Current induced magnetization switching in magnetic tunnel junctions with perpendicular magnetic anisotropy

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Magnetic Tunnel Junctions (MTJs) with Perpendicular Magnetic Anisotropy (PMA) are of great interest for high-density non-volatile magnetic random access memory due to possible low critical current density, good thermal stability and downscalable junction size [1]. We present experimental data on MTJs with following layers structure (thicknesses in nm) 5 Ta / 20 Ru / 5 Ta / 1.0 CoFeB / 0.8-1.3 MgO / 1.5 CoFeB / 5 Ta / 5 Ru. Elliptical nanopillars with the dimensions ranging from 1 µm down to 170 nm exhibiting PMA and tunneling magnetoresistance of 90% were fabricated using e-beam lithography. Current induced magnetization switching hysteresis loops with voltage pulses of different time lengths were measured, from which intrinsic critical current density of -0.47 MA/cm² for parallel to anti-parallel and 1.03 MA/cm² for anti-parallel to parallel switching was derived.

References:

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