Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Current-induced domain wall motion in the presence of spin Hall effect JISU RYU, PCTP and Department of Physics, Pohang University of Science and Technology, Kyungbuk 790-784, Korea, KYUNG-JIN LEE, Department of Materials Science and Engineering, Korea University, Seoul 136-701, Korea, HYUN-WOO LEE, PCTP and Department of Physics, Pohang University of Science and Technology, Kyungbuk 790-784, Korea — Recently, traces of the spin Hall effect-induced spin transfer torque (SHE-STT) on a domain wall motion (DWM) are observed.[1] While the magnetization reversal of a single domain by SHE-STT [2] can be understood rather intuitively, SHE-STT effect on a DWM is indistinct. This issue is theoretically investigated [3] in ideal nanowires, where extrinsic pinning centers are absent. In practical situations, however, the DWM can be largely affected by the pinning centers such as nanowire defects. Here, we theoretically study SHE-STT effects on a DWM in the presence of extrinsic pinning centers. We first calculate the threshold current density J_C, above which a DW can escape from a pinning center. We found that SHE-STT can significantly reduce J_C of a DW with certain chirality. Secondly we examine a DWM direction. In ideal nanowires [2] SHE-STT can induce a DWM against electron flow in a certain current density range. We found that this reversed DWM can be prohibited for the pinning strength larger than certain threshold value. From this feature, we suggest one way to distinguish SHE-STT and the Rashba spin-orbit coupling induced STT. [1] P. P. J. Haazen et al., arXiv:1209.232(2012). [2] Liu et al., Science 336, 555(2012). [3] S.-M. Seo et al., Appl. Phys. Lett. 101, 022405(2012).

Jisu Ryu
Department of Physics, POSTECH, Republic of Korea

Date submitted: 09 Nov 2012 Electronic form version 1.4