Manipulation of the magnetic moments in ferromagnetic (FM) layers via various spin torques has enabled the spintronics research community to encode the digital data in low-power, non-volatile memory and logic devices. Current-induced coupled domain wall (DW) dynamics are investigated in both in-plane and perpendicular magnetic anisotropy materials via experimental and micromagnetic simulations. The effect of DW stray field on DW dynamics in a neighbouring NiFe nanowire with in-plane magnetic anisotropy is studied using micromagnetic simulations. The DWs in the multi-nanowire systems are driven by passing spin-polarized currents to one of the nanowire. The phenomenon is made possible due to the magnetostatic coupling between the DWs. To minimize the stray field from the DWs, current-induced magnetization manipulation in antiferromagnetically coupled thin films (FM/Ru/FM) with perpendicular magnetic anisotropy is investigated experimentally. A qualitative method is proposed to determine the spin-orbit torque (SOT) effective fields. The SOT fields in the SAF structures are found to be a vector sum of the individual SOT fields of the two FM layers. The SOT fields were efficiently modulated by tuning the net areal magnetization of the SAF structure. The DWs in the SAF structures are driven by nanosecond long current pulses. The RKKY exchange torque on the SOT-driven antiferromagnetically coupled Néel DWs can move the Néel DWs with a velocity of ~ 300 m/s at a current density of $1.04 \times 10^{12}$ A/m$^2$. The interplay between the SOT and RKKY coupling and its effect on the DWs dynamics are explained via the micromagnetic simulations. The SAF magnetic memory devices are found to be radiation hard and the DW memory devices are still able to perform continuous data writing and reading even after being irradiated by several high energy proton beams. The devices are annealed at different temperatures over a range of time spans in atmosphere and the thermal stability factor ($\Delta$) is calculated for the data retention. The SAF DW memory devices are found to have $\Delta = 33$ at an elevated temperature of $T = 190^\circ$ C.

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**Current-driven domain wall dynamics in coupled ferromagnetic structures**