

Cu/Al₂O₃ 界面における軌道変換によるスピントルク

Spin torque induced by orbital conversion at Cu/Al₂O₃ interface

理研 CEMS¹, Postech², 東大物性研³ ○金 俊延¹, Dongwook Go², 蔡 瀚陞³, 近藤浩太¹,

Hyun-Woo Lee², 大谷義近^{1,3}

RIKEN-CEMS¹, Postech², ISSP, Univ. Tokyo³ ○Junyeon Kim¹, Dongwook Go², Hanshen Tsai³,

Kouta Kondou¹, Hyun-Woo Lee², YoshiChika Otani^{1,3}

E-mail: junyeon.kim@riken.jp

Despite the recent astonishing progress on the spin conversion induced by the spin-orbit interaction (SOI), there is an obstacle for further applications due to material limitation to heavy elements. Here we report an alternative mechanism of the charge-to-spin conversion in ferromagnetic metal (FM)/Cu/Al₂O₃ structures by a key role of the orbital moment.

The charge-to-spin conversion was observed by the spin torque ferromagnetic resonance (ST-FMR) technique. In this study, observed spin torque efficiency reaches up to ~0.3, which corresponds to the largest efficiency from heavy metals [1]. It is a surprising result considering that none of the heavy element was included in this structure. One possible mechanism of this result is the generation of the orbital moment at the orbital textured Cu/ Al₂O₃ interface by the orbital Rashba effect [2]. The generated orbital moment is converted to the spin, and it exerts a torque for the magnetization of the FM.

[1] Pai *et al.*, Appl. Phys. Lett. **101**, 122404 (2012).

[2] Park *et al.*, Phys. Rev. Lett. **107**, 156803 (2011).

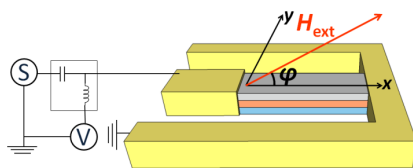


Fig.. 1 Schematic image for the ST-FMR measurement.

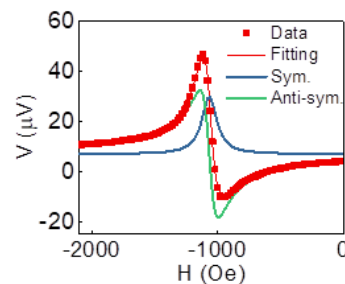


Fig. 2 Observed ST-FMR spectrum.