界面—バルク効果に決められるエデルシュタイン磁気抵抗

Edelstein Magnetoresistance Governed by Interface-bulk Contributions

理研 CEMS[1]，東大物性研[2]，東北大金研[3]，○金　俊延[1]，Yan-Ting Chen[1]，軽部　修太郎[1,2]，
高橋　三郎[3]，近藤　浩太[1]，多々良　源[1]，大谷　義近[1,2]

RIKEN-CEMS[1], ISSP, Univ. of Tokyo[2], IMR, Tohoku Univ.[3], ○Junyeon Kim[1], Yan-Ting Chen[1],
Shutaro Karube[1,2], Saburo Takahashi[3], Kouta Kondou[1], Gen Tatara[1], YoshiChika Otani[1,2]

E-mail: junyeon.kim@riken.jp

There is a puzzling issue on the conversion efficiency although many interests on the spin/charge current interconversion at the two-dimensional (2D) interfaces. Contrast to the bulk spin Hall materials, the conversion efficiency at the 2D interfaces shows order of magnitude difference between the charge-to-spin current conversion and the spin-to-charge current conversion. Here we provide a practical solution on this issue through an experimental study on the spin transport and a theoretical study considering a spin relaxation process nearby the interface [1].

Since then a report by Nakayama *et al.*, we have perceived that the spin/charge current interconversion by the spin-orbit interaction leads a modulation of the resistance [2]. We call Edelstein magnetoresistance (Edelstein MR) for such resistance modulation by the Edelstein effect at the Rashba or other 2D interfaces. In this study, we observed the Edelstein MR in CoFe/Cu/Bi_2O_3 thin films, where the Cu/Bi_2O_3 interface shows the Rashba splitting. We also developed a general analytical model considering with the spin relaxation process. As shown in Fig. 1(a), the accumulated spins at the interface by the Edelstein effect will leave outside the interface, or be relaxed inside the interface [1,3]. Based on the model, we analyzed the Cu thickness dependence of the Edelstein MR (Fig. 1(b)). Interestingly, this study reveals only 34 % of the accumulated spins can get out the interface [1].

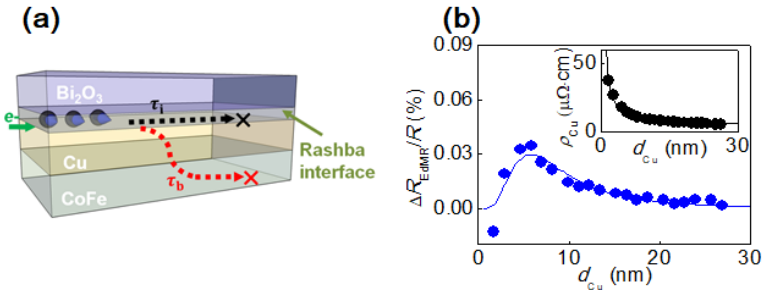

Fig. 1 (a) Path of the accumulated spins adjacent of the interface. (b) Cu thickness dependence of the Edelstein MR. Inset shows the resistivity of the devices as a function of Cu thickness.

[1] J. Kim *et al.*, Phys. Rev. B **96**, 140409(R) (2017).

[2] H. Nakayama *et al.*, Phys. Rev. Lett. **110**, 206601 (2013).

[3] S. Zhang and A. Fert, Phys. Rev. B **94**, 184423 (2016).