

異方性変調構造を有する Pt/Co 構造における一方向性有効磁場の観測

Unidirectional effective field observed in Pt/Co structure with spatial anisotropy modulation

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In ferromagnet/heavy-metal system with structural inversion asymmetry, the interfacial Dzyaloshinskii-Moriya interaction (iDMI) acts as unidirectional effective field (UEF) on the magnetization. Owing to the UEF, the magnetic domain wall in perpendicularly magnetized materials, in which the magnetization spontaneously points in-plane (IP) direction, becomes Néel wall with fixed chirality. Thus, when the spatially anisotropy-modulated (AM) structure, where both IP and perpendicular (PD) easy regions coexist in a single system, is artificially created, the UEF is expected to also emerge at the IP/PD boundary [1,2]. In this study, we have created the AM structure in Pt/Co system and observed the UEF using it.

IP magnetized Pt(2.4 nm)/Co(1.0)/MgO(2.0) multilayer on a thermally-oxidized Si substrate was fabricated into the 1- μm wire using EB lithography and ion milling. By conducting slight etching of the MgO surface in one side of the wire, the AM structure was created (etched region exhibits the PD easy). Figure 1 shows the result of the resistance (R) measurement with sweeping in-plane magnetic field orthogonal to the wire (H_y). R decrease for higher H_y shown in Fig. 1 is due to the AMR and/or SMR in the IP region. Importantly, the shift of the MR curve in $-H_y$ direction is observed when the PD magnetization is up. Moreover, the sign of the curve shift is reversed when the PD magnetization is down. These results indicate that the UEF that sign depends on the PD magnetization direction acts on the IP magnetization and its sign is consistent with the prediction from the iDMI.

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[2] Z. Luo *et al.*, *Science* **363**, 1435 (2019).

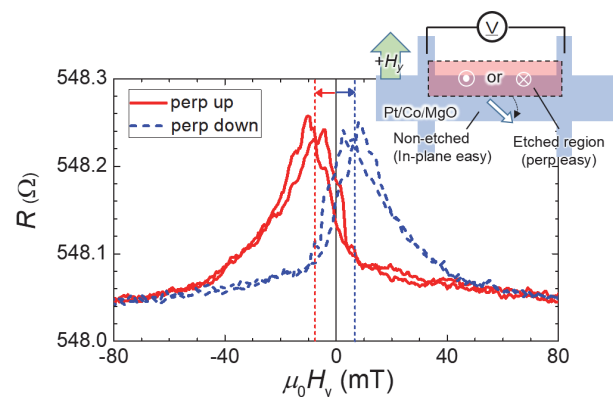


Fig. 1 Wire resistance (R) as a function of in-plane external magnetic field (H_y). The inset shows the experimental configuration. The width of the IP region is ~ 170 nm.