Nanooptics and photonics

Peculiarities of polarized magnetophotoluminescence of InGaAs/GaAs quantum wells

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Strained-layer structures offer the ability to adjust their properties by the appropriate choice of materials and growth conditions for various microelectronics and optoelectronics applications. This is the case of the InGaAs/GaAs heterostructure, which has been extensively investigated. This structure is at the heart of many high-speed and high-frequency electronic devices such as lasers, the state-of-the-art quantum cascade lasers, and light-emitting diodes, detectors for optical communications and sensing, and solar cells.

Undoped strained $In_xGa_{1-x}As$ ($0.13<x<0.15$) quantum wells grown by molecular beam epitaxy on (001) GaAs are studied by means of polarization and excitation power-dependent photoluminescence in magnetic fields up to 9 T applied parallel to the growth axis and at low temperature (~10 K). It is found strong polarization switching from σ^+ to σ^- circular polarizations in the spectral range of 1e-1hh exciton transition induced by magnetic field and specific oscillations of the photoluminescence peak intensity for N=0 Landau transitions under high intensity excitation and changing magnetic field. The origin of these oscillations is discussed related to the nanostructures arising in the InGaAs quantum well due to specific In segregation. These structures due to peculiarities of strain distribution and spatial and magnetic field confinement can develop type I-type II behavior depending on the experimental conditions.