Elucidation and application of current-induced domain wall motion

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Current-induced magnetic domain wall motion has been attracted much attention both from scientific and technological points of view\(^1\). When a magnetic DW is driven by electric current via adiabatic spin torque, theory predicts a finite threshold current even for a perfect wire without any extrinsic pinning\(^2\). We have shown that this intrinsic pinning determines the threshold current, and thus that the adiabatic spin torque dominates the DW motion resulting in DW motion along electron flow direction, in a perpendicularly magnetized Co/Ni system sandwiched by a symmetric capping and seed layers\(^3\)\(^\text{-7}\). On the other hand, current-induced DW motion against electron flow direction has been observed in ultrathin magnetic films in which the structural inversion symmetry (SIA) was broken\(^8\)\(^,\)\(^9\). Recently, this DW motion against electron flow direction has been explained by the combination of a chiral DW stabilized by Dzyaloshinskii–Moriya interaction (DMI) and spin Hall torque\(^10\)\(^\text{-}12\). Effect of DMI on the field-induced DW motion is also discussed\(^13\).

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Reference