

\*課題番号 : F-12-TU-0075  
\*支援課題名 (日本語) : ビットパターンが形成された磁気記録メディアの作成  
\*Program Title (in English) : Bit Patterned magnetic recording media  
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※研究概要 (Summary) :

Recently various kinds of approaches have been pursued to develop magnetic recording media with areal densities  $\sim$  tera-bits/inch<sup>2</sup>. [1, 2] Bit patterned media (BPM) is promising for future magnetic storage. This implies the formation of an ordered two dimensional array of magnetic nano-structures with out-of-plane magnetic anisotropy. Several methods, such as lithography, self assembly, ion implantation etc. were suggested to fabricate patterned islands of high anisotropy magnetic materials (such as L10 FePt). However, these arrays can not achieve practical applications unless a soft magnetic under-layer which improves the performance of bit-writing is applied.[1,3] The so-called patterned exchange-coupled composite (PECC) bilayered structures made from soft and hard magnetic materials (L10 FePt) are required. Very recently, we found that the L10 FePt grows along preferred (111) crystallographic direction on a soft magnetic CoFeTaB metallic glass thin film.[4] The coercivity of L10 FePt (111)/glassy CoFeTaB bilayered structure can be tailored easily. [4] Here we report on the use of CoFeTaB metallic glass thin film as a soft magnetic under-layer, which promotes the growth of L10 FePt along preferred (111) crystallographic direction. Preferred oriented phase of L10 FePt is obtained either by depositing it in-situ on a heated CoFeTaB/SiO<sub>2</sub>/Si or at room temperature (FePt/CoFeTaB/SiO<sub>2</sub>/Si) followed by annealing at 400-450oC for 15 minutes. The later process is shown to be advantageous in term of fabrication of patterned media. Pattern size

ranging from 25  $\mu$ m to 100 nm made from L10 FePt (111)/glassy CoFeTaB were fabricated by photo/electron beam lithography. A transition from multi-domain to single domain like was noticed as the size of the dots approaches to  $\sim$  300 nm or below. The structural and magnetic characterizations strongly suggest the applicability of the present bilayered structure in the fabrication of high density bit-patterned magnetic recording media.

※実験 (Experimental) :

EB lithography system

※結果と考察 (Results and Discussion) :

A high density bit-patterned structure has been successfully fabricated by an EB lithography system at a company. An advanced bit-pattern has been already designed and will be fabricated at Tohoku University.

※その他・特記事項 (Others) :

References:

- [1] K. Z. Gao, and H. N. Bertram, IEEE Trans. Magn. 38, 3675 (2002).
- [2] G. W. Qin, Y. P. Ren, N. Xiao, B. Yang, L. Zuo and K. Oikawa, Internat. Mater. Rev. 54, 157 (2009).
- [3] J. P. Wang, W. Shen and J. Bai, IEEE Trans. Magn. 41, 3181 (2005).
- [4] N. Kaushik, P. Sharma, K. Yubuta, A. Makino and A. Inoue, Appl. Phys. Letts. 97, 072510 (2010)