IMPACT OF DAMPING CONSTANT IN HEAT-ASSISTED MAGNETIC RECORDING

Tadashi KOBAYASHI¹, Yoshinobu NAKATANI², Kohei ENOMOTO¹ and Yuji FUJIWARA¹
1) Mie Univ., Tsu, Japan, kobayasi@phen.mie-u.ac.jp
2) Univ. of Electro-Communications, Chofu, Japan, nakatani@cs.uec.ac.jp

I. INTRODUCTION

We have already proposed a new model calculation [1, 2] for heat-assisted magnetic recording using the grain magnetization reversal probability and the attempt period, whose inverse is the attempt frequency $f_0$. $f_0$ is a function of the damping constant $\alpha$ [3], and $\alpha$ is also a function of temperature [4, 5]. Therefore, although knowledge of $\alpha$ at the writing temperature is necessary, it is unknown.

In this study, we calculate the bit error rate for $\alpha = 0.1$ and $0.01$ using our new model calculation, and discuss the results for various thermal gradients and linear velocities.

II. RESULTS

The new model calculation can obtain the bit error rate as a function of the writing field $H_w$. The bit error rates in this study are useful only in a comparison. Figure 1 shows the dependence of the minimum bit error rate (bER) on the thermal gradient for $\alpha = 0.1$ and $0.01$ within $H_w \leq 10$ kOe where the linear velocity $v = 10$ m/s. When $\alpha = 0.1$, the bER can be reduced as the thermal gradient increases since erasure-after-write can be suppressed. On the other hand, when $\alpha = 0.01$, the bER becomes rather worse as the thermal gradient increases. Since the attempt period is long and the attempt number during writing is small for $\alpha = 0.01$, the chance for writing decreases. The medium becomes cool before writing as the thermal gradient increases, and write-error increases. The coercivity becomes very high before writing, and a higher writing field $H_w > 10$ kOe becomes necessary. We can consider writing slowly by reducing the linear velocity to reduce write-error since the writing chance increases. As expected, the bER can be reduced as the linear velocity decreases as shown in Fig. 2. The damping constant at the writing temperature is a very important parameter.

We acknowledge the support of the Advanced Storage Research Consortium (ASRC), Japan.

REFERENCES


Tadashi Kobayashi
E-mail: kobayasi@phen.mie-u.ac.jp
Tel: +81-59-231-9731