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Co/Pt 다층박막의 활성화부피의 Ar 스퍼터링 압력에 대한 의존성

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Dependences of the activation volumes on Ar sputtering pressure in Co/Pt multilayers prepared by dc magnetron sputtering

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1. INTRODUCTION

To achieve high-performance magnetic information technology, it is essential to understand domain reversal dynamics because information is stored in the form of magnetic domain. The key to domain reversal dynamics is the activation volume, which is the effective unit volume of the coherent rotation acting as a single-domain particle. In the information storage technologies, the activation volume is closely related to the theoretical limit of maximum achievable storage density, media noise, and thermal stability. We report that the activation volumes are generally unequal in Co/Pt multilayers prepared by dc magnetron sputtering under various Ar pressures and they are sensitively dependent on Ar pressure

2. EXPERIMENT

Serial samples of Co/Pt multilayers (4-Å Co/11-Å)$_{10}$ were prepared by dc magnetron sputtering with changing the Ar pressure from 2 to 7.5 mTorr. Magnetization reversal process has been observed using a magneto-optical Kerr effect microscope system capable of grabbing time-resolved domain patterns under an applied magnetic field. The wall-motion speed and the nucleation rate were simultaneously determined using a domain reversal model[1] based on time-resolved domain evolution patterns. From field dependence of the wall-motion speed and the nucleation rate, we determined the wall-motion activation volume and the nucleation activation volume within the context of a thermally activated relaxation process

3. RESULTS AND DISCUSSION

Wall-motion activation volume is found to be slightly larger than nucleation activation volume in Fig. 1 and all samples shows nuclear dominant reversal process. A reversal process having a smaller activation volume is expected to

dominant since the activation energy is proportional to the activation volume[2]. Interestingly, both activation volumes decreased in the same trend with increasing Ar sputtering pressure. This can be understood by the explanation that magnetization reversal behavior changes with respect to sample preparation condition via the change in the film morphology such as grain structure. We can expect that the activation volume decreases with increasing Ar pressure, because of decreasing grain size of the sample with increasing Ar pressure, as seen in Fig.2

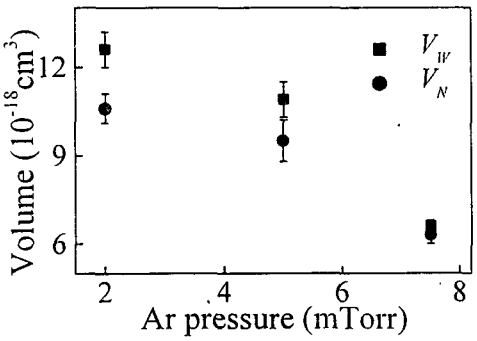

Fig.1. Wall motion activation volume V_W an nucleation activation volume V_N of (4-Å Co/11-Pd)$_{10}$ samples with respect to Ar pressure

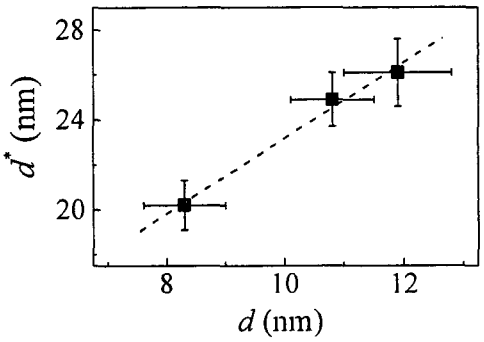

Fig. 2. Dependence of effective activation size d^* o grain size d of Co/Pt multilayers. d^* is defined as th diameter of a cylindrical body equivalent to th activation volume.

ACKNOWLEDGMENT

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4. REFERENCES

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