

Patchara Sukonrat 2012: Characterization of Micropatterned Magnetic Structures.
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Advisor: Ms. Watcharee Rattanasakulthong, Ph.D. 82 pages.

SU-8 photoresist pillars (around 9.6 μm in diameter) and holes (11.2-16.6 μm in diameter) were patterned by synchrotron X-ray lithography. Ferromagnetic cobalt (Co) films were then sputtered on these patterned substrates. Scanning electron microscopy (SEM) revealed smooth surface morphology of cobalt films in all samples. From vibrating sample magnetometry (VSM) with in-plane and out-of-plane magnetic field, Co films of 50-80 nm in thickness on the micropillar substrate had lower magnetizations than those of continuous films because of their smaller domains. Furthermore, magnetic anisotropy was observed with a higher magnetization in the out-of-plane direction. For 0.9-1.4 μm thick Co films on the microhole substrates, samples with larger holes exhibited lower magnetic anisotropy and the difference between in-plane and out-of-plane magnetizations was less than that in the case of smaller holes. In both directions of applied magnetic field, the squareness and the coercivity were minimal in the sample with smallest holes because the sizes of magnetic domains in the holes and on the surfaces were comparable. After removal of Co films on the surface, the difference between in-plane and out-of-plane magnetizations was decreased indicating the reduction in magnetic anisotropy. By comparing the effect of the hole size, the squareness was still the lowest but the coercivity became the highest in the sample with smallest holes which is possibly due to the random magnetic field generated by residual Co after the polishing.

Student's signature

Thesis Advisor's signature