Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Interlayer spin transfer torque excited by spin-orbit effects in ferromagnets MARK D. STILES, Center for Nanoscale Science and Technology, NIST, Gaithersburg, USA, TOMOHIRO TANIGUCHI, National Institute of Advanced Industrial Science and Technology (AIST), Spintronics Research Center, Tsukuba, Japan, JULIE GROLLIER, Unité Mixte de Physique CNRS/Thales and Université Paris Sud 11, Palaiseau, France — While spin transfer torques generated by the spin Hall effect show the promise of effective switching in some devices, in others, the lack of control over the direction of the incident spins limits their efficiency. Here, we show that spin-orbit effects in ferromagnets, the anomalous Hall effect and the anisotropic magnetoresistance, allow greater control of the orientation of the incident spins. These spin-orbit effects cause in-plane electrical currents in one layer to inject spin currents, flowing perpendicularly to the electrical current, into another layer. The orientations of the flowing spins can be controlled through the orientation of magnetization in the "fixed" layer because transverse spin components dephase rapidly to zero and the spins become aligned with the magnetization. This control makes it possible to switch perpendicularly magnetized layers more easily. It also makes it possible to switch in-plane magnetized layers via propagation of transverse/vortex walls and can efficiently induce dynamics in coupled magnetic systems, e.g. coupled transverse domain walls. We calculate torques and critical currents for switching in CoFe/Cu/FePt structures, and domain wall velocities in Py/Co/Py structures.

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Date submitted: 13 Nov 2014 Electronic form version 1.4