Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Investigation on spin-orbit torque induced perpendicular switching through voltage controlled magnetism[1] CHONG BI, MENG XU, MARCUS ROSALES, TY NEWHOUSE-ILLIGE, HAMID ALMASI, WEIGANG WANG, Department of Physics, University of Arizona, Tucson, Arizona 85721, USA — Spin-orbit torques are shown to induce perpendicular magnetic switching in ultrathin ferromagnets (FMs) adjacent to heavy metals (HMs). Here, we demonstrated that the critical current density (J_c) for such perpendicular switching in HM/FM/oxide structures can be dramatically modulated by gate voltage induced reversible oxidation at FM/oxide interfaces [1]. Through controlling perpendicular anisotropy and saturation magnetization (M_s) of FM layer, respectively, we show M_s, rather than anisotropy field as suggested in macrospin model [2], dominates J_c. Moreover, the measured external field dependent J_c results indicate that the spin-orbit torques have either a bulk or interface origin under different magnetization states. These results not only provide a promising means toward energy-efficient switching, but also offer further insights in understanding the reversal mechanism of the ferromagnetic layer. This work was supported in part by NSF (ECCS-1310338) and by C-SPIN, one of six centers of STARnet, a Semiconductor Research Corporation program, sponsored by MARCO and DARPA.[1] C. Bi et al, submitted, [2] L. Liu et al. Phys. Rev. Lett. 109, 096602 (2012).

[1]This work was supported in part by NSF (ECCS-1310338) and by C-SPIN, one of six centers of STARnet, a Semiconductor Research Corporation program, sponsored by MARCO and DARPA.

Chong Bi
Department of Physics, University of Arizona, Tucson, Arizona 85721, USA

Date submitted: 14 Nov 2014 Electronic form version 1.4