Temperature Dependence of Electron Tunneling between Quantum Dots and Electron Gas\textsuperscript{1} YOKO SAKURAI, SHINTARO NOMURA, YUKIHIRO TAKADA, KENJI SHIRAISHI, University of Tsukuba, MASAKAZU MURAGUCHI, TETSUO ENDOH, Tohoku University, MITSUHISA IKEDA, KATSUNORI MAKIHARA, SEIICHI MIYAZAKI, Hiroshima University — We report that gate voltages required for electron injection to quantum dots (QDs) from electron gas and for emission from QDs strongly depend on temperature. For this experiment, Si-QDs floating gate MOS capacitors were designed and fabricated. Displacement current (I) was measured as a function of the gate voltage (V). Peaks in I-V curves appear as a result of charging and discharging of Si-QDs. We have found that the gate voltages for the electron injection to and for the emission from QDs shift toward more positive and negative values with decreasing temperature, respectively. Theoretical study predicts that electron tunneling is strongly enhanced when initial state of 2DES is localized below the QD [1]. Based on this discussion, the experimentally obtained results suggest that localization of electron gas induced by thermal fluctuation is responsible for enhanced electron tunneling.


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