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Electric field control of cubic-Rashba spin orbit interaction in two-dimentional hole gas confined in Ge/SiGe quantum well RAI MORIYA, Institute of Industrial Science, University of Tokyo, YUSUKE HOSHI, Graduate School of Engineering, Nagoya University, KENTAROU SAWANO, YASUHIRO SHIRAKI, Advanced Research Laboratories, Tokyo City University, NORITAKA USAMI, Graduate School of Engineering, Nagoya University, SATORU MASUBUCHI, TOMOKI MACHIDA, Institute of Industrial Science, University of Tokyo
— Recently, control of hole spins in the semiconductor heterostructure have received considerable attention. Due to the strong spin orbit interaction (SOI) of the holes, efficient electrical control of hole spins can be demonstrated. However due to the difficulty in fabrication of high quality samples, the studies of the SOI in the holes are still limited. The high mobility two-dimentional hole gass (2DHG) can be obtained in Ge/SiGe quntum well structure due to its small hole effective mass. Moreover since Ge is inversion symmetric crystal, only the Rashba-type SOI due to the structural inversion asymmetry is allowed. Thus 2DHG in Ge is a good platform to study the SOI of the holes and to demonstrate its electric field control. We fabricated gated Hall bar device from Ge/SiGe quantum well and studied low magnetic field transport of the 2DHG. At low temperature, a weak anti-localization is observed. From the comparison with analytical model, we attribute this is due to the cubic-Rashba spin orbit interaction. The electric field applied with gate voltage significantly alter the weak anti-localization peak, thus enable us to control SOI with electric field.

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