

Electrical detection of Dresselhaus term in an InAs quantum well structure

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The spin-orbit interaction (SOI) is one of the major concerns in the field of spin transistor devices because spin precession can be controlled by SOI parameter [1]. In a semiconductor channel SOI is divided into two terms, Rashba and Dresselhaus terms. The Rashba spin-orbit interaction (RSOI) is induced by the structural inversion symmetry and the Dresselhaus spin-orbit interaction (DSOI) is resulted from bulk inversion asymmetry. Detection and application of RSOI has been researched, however, DSOI has not because these two effects are phenomenologically inseparable so extraction of individual field is not simple. The Rashba field is always perpendicular to the wavevector but the orientation of the Dresselhaus field depends on the crystal orientation of channel [2]. Thus, for the various crystalline orientations we measured the Shubnikov-de Haas oscillations in an InAs quantum well system. Values for the Rashba parameter of 6.73×10^{12} eV/m and for the Dresselhaus parameter of 0.57×10^{12} eV/m were sequentially extracted and also the gate dependences of the two parameters were determined.

[1] H. C. Koo, J. H. Kwon, J. Eom, J. Chang, S. H. Han, and M. Johnson, *Science*, 325, 1515 (2009).

[2] Y. H. Park, H. -j. Kim, J. Chang, S. H. Han, J. Eom, H. -J Choi, and H. C. Koo, *Appl. Phys. Lett.* 103, 252407 (2013).