# Threshold current to move domain walls in perpendicular anisotropy[CoFe/Pt]$_N$

Ji Young Bae*, Young Jin Cho, Sung Chul Lee, Ung Hwan Pi, and Sunae Seo
Semiconductor Devices Laboratory, Samsung Advanced Institute of Technology (SAIT), Mt. 14-1, Nongseo-dong, Giheung-gu, Yongin-si, Gyeonggi-do, 446-712, Korea

Current-driven domain wall motion has now been reported in many experiments and discussed in various theories. The current-driven domains wall motion in magnetic nanowires has attracted much research interests due to its basic physical mechanisms involved and its potentials in applications such as magnetic logic [1] and high-density storage devices [2]. The experimental attention has been paid to the underlying of threshold current that is of crucial interest for low current applications to memory and sensor devices. As pointed out by Tatara and Kohno, in the limit of weak pinning and thick domain walls, threshold current density is expected to be proportional to hard-axis anisotropy [3]. The techniques do not extend to materials with perpendicular magnetic anisotropy because in-plane demagnetizing effects no longer play a role. Thus, alternative methods are needed to control wall injection and propagation in nanowires with perpendicular magnetic anisotropy. The impact of the pinning potential was reported by measuring the threshold current in spin valves with perpendicular magnetic anisotropy [4]. By artificially controlling the strength of the pinning field, the threshold current is found to decrease when reducing the pinning field.

In this presentation, we will report experimental determination of the threshold current in [Co90Fe10/Pt]$_N$ multilayer with perpendicular anisotropy while varying the strength of the applied magnetic field. The Ta(5nm)/ Pt(2.5nm)/[CoFe(0.5nm)/Pt(1nm)]$_N$ multilayer were deposited on high resistive Si substrate by dc magnetron sputtering. We studied three different samples with N=1, 3 and 5. Device was patterned as the hall cross structure with large pad as a domain wall injector. We monitored hall voltage at cross junctions with the application of current pulse. All experiments were performed in magnetic field. The current pulse amplitude which shows sudden increase of hall voltage is defined as the threshold current at each applied magnetic field. The domain wall motion in hall cross structure is controlled with 300 ns single pulse of $10^8$ A/cm$^2$ threshold current density and the domain wall moves along the electron flow by externally applied potential.

## References

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