Recent Progress in Spin-Polarized Scanning Electron Microscopy

K. Koike[1,2]

[1]Graduate School of Science, Hokkaido Univ., Kita10, Nishi8, Kita, Sapporo, 060-0810, Japan

[2]JST-SENTAN, Kita10, Nishi8, Kita, Sapporo, 060-0810, Japan

Spin-polarized scanning electron microscopy (spin SEM) is a magnetic domain observation methods. It has excellent capabilities, including high spatial resolution, high sensitivity to a thin or even a monolayer film, a large dynamic observation range, and detection of magnetization direction. Since the initial development of spin SEM by Koike et al. in 1984[1], its capabilities have been greatly improved. The spatial resolution is now 3 nm[2], the sample can be cooled down to 10 K, and images of three magnetization components and surface topography can be obtained simultaneously[3]. Moreover, images of elements and crystallographic orientation can be obtained for the same area as the magnetic domain image. Taking advantage of these capabilities, we have studied recorded bits of high density magnetic recording media, magnetic coupling between a ferromagnetic Fe thin film and a single-crystal NiO antiferromagnet[4], a patterned magnetic island array[5], and the temperature-dependent spin structure of a strongly correlated magnetic materials: La2-2xSr1+2xMn2O7 (x = 0.30, 0.32)[6][7]. In this talk, I will discuss the above topics in detail, and demonstrate the applicability of spin SEM to various fields related to magnetism.

[1] K. Koike et al. Jpn. J. Appl. Phys. **23** (1984) L187.

[2] K. Koike et al. in preparation

[3] T. Kohashi et al. Rev. Sci. Instrum. **75** (2004) 2003.

[4] H. Matsuyama et al. Phys. Rev. Lett. **85** (2000) 646.

[5] N. Kida et al. Phys. Rev. Lett. **94** (2005) 077205.

[6] M. Konoto et al. Phys. Rev. Lett. **93** (2004) 107201.

[7] M. Konoto et al. Phys. Rev. B**71** (2005) 184441.