The influence of repetition of bilayer in CoSiB/Pd multilayer with Perpendicular Magnetic Anisotropy

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1. Introduction

Perpendicular magnetic anisotropy (PMA) is the perpendicular direction dependence of the magnetic properties of a material. Magnetic thin films with PMA are magnetized in a direction normal (perpendicular) to the plane. Experimental studies of the PMA in magnetic thin films and multilayers have been done for almost 40 years since Iwasaki and Takemura first investigated the mechanism of the PMA in Co/Cr thin films [1]. In 1985, Carcia et al. established the importance of the interface between the magnetic layer and the nonmagnetic layer as the driving mechanism for the PMA [2]. Subsequently, in studies of magneto resistive random access memories (MRAMs), magnetic tunnel junctions (MTJs) with PMA became a key issue for realizing next-generation high-density and non-volatile memory devices, such as a spin-transfer torque MRAM [3-7]. PMA has two strong advantages for the next-generation devices: low current density and high thermal stability. Both these factors are important issues for application of next-generation devices. Moreover, amorphous materials has higher saturation magnetization than crystalline materials. This characterization is particularly useful for improving of capability of devices. Therefore, we have been studied magnetic and perpendicular magnetic anisotropic property of multilayers consisting of amorphous $Co_{75}Si_{15}B_{10}$. In this paper, we investigated the multilayer with PMA and studied the magnetic property of multilayer with various conditions.

2. Experiment

The chamber's base pressure was up to 2.0×10^{-7} Torr, and the working pressure was 2 mTorr. All films were uniformed in size, 1.4 cm × 1.4 cm, and were deposited by ultra high-vacuum system at room temperature. The magnetic properties of all multilayers were measured by a vibrating sample magnetometer.

3. Result and discussion

In this study, we investigated the magnetic properties (the coercivity and saturation magnetization) of the CoSiB/Pd multilayers and found the dependence of repetition of CoSiB/Pd bilyaer on their magnetic property. We note that the coercivity and the saturation magnetization of the CoSiB/Pd multilayer increase or decrease with changing of repetition number of CoSiB/Pd bilayer. Especially the perpendicular magnetic anisotropic property is closely related with the repetition of CoSiB/Pd bilayer.

4. References

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