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Magnetic properties of spin valves having extremely thin underlayers

Jiwon Kim[1], Soonchul Jo*[1], Sang Yoon Kim[2], Hoon Ko[2], and Chang-Woo Lee[2]
[1] School of Electronic Engineering, Soongsil University, 1 Sangdo-Dong, Dogjak-Gu, Seoul, 156-743, Korea
[2] Dept. of Nano & Electronic Physics, Kookmin University, 861-1, Chongnung-Dong, Songbuk-Gu, Seoul 136-702, Korea
*Corresponding author: jschul@ssu.ac.kr, Phone: +82 2 820 0636, Fax: +82 2 8217653

Magnetic properties of spin valves having Ta(N) and Mo(N) underlayers were studied by varying their thickness. Spin valve structures of Underlayer(t Å)/NiFe(21 Å)/CoFe(28 Å)/Cu(22 Å)/CoFe(18 Å)/IrMn(65 Å)/Ta(25 Å) were deposited on the Si/SiO_2(2,000 Å) substrate using DC magnetron sputtering system. Underlayer materials studied were Mo, MoN, Ta, and TaN. Thickness of the underlayer films was varied from 0 to 45 Å. Nitrogen flow rate during the nitride deposition was 1 sccm.

Figure 1 shows the MR ratio of spin valve structures for various underlayer material and thickness. For Ta underlayer, the MR ratio increases from 2.5 % to 6.1 % as the thickness of the underlayer increases from 8 to 35 Å, and then, the MR ratio decreases to 4.7 % as the thickness is further increased to 45 Å, which is typical for Ta underlayer. However, the MR ratio of about 8.0 % does not vary much as the thickness of the Mo underlayer varies from 2.5 Å to 45 Å. For MoN underlayer, the MR ratio is about 7.4 % and does not vary up to 45 Å of underlayer thickness. Similarly, the MR ratio does not vary much, but the value of about 4.6 % is much lower for TaN underlayer compared with Mo(N) underlayers.

From these data, it is concluded that extremely thin Mo(N) underlayers of few Å may be used for *spin valves with much higher MR ratio than Ta(N)* underlayers, thus allowing much thinner overall device thickness.

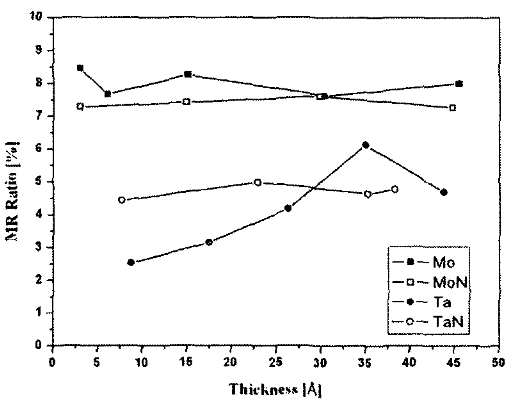

Fig. 1. MR ratio of spin valve structures for various underlayer material and thickness.

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Design Innovative Four-axial Actuator for High Density Optical Drive

Yung-Sung Lan[1,2], Chung-Hao Tien[3], Ming-Tsan Peng[2]
[1] Department of Photonics and Institute of Electro-Optical Engineering, National Chiao Tung University, Hsinchu, Taiwan 300, R.O.C
[2] Electronics and Optoelectronics Research Laboratories, ITRI, Hsinchu, Taiwan 300, R.O.C.
[3] Department of Photonics and Display Institute, National Chiao Tung University, Hsinchu, Taiwan 300, R.O.C.
*Corresponding author: YSLan@itri.org.tw, Phone: +886-3-5918072, Fax: +886-3-5917531

In this paper, we proposed an innovative four-axial actuator that is totally different from a traditional four-wire scheme. The tilting magnets are positioned under the moving part where compensation for tilting can be independently actuated. As the density in optical data storage systems increases, a drive capable of tilt control thus becomes necessary in order to improve the tilt margin as the coma aberration is accordingly increased. The prerequisite for achieving a diffraction-limited spot is to reduce the aberrations in the disk system. However, as the recording density is developed toward a higher numerical aperture (NA), the coma aberration which is proportional to the NA^3 has become more critical and the tilt compensation is thus required [1],[2]. Nowadays, there are two methods to implement the function of three degrees of freedom (focusing, tracking and tilting) control, for example Masanari Mohri, et al. Although the above-described structure makes it possible to correct a tilt in a radial direction caused by the warp of a disc and the like, so-call radial tilt, it is difficult to correct a tilt in a tangential direction caused by the bend of the disc, so-call tangential tilt. This paper is provided to solve the above problems with the conventional object lens driving device. The radial and tangential tilting magnets are positioned under the moving part where compensation for tilting can be independently actuated. A detailed exploded perspective of the actuator is presented in Fig. 1, where the overall configuration consists of a lens-holder, one focusing, one tracking and four tilting coils, repsectively. The torque around the Z-axis parallel to the tangential direction of the disc is generated by the radial tilting coils. The torque around the X-axis parallel to the radial direction of the disc is generated by the tangentail tilting coils, as shown in Fig. 1.

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