

Sputtered Hexagonal Ba-Ferrite Films for High Density Magnetic Recording Media

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Abstract - Good chemical stability and mechanical durability as well as excellent magnetic properties are essential for ultra high density magnetic recording media.

Oxide films have a lot of advantage of chemical stability and mechanical durability as compared with a metal thin film. The authors have been studying a magnetoplumbite type of hexagonal Ba-ferrite thin films prepared by sputtering[1] and sol-gel method[2]. We already reported that sputtered Ba-ferrite sputtered films possess an excellent recording characteristics[3]. In order to prepare Ba-ferrite films with c-axis orientation, the substrate temperature should be elevated up to about 620 °C [1] and such a high temperature is not suitable for the practical fabrication of magnetic recording media. The authors have already reported that Pb addition is effective to lower the substrate down to 550 °C[4].

It is still recommended to reduce the substrate temperature for the practical fabrication of a high density magnetic recording media.

In this study, Ba-ferrite films have been prepared at room temperature by using a Facing Target Sputtering(FTS) system and a conventional dc magnetron sputtering(DCMS) system. The films were successively annealed in the air and their crystallographic characteristics and magnetic properties have been studied.

The targets are sintered ferrite disk(8cm diameter) with stoichiometric composition of Ba-ferrite (i.e. BaFe₁₂O_x) and the substrate is thermally oxidized silicon wafer. The substrate temperature was set at room temperature in both sputtering system. All of the films were amorphous and did not show ferromagnetism. The films prepared by FTS system were crystallized at annealing temperature of about 650 °C, while those prepared by DCMS system were still amorphous after annealing at this temperature. All of the films were crystallized at annealing temperature of 750 °C. Coercivities and saturation magnetization are about 3kOe and 200-250 emu/cc, respectively, for the annealed films prepared by FTS system, while those prepared by DCMS system are about 2kOe and 150 emu/cc, respectively. It was found that the crystallization of the films prepared by FTS system begins at lower annealing temperature. This will be of advantage to practical mass production for recording media.

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*This work was supported in part by a Grant-in-Aid for Developmental Scientific Research(06655093) from the Ministry of Education, Science and Culture.