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Current-Driven Resonance of Single Domain Wall in Permalloy Nanowires SEOK-HWAN CHUNG, FRANK Y. FRADIN, AXEL HOFFMANN, Materials Science Division and Center for Nanoscale Materials, Argonne National Laboratory — The manipulation of magnetic domain structures with electrical transport current is of fundamental interest for understanding the magneto-transport properties of spintronic devices. We measured current driven domain wall resonance by using a well-defined single domain wall in half-circle nanowires with 35 μm radius. Nanowires of 40 nm-thick and 250 nm-wide Permalloy with contact pads were fabricated by multi-step electron beam lithography and subsequent lift-off processes. A single *transverse* magnetic domain wall can be effectively introduced and pinned in the center of the nanowire, due to the strong shape anisotropy, by applying external field perpendicular to the center of the wire. This was confirmed with magneto-transport measurement, magnetic force microscopy and micromagnetic simulation. We observed single domain wall resonance by measuring the reflected power as a function of driving frequency and applied pinning field. From these measurements, we can obtain the domain wall inertia (Döring mass), which is 4×10^{-8}g/cm^2 in our sample. The critical current density for the wall motion is $\sim1\times10^7$A/cm^2. We attribute the mechanism of the current driven wall motion in our sample to the spin and momentum transfer from s electrons in the conduction band to the local d electrons in the domain wall. * Supported by DOE, BES under contract W-31-109-ENG-38.

Seok-Hwan Chung
Materials Science Division and Center for Nanoscale Materials, Argonne National Laboratory

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