PHOTOLUMINESCENCE PARAMETERS AND CRITICAL THICKNESS OF $In_xGa_{1-x}As$ QUANTUM WELL LAYERS EMBEDDED IN GaAs MATRIX

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Here, we present the photoluminescence study of $In_xGa_{1-x}As$ single quantum wells grown on the GaAs substrate with x ranging between 0.16 and 0.35. Thicknesses of the quantum well (QW) layer were about or substantially larger than critical ones. The results obtained suggest that: 1) heterostructures with QW layers that thickness does not exceed the critical one are homogeneously elastically strained almost without defects; 2) the concentration of defects generated in thick QW layers increases with increase of thickness exceeding the critical one (it is roughly equal to several units of 10^{11} cm^{-2} for the layers with $x > 0.2$ and thickness exceeding the critical one by a factor of about 1.6); 3) in thick layers, there is a large long-range inhomogeneous redistribution of In atoms. This is found from the dependences of the full-width-at-half maxumum (FWHM), energy of photoluminescence transition, and their dispersions on a deviation of the thickness of a quantum layer from the critical one. The results obtained are compared with those of structural studies presented previously by other researches.