



量子物理学・ナノサイエンス第 45 回特別セミナー

Correlation between the Dzyaloshinskii-Moriya Interaction and Charge Asphericity

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概要

Recent intensive studies on the formation of chiral domain wall (DW) and skyrmion, and their current-driven dynamics are closely related to the Dzyaloshinskii-Moriya interaction (DMI) in the systems with the inversion symmetry breaking (ISB) [1-3]. In spite of many progresses to understand and utilize DMI, the microscopic origin of DMI has remain controversial [4,5]. In this presentation, we show results of our experimental and theoretical studies to examine the microscopic origin of the DMI [6]. Firstly, we demonstrate that DMI in the Co/Pt bilayer shows strong temperature dependence. To find correlation between electron orbital structure and the temperature dependence of DMI, the x-ray magnetic circular dichroism analysis results are mainly discussed. We find that the perpendicular orbital moment and the dipole moment increase at low temperature while the in-plane orbital moment is almost temperature-independent. The theoretical investigation based on the tight-binding model qualitatively reproduces the anisotropic change of the orbital moment, showing that orbital-to-orbital electron hopping with the ISB is related to the temperature dependence of DMI. In addition, the density functional theory calculation exhibits that the orbital anisotropy and the dipole moment have clear correlation with DMI.

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[4] Emori, S., Bauer, U., Ahn, S.-M., Martinez, E. & Beach, G. S. D. *Nat. Mater.* **12**, 611-616 (2013).

[5] Yang, H. et al. *Phys. Rev. Lett.* **115**, 267210 (2015).

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