DOMAIN WALL DYNAMICS IN PERPENDICULARLY MAGNETIZED Pt/CoFeB/Pt MEDIA; MAGNETIC CHARACTERIZATION AND MICRO-MAGNETIC SIMULATIONS

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Domain wall motion (DWM) in perpendicularly magnetized nanowires is of particular interest due to the wide tuneability of the critical parameters governing its dynamics. Ultrathin Co layers (0.3 - 1.5 nm) sandwiched between Pt have been extensively studied in the past decades due to the high perpendicular magnetic anisotropy (PMA) resulting in well defined perpendicularly magnetized layers. By nanostructuring these layers using EBL and FIB we obtain single domain nanowires in which we can create and manipulate domain walls. Furthermore, the PMA results in very narrow domain walls (~5 nm) opening up the possibility to study the much debated non-adiabatic spin-torque [1].

We have characterized sputter deposited Pt/CoxFe80-xB20/Pt as a function of thickness and x ranging from 0-80 atomic weight percent, using magnetometry (SQUID, MOKE), extraordinary hall effect, and pump-probe techniques. Hereby we obtain critical parameters for DWM such as the saturation magnetization, magnetic anisotropies and coercivity but also dynamical parameters such as the damping parameter α and Barkhausen volume.

Using the experimental parameters we have performed micro-magnetic simulations on the field and current induced DWM in perpendicularly magnetized nanowires. The simulations show similar features as in-plane DWM, such as a Walker breakdown field. However, the dynamics of the domain wall shape after the Walker breakdown is remarkably different. Finally, we identify the critical parameters in perpendicularly magnetized nanowires for field and current induced DWM for optimizing our proposed nanomagnetic system.

[1] G. Tatara and H. Kohno, PRL **92** 086601 (2004)