T-13

Magneto-photoluminescence transitions of GaAs/AlGaAs coupled double-well structures

Y. H. Shin, Y. H. Park, Yongmin Kim*

Department of Applied Physics, Dankook University, Seoul 140-714, Korea.

A thin AlGaAs barrier (2.5 nm) inserted into a GaAs/AlGaAs single heterojunction formed a square and a wedge-shaped triangular quantum well in the conduction band. In such a structure, the valence band does not have tunnel-coupled energy levels. Hence, the photogenerated valence holes tend to move to the GaAs flatband region. This asymmetric quantum structure showed intense nonlinear photoluminescence emission behavior with external excitation power and magnetic field. Increasing the external laser power simply caused the number of photogenerated holes to increase near the interface close to the quantum well, which then recombined with the conduction band electrons. External magnetic fields resulted in an increased Coulomb attraction which generated dynamic movement of valence holes. The migration of unbound holes to the interface region from the GaAs flatband area produced highly nonlinear optical transitions in magnetic fields.

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