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Domain walls resistance study in magnetic thin films by means of thickness modulation[1] WEI-LI LEE, Department of Physics and Astronomy, Johns Hopkins Univ., F.Q. ZHU, V. THAMPY, C.L. CHIEN — The manner with which the magnetic domain wall (DW) affects the transport properties of a ferromagnet remains an interesting but difficult topic. Experimental extraction of magnetoresistance (MR) of DWs is challenging because of other dominating contributions especially the anisotropic magnetoresistance (AMR). We have explored one way to extract DW resistance by creating structures with built-in thickness modulation (THM). By capitalizing on the thickness dependence of coercivity, the domain size and hence the number of DWs can be controlled through the period of THM. In a previous work, we used lithography to pattern a 50 nm thick Co film, 5μm in width and 60μm in length. We then used a focused ion beam to create grooves transverse to its length with depth $\sim$ 8 nm and period $\sim$ 500 nm. Magnetic force microscopy reveals an induced magnetic anisotropy along the groove direction. By applying magnetic field along various directions and taking in account the AMR contributions, we have deduced that the DW resistance in Co is positive with a value of $\sim$ 29.3 mΩ corresponding to $\sim$ 0.14% MR. In the present work, the structure is prepared in different way and geometry so that current parallel to walls and current perpendicular to walls DW resistance can be both obtained from the experiment. The latest results and comparison with theoretical models will be discussed.

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