Domain Wall Motion Driven by Negative Spin-Transfer Torque

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1. Introduction

The domain-wall (DW) motion driven by pure electric current has been recently demonstrated. However, the main driving force on such DW motion has remained under debate. This is due to the contradictory experimental results of the DW motion in the direction of the current flow, which is opposite to the prediction of the standard spin-transfer torque (STT) theory. To understand such opposite DW direction, the spin-orbit torque (SOT) on chiral DWs has been recently introduced and extensively studied nowadays [1-4].

2. Method & Results

For this study, we fabricated Pt/Co/Pt films, of which the SOT is compensated by adjusting the thicknesses of the upper and lower Pt layers. Interestingly, the DWs of these films, even without the SOT, were observed to move in the direction of the current flow.

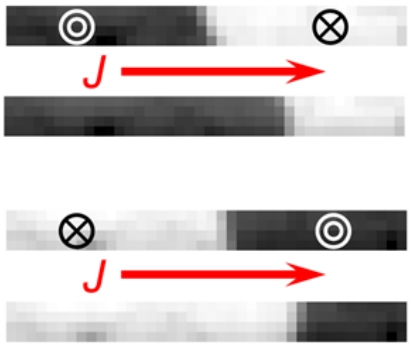

Fig. 1. DW motion along the current flow observed in Pt/Co/Pt device with symmetric Pt thicknesses. Black(white) domain represents up(down) magnetic domain, respectively.

3. Discussion

We show here that even in the absence of the SOT, the DW moves in the direction of the current flow, manifesting the existence of another origin. The present observation can be explained by introducing the existence of the negative STT (*n*STT). Such *n*STT is possibly due to either a negative spin polarization or a negative nonadiabaticity.

4. Conclusion

These findings are expected to provide the final piece of the controversial puzzle in the current-induced DW motion and new possibility of designing spintronic devices with the *n*STT as an additional degree of freedom for manipulating DWs.

5. References

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