OPTICAL POLARIZATION ANISOTROPY, INTRINSIC STARK EFFECT AND COULOMB EFFECTS ON THE LASING CHARACTERISTICS OF [0001]-ORIENTED $GaN/Al_{0.3}Ga_{0.7}N$ QUANTUM WELLS

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S u m m a r y

We present a theoretical investigation of space separated electron and hole distributions, which consists in the self-consistent solving of the Schrödinger equations for electrons and holes and the Poisson equation. The results are illustrated for the $GaN/Al_{0.3}Ga_{0.7}N$ quantum well. The optical gain spectrum in a [0001]-oriented $GaN/Al_{0.3}Ga_{0.7}N$ quantum well in the ultraviolet region is calculated. It is found that both the matrix elements of optical transitions from the heavy hole band and the optical gain spectrum have only the strict x (or y) light polarization. We present studies of the influence of the confinement of wave functions on the optical gain which implicitly depends on the built-in electric field calculated to be 2.3 MV/cm. Whereas the structures with narrow well widths exhibit the usual development of the light gain maximum almost without shifting the spectral region, a significant blueshift of the gain maximum is found with increase in the plasma density for wider quantum wells. This blueshift is ascribed to the interplay between the screening of a strain-induced piezoelectric field and the bandstructure. A large Sommerfeld or Coulomb enhancement is present in the quantum well.