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Pulse-Current-Induced Switching of Ta/CoFeB/MgO with Perpendicular Magnetic Anisotropy YU-MING HUNG, LAURA REHM, GEORG WOLF, ANDREW D. KENT, Department of Physics, New York University — We study current-induced switching of thin magnetic layers with perpendicular magnetic anisotropy using in-plane currents and the spin-Hall effect in the quasi-static (swept current) and pulsed-current regimes. Our aim is to investigate the dynamics and efficiency of spin-transfer switching. The layer stacks consists of β-Ta(5nm)/$Co_{40}Fe_{40}B_{20}$(0.8nm)/MgO(2nm)/Ta(2nm) layers on oxidized silicon substrates. Hall bar structures with dimensions of $15 \times 180\,\mu m^2$ and cross shaped devices with width of $6\,\mu m$ are investigated with DC transport and pulse measurement, respectively. In DC transport experiments, we could switch the magnetization states reproducibly by varying the in-plane field and current. In pulsed experiments, we measured the dependence of the switching probability on pulse amplitude and duration in the presence of an in-plane field. A histogram analysis indicates the existence of intermediate states and suggests incoherent magnetization switching. Nearly 100% switching probability could be achieved at high enough pulse amplitude of 25.5 MA/cm^2 with 10 ns pulse duration and an applied field of $\sim$120 mT.
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