CP08

Magnetic Circular Dichroism Spectra of 3d Ferromagnets

T. Trypiniotis*, M. K. Kim, K. Y. Lee, D. H. Y. Tse, C. A. F. Vaz, D. M. Gillingham, J. A. C. Bland, and C. H. W. Barnes
Cavendish Laboratory, University of Cambridge, J. J. Thomson Avenue, Cambridge CB3 0HE, UK
*Corresponding author: T. Trypiniotis, e-mail: tt217@cam.ac.uk

One consequence of magneto-optics is magnetic circular dichroism (MCD), where for any ferromagnetic (FM) material there is a difference in the absorption coefficients for right- and left- circularly polarised light [1]. MCD is of particular importance to spintronics research since many techniques of studying spin transport rely on optical means for interpreting spin polarisation through optical spin orientation [2]. Such measurements involve spin injection experiments using spin-LED structures and spin detection using photoexcited spin polarised carriers travelling across the FM/semiconductor intrerface. The contribution of MCD to such experimental results might be mistaken for spin dependent transport effects or even mask them and is clearly undesirable [3]. Although some studies have measured MCD spectra, for example Manago et al. for Fe [4] and Markov et al. for Fe and $Ni_{80}Fe_{20}$ [5], systematic studies for all the major 3d FMs are yet to be reported.

Here we present a systematic study of MCD effects for the 3d FM metals and their alloys. Semi-transparent FM thin films were grown on glass substrates using molecular beam epitaxy at pressures of about 5×10^{-10} mbar. The MCD data is acquired in transmission using a polar geometry where the electric field is applied perpendicular to the sample plane by measuring the change in transmission for the two photon helicities. A photoelastic modulator is used to modulate the light between the two circular polarizations while measuring difference in transmission. A wavelength range of 400-1000 nm is covered utilising a combination of a white light source and a monochromator.

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CP09

Fe/MgO contact to InAs 2 DEG semiconductor

Seong Hoon Shim[1,2], Joonyeon Chang[1,3]*, Young Ju Park[1,3], Yun-Hi Lee[2], J. S. Moodera[3], and Suk-Hee Han[1]
[1]Center for Spintronics Research, Korea Institute of Science and Technology, Seoul 136-865, Korea
[2]National Research Laboratory for Nano Device Physics, Department of Physics, Korea University, Seoul 136-713, Korea
[3]Francis Bitter Magnet Laboratory, MIT, Cambridge, Massachusetts 02139 USA
*Corresponding author: Joonyeon Chang, e-mail: presto@kist.re.kr

The electrical injection and detection of the spin-polarized current at the interface between ferromagnets and semiconductors are essential for the spintronic devices. Utilization of effective tunnel barrier helps to overcome the intrinsic conductance mismatch between metal and semiconductor, which is a major source of low electrical spin injection. MgO tunnel barrier (TB) has currently much attentions because high TSP can be demonstrated in the magnetic tunneling junctions.[1] Some works reported the plausibility of MgO on Si and GaAs but did not show any meaningful spin signals by electrical measurements. [2,3] In the work, we present a purely electrical detection of spin injection and accumulation in InAs quantum wells through MgO tunnel barrier.

We fabricated a diode structure consisting of single ferromagnetic Fe electrode and an InAs based 2DEG semiconductor channel between which 2nm thick MgO layer was introduced, and observed spin-dependent transport across ferromagnet-insulator-2DEG junction.

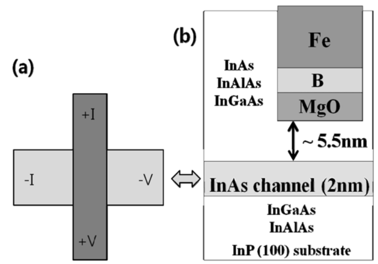

Fig. 1. Plan (a) and cross section (b) view of a diode structure patterned on InAs 2DEG.

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