

The Physical Origin of Oscillatory Depinning of Domain Walls from Notches in Ferromagnetic Nanowires

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1. Introduction

The transverse control over the DW depinning from geometric constriction such as notches provides an additional degree of freedom for controlling domain wall position in potential applications[1]. In this study, we experimentally investigate the physical origin of oscillatory depinning phenomenon from notch with increasing transverse magnetic field.

2. Experiment

U-shaped Ni₈₁Fe₁₉ nanowire 640 nm wide and 20nm thick is fabricated on a Si(100) substrate using e-beam lithography, dc-magnetron sputtering, and a lift-off process.

The depinning behaviors are monitored by the MOKE signal detection at probing points using a longitudinal Kerr effect measurement system with a laser spot of ~500 nm in diameter.

3. Results and discussion

Oscillatory depinning behavior with increasing transverse magnetic field is because the energy of the DW at the pinning structure is proportional to the lateral displacement of the vortex core across width of the nanowire by the combination of the vortex DW sideways motion and horizontal motion.

4. Reference

[1] D. Atkinson, D. S. Eastwood, and L. K. Bogart, *Appl. Phys. Lett.* **92**, 022510 (2008).