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Resonant tunneling effect and tunneling magnetoresistance in ferromagnetic-semiconductor quantum heterostructures SHINOBU OHYA, Dept. of Electronic Eng., The Univ. of Tokyo; PRESTO JST, PHAM NAM HAI, YOSUKE MIZUNO, Dept. of Electronic Eng., The Univ. of Tokyo, MASAAKI TANAKA, Dept. of Electronic Eng., The Univ. of Tokyo; SORST JST
— Ferromagnetic-semiconductor quantum heterostructures are expected to realize novel functions by combining the resonant tunneling effect and the tunneling magnetoresistance (TMR). However, there are no reports on the clear observation of the resonant tunneling effect and TMR associated with it in these structures. We fabricated the GaMnAs quantum-well (QW) double-barrier heterostructures composed of GaMnAs(20 nm)/AlGaAs(4nm)/GaMnAs(d=3.8-20 nm)/ AlAs(4nm)/GaAs:Be on p-GaAs (001) substrates using molecular-beam epitaxy (MBE). The dI/dV-V characteristics and bias dependence of TMR measured at 2.6 K clearly show oscillatory behaviors in the negative bias region where holes are injected from the GaAs:Be layer to the GaMnAs QW. With increasing d, the peaks of these oscillations shift to smaller voltages and the period becomes short, which indicates that they are induced by the resonant tunneling effect. This work was partly supported by PRESTO/SORST of JST, Grant-in-Aids for Scientific Research, IT Program of RR2002 of MEXT, and Kurata-Memorial Hitachi Science & Technology Foundation.

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