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*NEBRASKA CENTER FOR MATERIALS AND NANOSCIENCE / NSF-MRSEC SEMINAR SERIES PRESENTS*

MRSEC

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## PERPENDICULAR MAGNETIC ANISOTROPY DRIVEN BY FERROMAGNETIC/ ANTIFERROMAGNETIC EXCHANGE COUPLING

A novel perpendicular anisotropy and new kind of spin-reorientation transition were found in ferromagnetic/antiferromagnetic bilayer system. The perpendicular anisotropy was found to be driven by an antiferromagnetic layer with suitable control of the thickness. This bi-layer system can be used as a new building block for designing nanomagnetic device or storage media with perpendicular magnetization.

In details, Fe/Mn bilayers grown on $Cu_3Au(100)$ [1,2] were investigated. With increasing Mn thickness, the magnetic easy axis of 6 ML Fe/n ML Mn was observed to switch from in-plane to perpendicular direction by magneto-optical kerr effect (MOKE) and photo emission electron microscopy (PEEM) in application of synchrotron radiation. The PEEM provides the technique for element-specific magnetic domain imaging with help of magnetic circular dicroism effect and by selecting various absorption edges of different elements. The magnetic domain of antiferro-magnetic Mn layer was shown to be antiparallel to the Fe domain in both regions of perpendicu-lar and in-plane magnetization. The perpendicular magnetization is accompanied with the en-hanced coercivity, being proposed to be attributed to the exchange coupling from Fe/Mn inter-face, which overcomes the in-plane anisotropy of the magnetic thin films. A detailed phase dia-gram at variation of thickness and temperature is given for optimizing material parameters and estimation of the effective perpendicular anisotropy as well.

[1] W. C. Lin,T. Y. Chen, L. C. Lin, B. Y. Wang, Y. W. Liao, K.-J. Song, and Minn-Tsong Lin, Phys. Rev. B **75**, 054419 (2007)
[2] W. C. Lin, B.Y. Wang, T.Y. Chen, L.C. Lin, Y.W. Liao, W. Pan, N.Y. Jih, and K. J. Song, and Minn-Tsong Lin, Appl. Phys. Lett. **90**, 052502 (2007).

**Host:**
**Sy-Hwang Liou & Axel Enders**

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