Effects of a perpendicular component of head field on the writing process in longitudinal magnetic recording

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An analytical model of calculating the writing process was first proposed by Williams and Comstock [1]. To simplify, only the in-plane component (along-track direction) of head field was to used to determine the magnetic transition in the model [1]. In this work, a three dimensional head field effects on the writing process was examined by micromagnetic simulation. Particularly, the influence of perpendicular component of head field on the writing process in logitudinal magnetic recording was studied by using a planar-type head.

The three field components generated by the planar-type head, namely, those in the along-track (H_x), the cross-track (H_y), and the perpendicular (H_z) directions are shown in Fig.1(a). The four different types of H_z are considered in writing process as shown in Fig.1 (b); the value of H_z of type I is assumed to be zero, and that of type II is same as shown in Fig.1(a). The intensity of H_z of type III and IV are 1.4 and 1.8 times of type II, respectively. The components of H_x and H_y used in writing are the same as shown in Fig.1(a) for all types. Fig. 2 shows the bit patterns are generated for the medium with $K=3.5\times10^5$ J/m^3 at bit densities of 454 kfci. The bit patterns are considered to be reasonably good in all cases of type I, II, III, and IV. However, the shape of bit patterns is very sensitive to H_z. As increasing of H_z, the bit patterns become bent and the track width is significantly increased. Furthermore, for type IV, it was obtained a good bit patterns for the medium with high value of K ($K=5.0\times10^5$ J/m^3), which means that the optimal write field is reduced due to high value of H_z.

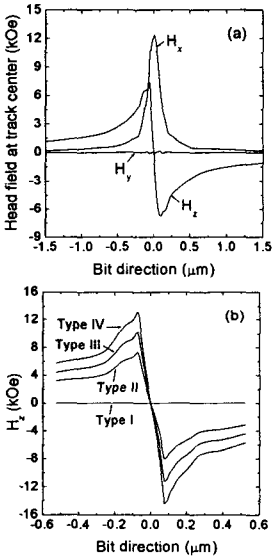

Fig.1. (a) Three field components of H_x, H_y and H_z generated by planar-type head. (b) Four different types of H_z.

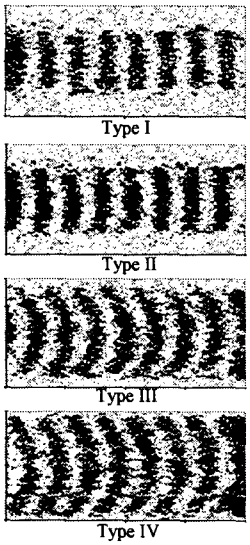

Fig.2. Recorded bit patterns of type I, II, III and IV for the medium with $K=3.5\times10^5$ J/m^3 at a bit densities of 454 kfci.

References

[1] M. L. Williams and R. L. Comstock, AIP Conf. Proc. **5**, 738 (1971).