Current-Driven Domain-Wall Depinning in Pt/CoFe/Pt Nanowire with Perpendicular Magnetic Anisotropy

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We report the experimental determination of the spin transfer torque efficiency, by observing the current-driven domain-wall depinning of Pt/CoFe/Pt nanowire with perpendicular magnetic anisotropy. The depinning time is found to be exponentially proportional to the applied magnetic field, as well explained by the Néel-Brown formula. By injecting the current into the nanowire, the depinning time and the threshold magnetic field are noticeably varied. From the linear dependence of the threshold current density with respect to the applied magnetic field, the spin transfer torque efficiency is estimated to be $(7.2\pm0.6)\times10^{-15}$ Tm^2/A.

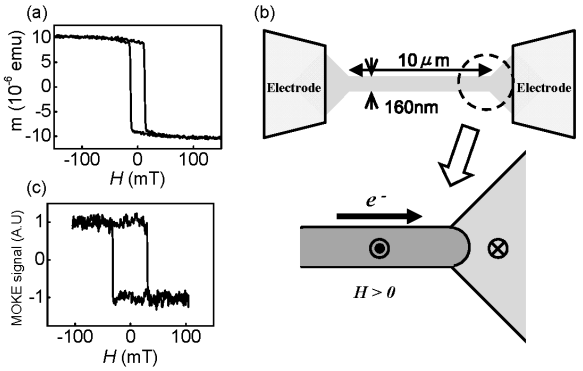

Fig. 1. (a) Out-of-plane hysteresis loop of the film measured by an alternating gradient magnetometer. (b) Sample structure and the measurement geometry. (c) Typical out-of-plane hysteresis loop of nanowire measured by the magneto-optical Kerr effect microscope.

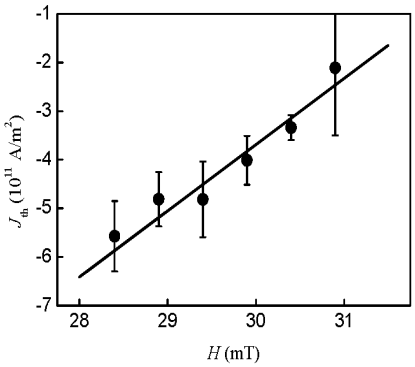

Fig. 2. The threshold current density with respect to the external magnetic field. From the best linear fit, we can obtain the spin transfer torque efficiency.