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Generation and detection of spin current in GaAs with MgO tunnel barriers Replace Y.J. PARK, Francis Bitter Mag. Lab., MIT, Cambridge, MA 021392 / Nanodevice Res. Center, Korea Inst. of Sci. and Tech., Seoul, Korea, M. VAN VEENHUIZEN, J.S. MOODERA, Francis Bitter Mag. Lab., MIT, Cambridge, MA 02139, C.H. PERRY, D. HEIMAN, Dept. of Phys., Northeastern Univ., Boston, MA 02115 — The MgO tunnel barrier has been proven as one of best candidates for the spintronic memory and switching devices. When one injects and detects spin polarized carriers efficiently into (and out of) semiconductors, the use of tunnel barrier (TB) is expected to avoid the conductivity mismatch and provide a high feasibility for the fabrication of a spin transistor. To reach this goal evaluation of the TB on a semiconductor is an important issue. In this work, we report the combination of spin dependent photocurrent generation and electrical detection as an efficient technique for understanding the role of the MgO TB grown on GaAs. We used (100)GaAs/MgO/Fe structures prepared in an MBE chamber. Our results show that spin filtering effects are largely influenced by the quality of MgO TBs. The estimated photocurrent polarization reaches up to approximately 80% at RT in a certain forward bias region which is associated with transport processes. The efficient room temperature spin filtering for GaAs/MgO/Fe structures observed here has not been reported yet for either Fe/GaAs or Fe/Al_2O_3/GaAs structure. The possible origin will be discussed in detail.

Young Ju Park
Francis Bitter Magnet Laboratory, MIT, Cambridge, MA 021392/
Nanodevice Research Center, Korea Institute of Science and Technology, Seoul, Korea

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