

Field-Induced Magnetization Reversal Dynamics of Nanostructured Ferromagnetic Materials

S. -C. Shin

Department of Physics and CNSM, KAIST, 373-1 Guseong-Dong, Yuseong-Gu, Daejeon, 305-701, KOREA

*Corresponding author: e-mail: scshin@kaist.ac.kr, Phone: +82 42 869 2528, Fax: +82 42 869 8100

Magnetization reversal dynamics in ferromagnetic thin films continues to be an important issue in magnetism. Interest has rapidly grown by the recent technological progress in spintronics. In this talk we will present field-induced magnetization reversal behaviour of various nanostructured ferromagnetic materials including nanothin films with perpendicular and in-plane magnetic anisotropy, nanogranular thin films, and nanoconstricted wires, which were investigated using magneto-optical Kerr microscopy[1] and magnetic transmission x-ray microscopy. We will discuss three contrasting magnetization reversal processes witnessed in perpendicular anisotropy materials[2], random nucleation process in the individual grains observed in nanogranular system of CoCrPt films[3], critical scaling behaviour of Barkhausen avalanches observed in in-plane systems of Co and MnAs nanothin films[4], and pinning/depinning processes in domain propagation of magnetic wires. Monte Carlo simulation results will be presented to explain magnetization reversal behaviour observed in perpendicular anisotropy materials.

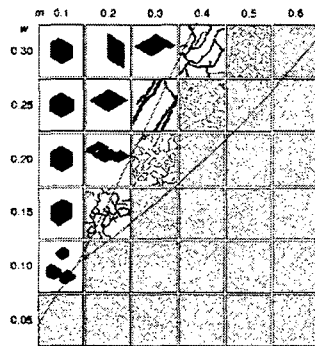


Fig.1. Phase diagram of magnetization reversal process of perpendicular nanothin films

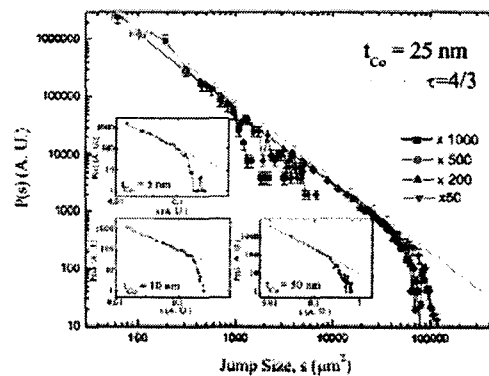


Fig.2. Distributions of the Barkhausen jump size in 25 and 50-nm Co samples

References

- [1] S.-B. Choe, D.-H. Kim, Y.-C. Cho, H.-J. Jang, K.-S. Ryu, H.-S. Lee, and S.-C. Shin, *Rev.Sci.Instrum.* **73**, 2910 (2002).
- [2] S.-B. Choe, and S.-C. Shin, *Appl.Phys.Lett.* **80**, 1791 (2002).
- [3] M.-Y. Im, P. Fischer, T. Eimüller, G. Denbeaux, and S.-C. Shin, *Appl.Phys.Lett.* submitted (2003).
- [4] D.-H. Kim, S.-B. Choe, and S.-C. Shin, *Phys.Rev.Lett.* **90**, 87203 (2003).