Pt/Co/Pd 系における電流誘起磁壁駆動の膜構造依存性

Film Structure Dependence of Current Induced Magnetic Domain Wall Motion in Pt/Co/Pd System

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Current-induced magnetic domain wall motion (CIDWM) has been intensively studied in perpendicularly magnetized systems such as Pt/Co [1]. In this system, the spin orbit torque (SOT) caused by the spin Hall effect in the Pt layer and the interfacial Dzyaloshinskii-Moriya interaction (DMI), which determines the Néel wall chirality, are considered to have the major contribution to the domain wall (DW) motion [2]. Since both effects strongly depend on the film structure, CIDWM is also expected to be affected by the change in the film structure. In this work, we investigate CIDWM in the structurally-inverted samples of Pt/Co/Pd (“bottom Pt”) and Pd/Co/Pt (“top Pt”).

Two kinds of multilayers consisted of Ta(1.4 nm)/Pt(3.4)/Co(0.48)/Pd(3.6)/Ta(0.35) and Ta(1.4)/Pd(3.6)/Co(0.48)/Pt(3.4)/Ta(0.35) were deposited on thermally-oxidized Si substrates by rf sputtering. These films were patterned into 5-μm-wide wire. Single DW was introduced in the wire and the CIDWM induced by pulsed currents was observed using a polar Kerr microscope. Figure 1 shows the DW velocity v as a function of injected current density J for each sample. In bottom Pt sample, the direction of the DW motion is the same with that of the injected current, which is consistent with the previous reports [1]. The sign of the SOT in top Pt sample is expected to be opposite to that in bottom Pt sample. In top Pt case, however, the DW is moved also in the current direction as shown in Fig. 1. The results shown here suggest that the sign of the DMI in bottom and top Pt samples are opposite to each other, *i.e.*, the combination of the reversed SOT and the opposite sign of DMI is considered to result in the DW motion in the same direction.

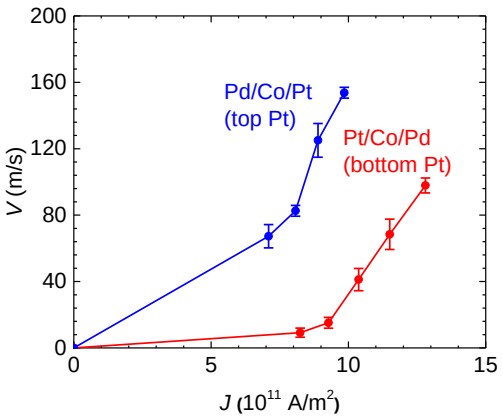

Figure 1 current density J dependence of the domain wall velocity for top Pt (blue) and bottom Pt (red) samples.

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[1] I. M. Miron, *et al.*, Nature Materials **10**, 419 (2011).

[2] K. S. Ryu, *et al.*, Nature Nanotechnology **8**, 527 (2013).