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In-situ Stress Evolution of CoCrPt Thin Films on Self-assembled PS-PVP Diblock Copolymer Template

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Recent studies have focused on artificially roughened surface, since it could be possible to obtain the desirable magnetic properties by artificially creating and controlling the surface/interface structure and morphology [1, 2]. In this study, we have investigated correlation of mechanical stress and growth structures of $Co_{68}Cr_{18}Pt_{14}$ thin films deposited on periodically modulated PS_{21400}(styrene)-PVP_{20700}(vinyl pyridine) diblock copolymer self-assembled surface. Figure 1 show the evolution of force/width curve in CoCrPt/Si and CoCrPt/PS-PVP/Si samples measured by in-situ stress measurement system. The positive and negative slope means a tensile stress and a compress stress in the film, respectively. It is worthwhile to mention that the magnitude and sign of stress observed in CoCrPt/Si and CoCrPt/PS-PVP/Si samples are completely different, i.e. the developed stress in CoCrPt/Si sample shows two time larger than CoCrPt/PSPVP/Si sample in magnitude with the slopes of different sign. Combined study of atomic force microscopy (AFM) and surface magneto-optical Kerr effect (SMOKE) revealed that the stress relaxation in the CoCrPt/PS-PVP/Si(100) is closely related with growth structure and magnetic properties of CoCrPt film on PS-PVP surface.

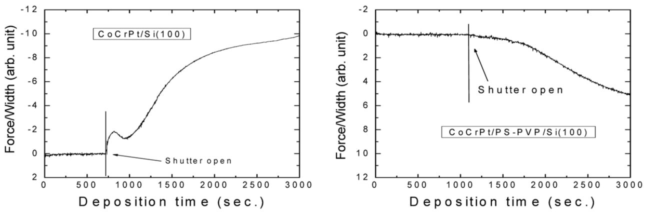

Fig. 1. Stress evolution in CoCrPt/Si(100) and CoCrPt/PSPVP/Si(100) samples.

REFERENCES
[1] J.-R. Jeong *et al*., Appl. Phys. Lett. 90, 022509 (2007).
[2] J.-R. Jeong *et al*., Phys. Stat. Sol. b 241, 1609 (2004).

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Double Vortex Interaction in Micron-Sized Elliptical NiFe Elements Studied by Real-Time Kerr Microscopy

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Magnetic vortex states are often observed in patterned ferromagnetic thin films of micrometer size or smaller. These states are normally characterized by the magnetization adopting a circular configuration, with the spin orientation changing by 180 degrees over a very short path length. This behaviour arises from the competition between the magnetostatic energy and the exchange energy, which favors an in-plane, closed flux domain structure [1, 2]. In the center of the vortex, at its core, this behavior forces the spins to turn out of the plane [3, 4]. Magnetic vortices has been studied intensively in recent year by various techniques such as MFM, PEEM, and broadband microwave. In this study, we have used full-field optical Kerr microscopy to study the double-vortex interaction in epitaxially grown micron-sized elliptical ferromagnetic thin films by observing magnetization-switching behaviour. Both micromagnetic simulation and experimental measurements were carried out to determine the origin of the observed magnetization reversal process. It was found that the direction in which each vortex core rotates largely depends on the edge spins that are not saturated by an externally applied magnetic field. It was also found that the switching fields depend significantly on the relative direction in which the vortex cores rotate.

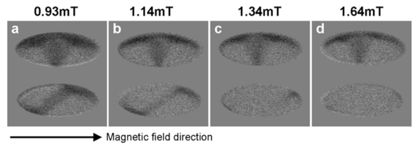

Fig. 1. Kerr microscope images of 20 μm × 6 μm elliptical elements at an increasing magnetic field with two different magnetization states. (a) 0.93mT, (b) 1.14mT, (c) 1.34mT, and (d) 1.64mT.

REFERENCES
[1] B. Van Waeyenberge *et al*., Nature **444**, 46 (2006).
[2] K S. Buchanan *et al*., Nature Physics **1**, 172 (2005).
[3] T Shinjo *et al*., Science **289**, 930 (2000).
[4] J Miltat and A Thiaville, Science **298**, 555 (2002).