

How antiferromagnetism drives the magnetization of a ferromagnetic thin film to align out of the plane?

Bo-Yao Wang (王柏堯)

Department of Physics, National Changhua University of Education, Changhua 500, Taiwan
bywang1735@cc.ncue.edu.tw

Abstract

Antiferromagnet is a class of magnetic material with rich physics and potential application, but, however, had been underestimated for a long time in history because of the lack of macroscopic magnetization and insensitivity to the external magnetic field. In this work, we explore the interesting phenomenon of induced perpendicular magnetic anisotropy (PMA) in antiferromagnetic/ferromagnetic (AFM/FM) exchange-coupled systems. In the first part of this talk, I will show you the discovery of a new feature of an antiferromagnet that can drive the magnetization of adjacent FM films perpendicular [1-3]. Such an established perpendicular magnetization is attributed to the unpinned moments of the AFM film at the interface, with its thermal stability supported by magnetic coupling with the underlying AFM moments [2]. And then, I will present that the antiferromagnet-induced PMA is not only sensitive to the interfacial AFM moments but also to the spin structure of AFM films [4-6]. Finally, I will present our recent progress on systems of antiferromagnet-induced PMA.

Keywords – *perpendicular magnetic anisotropy, antiferromagnetic thin film*

References

- [1] B.-Y. Wang, N.-Y. Jih, W.-C. Lin, C.-H. Chuang, P.-J. Hsu, C.-W. Peng, Y.-C. Yeh, Y.-L. Chan, W.-C. Chiang, D.-H. Wei, and M.-T. Lin, Phys. Rev. B **83**, 104417 (2011).
- [2] B.-Y. Wang, J.-Y. Hong, K.-H. Ou Yang, Y.-L. Chan, D.-H. Wei, H.-J. Lin, and M.-T. Lin, Phys. Rev. Lett. **110**, 117203 (2013).
- [3] B.-Y. Wang, C.-C. Chiu, W.-C. Lin, and M.-T. Lin, Appl. Phys. Lett. **103**, 042407 (2013).
- [4] B.-Y. Wang, P.-H. Lin, M.-S. Tsai, C.-W. Shih, M.-J. Lee, C.-W. Huang, N.-Y. Jih, P.-Y. Cheng, and D.-H. Wei, Phys. Rev. B **92**, 214435 (2015).
- [5] B.-Y. Wang, M.-S. Tsai, C.-W. Huang, C.-W. Shih, C.-J. Chen, K. Lin, J.-J. Li, N.-Y. Jih, C.-I Lu, T.-H. Chuang, and D.-H. Wei, Phys. Rev. B **96**, 094416 (2017).
- [6] B.-Y. Wang, J.-Y. Ning, T.-H. Li, C.-C. Chung, C.-Y. Hsu, M.-S. Tsai, T.-H. Chuang, and D.-H. Wei, Phys. Rev. B **105**, 184415 (2022).