Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

The effect of annealing on the spin-transfer torques of MgO MTJ nanopillars YUN LI, HSIN-WEI TSENG, PINSHANE HUANG, JOHN READ, DAN RALPH, ROBERT BUHRMAN, Cornell University, Ithaca NY 14853 — Thermal annealing is essential for enhancing the tunneling magnetoresistane (TMR) of magnetic tunnel junctions, and many studies have focused on the effect of annealing on MTJ chemical, structural, and electrical transport properties. Here, we report the magnetic, electronic properties and the in-plane and field-like spin-transfer torques (STT) in both as-grown and post-annealed FeCoB/MgO/FeCoB MTJs nanopillars. We find that the 350 $^{\circ}$C vacuum annealing breaks the symmetry of the bias dependence of the TMR, conductivity, and switching phase diagram (SPD). Moreover STT-FMR measurements indicate that annealing substantially increases the in-plane torque asymmetry with bias voltage direction, as well as affecting the field-like torque magnitude, with the latter indicating a very significant enhancement of interlayer exchange coupling across the barrier. This STT change is consistent with the change in chemical composition and structural coherency of the MTJ interfaces and electrodes, indicated by XRD and analytical STEM analyzes.

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Date submitted: 23 Nov 2010 Electronic form version 1.4