Thickness dependence of magnetic moments in CoSiB/Pd multilayers with perpendicular anisotropy

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1. Introduction

Materials with perpendicular magnetic anisotropy (PMA) have large anisotropy energies more than that with in-plane magnetic anisotropy (IMA). For the patterned device, in addition, the magnetization of materials with PMA does not suffer from thermal instability due to magnetization curling observed at the edge of in-plane case [1]. Based on these general theories, devices with PMA have lower switching currents than devices with IMA for the same magnetic field [2-4]. Multilayers based on Co-based crystalline materials show PMA for a certain range of thickness of layer and number of periods with noble metals such as Pt, Pd, and Au [5-9].

Therefore, we studied the magnetic momnents of amorphous ferromagnetic CoSiB/Pd multilayers as functions of the thicknesses of CoSiB and Pd layers. In order to investigate of the role of these amorphous multilayers, the magnetic properties were studied by a VSM.

2. Experiments

The chamber's base pressure was up to 2.0×10^{-7} Torr, and the working pressure was 2×10^{-3} Torr. All films were uniformed in size, 1.4 cm x 1.4 cm, and were deposited at room temperature. The magnetic properties of the multilayers were measured by a vibrating sample magnetometer.

3. Result

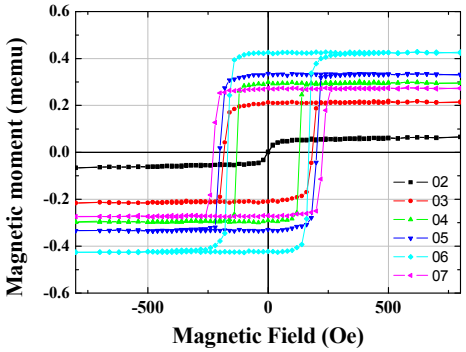

Fig. 1. The hysteresis loops of [CoSiB (2, 3, 4, 5, 6, 7) Å/Pd 14 Å]$_5$ multilayers with perpendicular mag -netic anisotropy

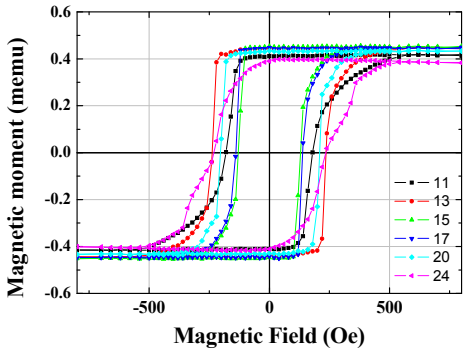

Fig. 2. The hysteresis loops of [CoSiB 7 Å/Pd (11, 13, 15, 17, 20, 24) Å]$_5$ multilayers with perpendicular magnetic anisotropy

The magnetic moment and the shape of hysteresis loop depend on the CoSiB and Pd thickness, repectively.

4. Discussion and Conclusion

The magnetic moment and the shape of hysteresis loop depend on the CoSiB and Pd thickness, respectively. The magnetic moment and the shape of hysteresis loop have a lot of information about the analysis of magnetic multilayers. A quantitative interpretation of the correlation of these informations of CoSiB/Pd multilayer are studied in this article. The further study of this interpretation is an issue to be addressed in the future.

5. References

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