

State Switching in the Lasing of 1.3 μm GaAs-based InAs Quantum Dot Laser Diode

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We have investigated the characteristics of GaAs-based 1.3 μm quantum dot laser diodes (QDLs) with $\text{Al}_{0.7}\text{Ga}_{0.3}\text{As}$ cladding layer and the active region consists of 3-stacked InAs quantum-dots (QDs) in an $\text{In}_{0.15}\text{Ga}_{0.85}\text{As}$ quantum well (DWELL). The QDLs were fabricated to ridge waveguide structure and applied a high reflection coating on one-sided mirror facet. Under a pulsed mode operation (0.1 %), for a $50 \times 1500 \mu\text{m}^2$ QDL the threshold current density, the lasing wavelength and the characteristic temperature are 95 A/cm^2 , $1.31 \mu\text{m}$ and 113 K, respectively. The QDLs showed a clear state switching from the ground state (GS) lasing at a wavelength of $1.31 \mu\text{m}$ to the excited state (ES) lasing at a wavelength of $1.23 \mu\text{m}$. The lasing wavelength switching from the GS to the ES depends on the cavity lengths, the injection currents and operating temperatures due to the gain saturation of the GS.

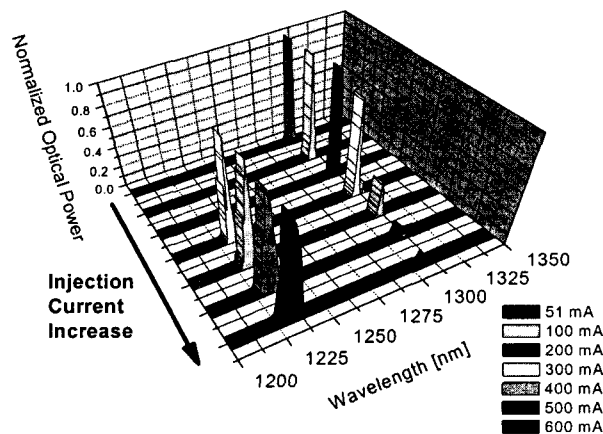


Fig. 1. The normalized lasing spectra of QDL as a function of the injection current.