Read/Write Performance of CoCrPtB Perpendicular Recording Media: Soft Magnetic Underlayer Dependence

Tae-Hyo Lee*, Hoon-Sang Oh, Kyongmi Lee, Kyung-Jin Lee, Young-Hun Im and Byung-Kyu Lee

Storage Lab., Samsung Advanced Institute of Technology, P. O. Box 111, Suwon, 440-600, Korea
*Corresponding author: e-mail: taehyo.lee@partner.samsung.com, Phone: +82 31 280 9228, Fax: +82 31 280 6955

The major advantage of double-layer perpendicular magnetic recording media is the ability to write high anisotropy media with strong and sharp head field, which comes from the employment of soft magnetic underlayer (SUL). SUL, however, is considered to be a part of the read/write head system with magnetic coupling to head element and it is known that any noise source due to the domain instability of SUL can be a serious problem that degrades the quality of read-back signal[1][2]. In order to reduce the SUL induced noise, many types of SUL materials and structures have been tried and some improvements have been actually made, but SUL induced noise problem has not been cleared yet.

In this work, we employed 4 different types of SUL structures, which includes single layered films (NiFeNb and CoZrNb) and bilayered films (NiFeNb/CoZrNb and CoZrNb/NiFeNb), and the magnetic properties and read/write performance of the medium grown on different SUL type has been compared.

CoCrPtB based recording medium was prepared on 65-mm glass substrate. Prior to the deposition of recording layer, 10 to 20nm thick Ru layer was deposited on SUL film in order to improve the crystallographic orientation of recording layer. Magnetic properties of recording layer was analysed with vibration sample magnetometer (VSM) and magneto-optical Kerr effect (MOKE). Microstructural properties and surface/interface morphologies were characterized with X-ray diffraction (XRD) and atomic force microscope (AFM), respectively.

Before the fabrication of media, we also carried out micro-magnetic simulations to predict the signal to noise ratios (SNR) of the media and compared the results with experimental values obtained from Guzik spin stand tests.

It was found that the magnetic properties of recording layer was strongly dependent on the SUL type, and the trend of SNR with SUL type was different from the simulation prediction because the magnetic properties of recording layer was fixed irrespective of SUL type in the simulation work.

In this paper, detailed results on dependence of static and dynamic properties of recording layer on the SUL type will be reported and the mechanism for the variation of magnetic properties with SUL type will discussed.

References

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