Current-induced domain wall motion in compensated ferrimagnetic TbFeCo films

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Transition metal (TM) and rare earth (RE) ferrimagnets have TM and RE magnetic moments antiferromagnetically coupled, and their magnetization and angular momentum can be varied by changing the chemical composition. Recently, antiferromagnetic spin dynamics in TM-RE ferrimagnets near the magnetization compensation point (MCP) are attracting great interest owing to the ultrafast dynamics. In this study, we investigated current-induced domain wall motion in TM-RE ferrimagnets, TbFeCo, with various Tb composition x across the MCP.

Pt/TbFeCo films were deposited on a thermally oxidized Si substrates using magnetron sputtering. The films were patterned into 5 μm × 30 μm wires by optical lithography and Ar ion milling. Figure 1 shows a schematic of the device structure and a Kerr microscope image of the magnetic domain structure. Current pulses are applied to the wire via a pulse generator and Kerr microscope images are captured to study current induced motion of domain walls. The TbFeCo film composition dependence of the current induced domain wall velocity is studied. We find the direction to which domain walls move depend on the film composition. The underlying mechanism that causes such effect will be discussed.

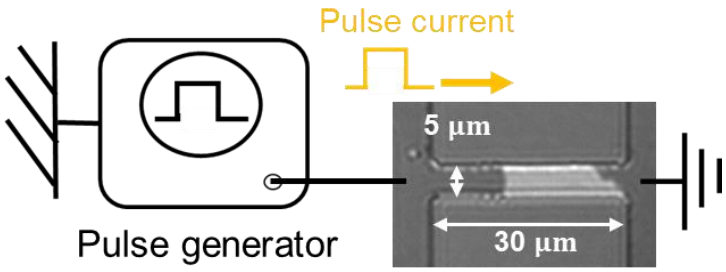

Fig.1 Schematic illustration of experimental setup and an optical micrograph of a device wire.