Single-layered Perpendicular Recording Media for High Density Recording (Central Research Laboratory, Hitachi Ltd.)

I. Low Noise Media

Table 1 Magnetic properties of perpendicular media.

Magnetic layer (nm)/Underlayer	M_s (emu/cm ³)	H_c (Oe)	M_r/M_s
A CoCr ₁₉ Pt ₁₀ (100)/TiCr ₁₀	480	1600	0.48
B CoCr ₁₉ Pt ₁₀ (100)/CoCr ₃₅ /TiCr ₁₀	480	2200	0.63
C CoCr ₁₉ Pt ₁₀ (33x3)/CoCr ₃₅ /TiCr ₁₀	480	3350	0.85
D CoCr ₁₉ Pt ₁₀ Ta ₂ (100)/CoCr ₃₅ /TiCr ₁₀	360	1800	0.62
E CoCr ₁₉ Pt ₁₀ Ta ₂ (25)/CoCr ₃₅ /TiCr ₁₀	360	2200	0.82
F CoCr ₁₇ Ta ₄ (50)/TiCr ₁₀	385	1800	0.48

Fig. 1. Magnetization curves.

Fig.2 Compositional microstructures of CoCrTa and CoCrPt media. TEM plan-view images (a) and (d), Cr/Co atomic ratio map (b) and (e), Line profile of Cr concentration analyzed along the linear regions denoted (b) and (e). Arrows indicated the position of grain boundary.

TEM plan-view image

Cross-sectional TEM image

Fig.3 TEM images of CoCrPt media with TiCr underlayer.

TEM plan-view image

Cross-sectional TEM image

Fig.4 TEM images of CoCrPt media with CoCr/TiCr dual-underlayer.

Fig. 5 Recording density dependence of medium noise.

Fig. 6. Relationship between coercivity and magnetic layer thickness.

Fig. 7 MFM images of 100kFCI-recorded and DC-erased samples for the single-layered perpendicular media, and noise spectrum of DC-erased region measured using MFM.

II. High Density Recording

Fig.8 Computer simulation of magnetization structure recorded at 170kFCI and 400kFCI for the single-layered perpendicular media. Recording magnetic field, $H_z = H_c$.

Fig.9 Computer simulation of recorded magnetization dependence on head-medium spacing.

Fig.10 Relationship between recording density and write head gap length.

Fig.12 Recorded magnetization structures recorded at 200 kFCI and 400 kFCI for the CoCr 17Ta4 media.

Fig.13 Recording density characteristics measured by using contact ring-type head and estimated from MFM data for the CoCr17Ta4 perpendicular media.

Fig.14 Non-linear transition shift properties of perpendicular and longitudinal recording media.

III. Magnetization Stability

Fig.16 Dependence of output decrease on linear recording density of CoCrPtTa perpendicular media.

Fig.15 Off-track overwrite characteristics.
 (a) MFM image recorded at 200 kFCI on 45 kFCI.
 (b) Off-track profiles of recorded signals.

Fig.17 Dependence of magnetization decay by increasing M_r/M_s .

References

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