Transition position shift in double layered perpendicular recording media with soft underlayer

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As magnetic recording density rapidly increases beyond 100Gbit/inch2, the current longitudinal recording faces the two basic problems; deficiency of recording head field and thermal stability of written bit. In order to solve these problems at least for some time, perpendicular recording is considered the most promising alternative. Double layered media with soft underlayer(SUL) is very effective in increasing writing head field and the head field gradient. However, at the same time the SUL could serve as various noise sources.

In the present study, to investigate the effect of SUL on noise, we have studied micromagnetic modelling of writing and reading process in a perpendicular system including a single pole head and a recording medium with SUL. In order to understand the contribution of SUL on signal to noise ratio (SNR), the SNR of single layered medium and the double layered medium with SUL were simulated with a single pole head. In the present case, an abrupt head field was applied during writing process. It was found that the SNR of the double layered medium shows lower SNR compared with the single layered medium. The higher noise in the double layered medium is not associated with transition jitter but with transition position shift. The transition position shift is associated with change of magnetization pattern of the SUL with time during writing process.

In the present paper, we will discuss the change of magnetization patterns of the SUL with time, for two different head sizes. Also, the effects of damping constant α of the SUL on SNR of the perpendicular recording will be discussed. It was found that as the α increases, SNR increases substantially. Details of the simulation studies will be presented.

References

[1] S. C. Lee, Y. W. Tahk, K. J. Lee and T. D. Lee, JMMM(2003) to be published.