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Current-Induced Magnetic Domain Wall Motion at Low Current Density via Perpendicular Anisotropy SOON-WOOK JUNG, POSTECH, WOOJIN KIM, TAEK-DONG LEE, KAIST, KYUNG-JIN LEE, Korea University, HYUN-WOO LEE, POSTECH — The current-induced motion of magnetic domain walls carries great potentials for applications such as nano-scaled logic and memory devices. To achieve this goal, a large reduction in the threshold current density J_c for the domain wall motion is highly desired. Here we show that by introducing and properly exploiting the perpendicular magnetic anisotropy, J_c can be reduced by one or even two orders of magnitude in experimentally accessible parameter regimes. Using the collective coordinate approach, we analyzed the physical origin of the reduction. The analytic result was also tested by micromagnetic simulations of the LLG equation with spin transfer torque terms. The resulting J_c is insensitive to domain wall pinning forces and also to the non-adiabaticity, both of which are hard to control in experiments.

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