have been prepared by the wet chemical methods. The effects of prepared condition and A substitution on the crystallography, particle shape and size, and magnetic properties of samples were investigated by X-ray diffraction, transmission electron microscopy and vibrating sample magnetometry. The coercivity, Curie and blocking temperature increase with A substitution.

REFERENCES

- [1] A. Verma, R. Chatterjee, *J. Magn. Mater.* 306 (2006), p. 313
- [2] R. Anulirangan, G. Vaibyanathan, S. Sundhithan, *J. Magn. Mater.* 288 (2005) p. 470
- [3] Gunter Schmid, Nanoparticles: from theory to application, WILEY-VCH Verlag GmbH & Co (2004)

GA06

Tunneling Across Multiferroics

Sheng Ju^{1,2}, Tian-Yi Cai^{1,3}, Guang-Yu Guo² and Zhen-Ya Li^{1*}

¹Department of Physics, Suzhou University, Suzhou, 215006, China

²Department of Physics, National Taiwan University, Taipei 106, Taiwan

³Institute of Physics, Chinese Academy of Sciences, Beijing 100080, China

*Corresponding author: zyl@isuda.edu.cn, Phone: +86 512 6511 2325, Fax: +86 512 6511 2597

We propose an electrically controllable spin filter based on multiferroic tunnel junction. This novel spin filter combines the exchange splitting of ferromagnets and asymmetry in energy potential due to the screening of ferroelectric polarization charges at electrodes. Transfer matrix calculations show an enhanced spin filtering efficiency, depending on the magnitude and orientation of ferroelectric polarization. A transition from a positive tunneling magnetoresistance to a negative one is also found. Furthermore, an electric controllable switching between multiple resistive states via magnetoelectric coupling is also described, which will open a new logic programming in the future spintronics. We also studied the relationship between tunnel magnetoresistance (TMR) and spin polarization in $Co/BiFeO_3/La_{0.5}Sr_{0.5}MnO_3$ structures. The effects of electric polarization in $BiFeO_3$ and unique band structure of half-metallic $La_{0.5}Sr_{0.5}MnO_3$ are considered explicitly. Using transfer matrix method, we have generalized Juller formula for TMR in these structures. Our calculations indicate that TMR depends strongly on the orientation of electric polarization in $BiFeO_3$ as well as $BiFeO_3$'s thickness.

REFERENCES

- [1] S. Ju, T. Y. Cai, G. Y. Guo, and Z. Y. Li, *Phys. Rev. B* 75 (2007) 064419.
- [2] T. Y. Cai, S. Ju, G. Y. Guo, and Z. Y. Li, (submitted)