Micromagnetic Simulation for Exchange Coupled Double Layer for High Density Recording

Hojun Ryu*, Dongwoo Suh, Yeungjoon Sohn, Hyeon-Bong Pyo, Yongwoo Park and **Munchel Paek**

Electronics and Telecommunication Research Institute, Basic Research Laboratory
161 Gajeong-Dong, Yuseong Gu, Daejeon, 305-350, Korea

*Corresponding author: e-mail: hjryu@etri.re.kr, Phone: +82 42 860 1614, Fax: +82 42 860 5202

Very small and high density recording media is indispensable to future information society. Magneto-optical media is one of the possible candidates for this needs. Itoh et al. have been demonstrated 64 Gbit/in^2 by using MAMMOS(Magnetic Amplifying Magneto-Optical System)[1]. However to achieve ultra high area density such as 100 Gbit/in^2, the thermal fluctuation limit should be overcome. In this work, we have calculated the effect of FePt sublayer to magneto-optical properties and the recording behavior of TbFeCo/FePt ECDL(Exchange Coupled Double Layer) thin film, which is consisted of TbFeCo thin film as a recording layer and FePt thin film as a sublayer improving thermal stability for its high crystalline magnetic anisotropy energy of up to 7×10^7 erg/cm^3[2]. The ECDL have been deposited onto glass/Si(100) substrates and measured by VSM(Vibrating Sample Magnetometer) and Spectral Polar Kerr Spectrometer for the range of 400 nm to 1000 nm. In order to calculate non-uniform grain shapes, Pseudo-Voronoi grain shapes have been employed on behalf of Voronoi algorithm for constructing the grain structure. As the thickness of TbFeCo thin film is set to 100 nm, longitudinal magnetization which along to down-track position is hardly found as FePt sublayer's thickness is under 50 nm for high anisotropy field of FePt sublayer. But the thickness of FePt thin film is increased over 50 nm, longitudinal magnetization is increased. And the thermal fluctuation of TbFeCo thin film is also investigated. According to increase of TbFeCo thickness the thermal fluctuation gradually goes down because the destruction of magnetic domains has been suppressed by the enhancement of magnetic domain wall coercivity. As 2.9 hexagons in a grain, the calculated average hexagon size is 17.1 nm for grain size calculation. Finally hysteresis curve with exchange coupling energy density and write bits behavior with thermal contour input have been simulated for ECDL system.

References

[1] A. Itoh et al. Optical Data Storage Topical Meeting 2000, Tu-C2, 2000
[2] O.A. Ivano et al. Phys. Met. Metall. 35 (1973) 81