Effects of PS-PVP Diblock Copolymer Topography on the Magnetic Properties of CoCrPt Thin Films

Jong-Ryul Jeong,* Myung Chul Choi, Mahn Won Kim, Mi-Young Im, and Sung-Chul Shin

Department of Physics and Center for Nanospinics of Spintronic Materials, Korea Advanced Institute of Science and Technology, Daejeon 305-701, Korea

*Corresponding author: midpath@kaist.ac.kr, Phone: +82 42 869 8167, Fax: +82 42 869 8162

Diblock copolymer templates are one of the most promising candidates for nanoscale pattering otherwise inaccessible by lithographic procedures. [1] In this study, we have investigated magnetic properties of $Co_{68}Cr_{18}Pt_{14}$ thin films deposited on nanopatterend PS_{21400}(styrene)-PVP_{20700}(vinyl pyridine) diblock copolymer. The PS-PVP diblock copolymer were coated on Si(100) substrate via 20 second dipping in diblock copolymer/toluene solution of concentration 10 mg/ml and 5 second rinsing with toluene. Fig. 1(a) shows a surface morphology of coated diblock copolymer on Si(100) measured by non-contact atomic force microscope (AFM). AFM microscopy revealed that size of the micelles are very uniform and highly ordered with the micelle islands height of 4 nm. The CoCrPt thin films were deposited on this polymer surface. Fig. 1(b) shows magnetic hysteresis loops measured by magneto-optical microscope magnetometer (MOMM) for the samples of 200-Å CoCrPt/PS-PVP/Si(100) and 200-Å CoCrPt/Si(100). As shown in Fig. 1(b), the perpendicular magnetic anisotropy (PMA) of CoCrPt film on nanopatterned PS-PVP polymer strongly enhanced compare to the CoCrPt film deposited on flat Si(100) substrate. The squareness ratio, defined as the remnant Kerr rotation angle divided by the saturation one, increased from 0.4 to 0.75. Considering the magnetic dipolar interaction together with the magnetocrystalline anisotropy we will discuss the origins of enhanced PMA in CoCrPt/PS-PVP films as well as the growth mode of CoCrPt films.

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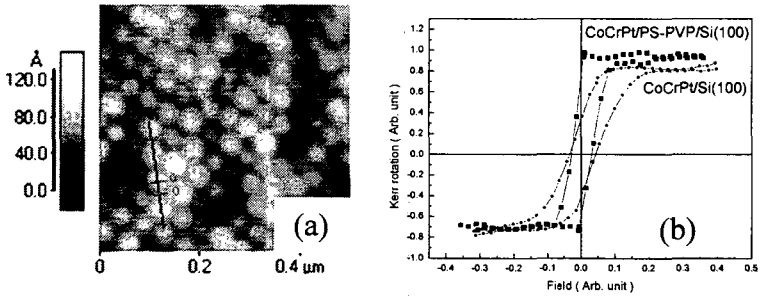

Fig. 1. (a) 0.5 μm × 0.5 μm AFM image of PS-PVP / Si(100) (b) MOKE hysteresis loops of 200-Å CoCrPt / PS-PVP / Si(100) and CoCrPt / Si(100) films.

References

[1] J. Y. Cheng, C. A. Ross, V. Z.-H. Chan, E. L. Thomas, R. G. H. Lammertink, and G. J. Vancso, Adv. Mater. **13**, 1174 (2001).