課題番号　　:F-14-TU-0046
利用形態　　:機器利用
利用課題名(日本語)　　:
Program Title (English)　　:Bit patterned recording media
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1. 概要(Summary)

Recently various kinds of approaches have been pursued to develop magnetic recording media with areal densities ~ tera-bits/inch^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 the patterned islands of high anisotropy magnetic materials (such as L10 FePt). However, these arrays cannot achieve practical applications unless a soft magnetic underlayer that improves the performance of bit -writing is applied. We found that the soft magnetic metallic glass thin films have ability to grow L10 FePt in preferred orientation, which is very difficult with conventional materials.

2. 実験(Experimental)

Bit Patterns of diameter 2 μm to 20 nm were fabricated to test the patternability of L10 (111) FePt/FeHfNbYB bilayered structure. Bit patterns of 2 μm in diameter (area ~ 10 x 10 mm^2) were fabricated by standard photolithography and smaller bit patterns of ~ 20 to 100 nm in diameter (area ~ 10 x 10 μm^2) were made by using Elionix ELS-G125S EB writing system and HSQ resist.

3. 結果と考察(Results and Discussion)

The FE-SEM images of biggest (2 μm) and the smallest (20 nm) bit patterns made in this study are shown in Fig. 1 (b). The growth of FePt on the SiO_2/Si substrate is polycrystalline with all types of crystallite orientations. By introducing a thin layer of glassy FeHfNbYB in between FePt and substrate, FePt crystallographic orientation changed from multi to preferred orientation along (111) crystallographic direction as shown in Fig. 1 (a). Fabrication results suggest that it is possible to pattern this bilayered structure in BPM with areal density > 1 Tbit/inch^2.

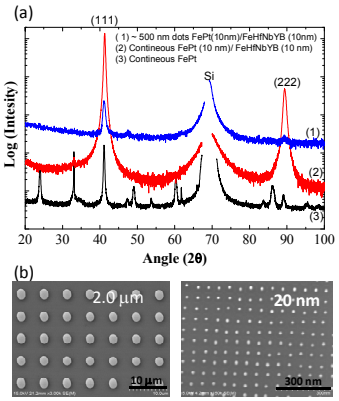

Fig. 1 (a) X-ray diffraction curves of patterned/non-patterned FePt (~10 nm)/FeHfNbYB (10 nm) thin films deposited on SiO_2/Si substrate. Curve for FePt deposited without soft magnetic underlayer is also included. (b) SEM image of ~ 2 μm and ~ 20 nm dots of FePt (~10 nm)/FeHfNbYB(~10 nm).

4. その他・特記事項(Others)

なし。

5. 論文・学会発表(Publication/Presentation)

(1) Neelam Kaushik, et al., "Potential of metallic glass thin films as a soft magnetic underlayer for L10 FePt based patterned recording media", IEEE Trans. Magn. 50 (4), 3201404 (2014).

6. 関連特許(Patent)

なし。