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MAGNETIC PROPERTIES OF HIGH COERCIVITY CoCrPtB/Cr MEDIA

Institute for Super Materials, ULVAC JAPAN, Ltd.
Choong Ryul Paik
Ikuo Suzuki
Noriaki Tani
Michio Ishikawa
Yoshihumi Ota
Kyuzo Nakamura

1. INTRODUCTION

The market of sputtered hard disks for longitudinal recording used as external memory of personal computers has been grown remarkably for their rapid increment of recording density. In order to increase the recording density of hard disks, it is generally effective to raise the coercivity of media. CoCrPt/Cr media have attracted much attention as high density recording media because of their high coercivity of over 2000 Oe[1,2]. But CoCrPt/Cr media still have a number of problems including a lot of Pt content and the high noise level. In our previous report, it has been found that the addition of B element increases the coercivity of CoCrPt/Cr media to above 3000 Oe[3]. It indicates that Pt content can be reduced by B addition in CoCrPt/Cr media. Present study describes the magnetic properties of the various compositions of CoCrPtB/Cr media in order to determine the optimum compositions for high coercivity, and also describes the noise properties of CoCrPtB/Cr media.

2. EXPERIMENTAL

CoCrPtB/Cr films were deposited by using a batch type sputtering system with three magnetron cathodes. Textured NiP/Al substrates were used in this study. Glass substrates are also used for structural analysis of the films. Cr underlayar, magnetic layer and carbon protective layer were deposited continuously under Ar atmosphere. The compositions of magnetic layers were controlled by changing the number of metal pellets placed on the Co GT target[4]. Carbon and Cr layer thickness, $Br \cdot \delta$, substrate temperature, bias voltage and Ar pressure were all kept constant. The magnetic properties were measured by VSM with the maximum applying field of 10 kOe. Microstructures were studied by X-ray diffraction using Cu-Kα radiation. The compositions of magnetic layers were determined by ICP and AES method. The read/write properties were measured by using a thin film head.

3. RESULTS AND DISCUSSIONS

Figure 1 shows the coercivity of CoCrPtB/Cr media versus B content while Pt content fixed to 0, 3,6 and 10at.%. The increase of B content increased the coercivity at all the Pt containing media, and maximum values were observed at 3,5 and 10at.% B content respectively. But the coercivity of CoCrB/Cr media decreases with the B addition. A very high coercivity of 3200 Oe was obtained in Co-10at.%Cr-10at.%Pt-10at.%B/Cr film. From these results, it is found that an addition of the same amount of Pt and B gives the maximum coercivity in CoCrPtB/Cr media and Pt content can be reduced into a half to obtain the same coercivity.

High recording density media, in general, require high coercivity and low noise characteristics. The reproduced spectra of Co-10at.%Cr-6at.%Pt/Cr and

Co-10at.%Cr-3at.%Pt-3at.%B/Cr disks are shown in Fig. 2 and 3, while keeping the coercivity constant at 1800 Oe. As shown in these figures, noise level of Co-10at.%Cr-3at.%Pt-3at.%B/Cr is lower than that of Co-10at.%Cr-6at.%Pt/Cr. S/N ratio is also higher by approx. 1.4dB. It was found that the addition of B is effective to reduce the noise level of CoCrPt/Cr film. In this study, the addition of B element could increase the coercivity and reduce the noise level of CoCrPt/Cr media, which is expected to become a practical high recording density media.

4. CONCLUSIONS

In this study, the magnetic properties and noise characteristics of CoCrPtB/Cr media were investigated, and the following results were obtained.
(1) The maximum coercivity of CoCrPtB/Cr media can be achieved by adding the same amount of Pt and B content while keeping Cr content fixed at 10at.%. A very high coercivity of 3200 Oe was obtained in Co-10at.%Cr-10at.%Pt-10at.%B/Cr film.
(2) By adding the B element, it is possible to reduce the Pt content into a half to obtain the same coercivity.
(3) The addition of B element is also effective to reduce the noise level of CoCrPt/Cr media.

5. REFERENCES

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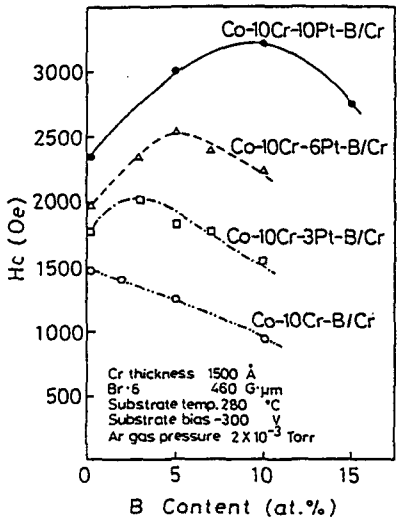

Fig.1 The relation between B content and Hc.

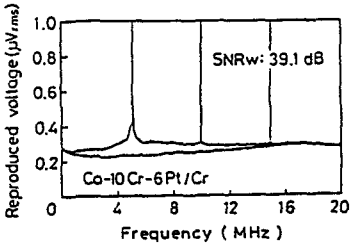

Fig.2 Reproduced spectra of Co-10Cr-6Pt/Cr media.

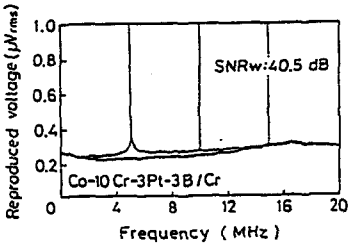

Fig.3 Reproduced spectra of Co-10Cr-3Pt-3B/Cr media