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

M. Frankowski,[1] W. Skowroński,[1] S. Ziętek,[1] M. Czapkiewicz,[1] A. Żywczak,[1] W. Powroźnik,[1] J. Wrona,[1] J. Kanak,[1] P. Wiśniowski,[1] and T. Stobiecki[1]

[1] *AGH University of Science and Technology, Department of Electronics*

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 lenghts were measured, form which intrinsic critical current density of -0.47 MA/cm^2 for parallel to anti-parallel and 1.03 MA/cm^2 for anti-parallel to parallel switching was derived.

References:

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This projectis supported by the Diamond Grant DI2011001541 and Swiss Contribution by NANOSPIN PSPB-045/2010 grant.