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Magnetic anisotropy properties of CoFeB/W bilayers and W/CoFeB/MgO trilayers YONGXI OU, YUN LI, L.H. VILELA LEAO, CHI-FENG PAI, D.C. RALPH, R.A. BUHRMAN, Cornell Univ — The development of highly scaled spin torque MRAM cells requires that the ferromagnetic free layer in a magnetic tunnel junction, generally a CoFeB layer in combination with an MgO tunnel barrier, have strong perpendicular magnetic anisotropy (PMA) in as thick a free layer as possible. Currently this PMA is believed to arise from interfacial anisotropy energy at the CoFe/MgO interface due to Fe-O bonds. We have found that strong PMA can also be achieved in W/CoFeB/MgO trilayers under certain growth and annealing conditions. Control experiments with amorphous-substrate/CoFeB/W bilayer structures indicate that PMA can be induced by the interface between CoFeB and W and that the effective interfacial anisotropy energy density is quite large in comparison to that found with the CoFeB/MgO PMA system. We have used spin torque ferromagnetic resonance to study the angle dependent anisotropy in these structures and find that there is a quite strong second order component competing with the first order term. We have used second-harmonic anomalous Hall voltage measurements to determine the strength of the spin-orbit torques in these W based systems. We will report on these measurements as well as on the spin-Hall-effect induced switching in our samples.

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