MOLECULAR BEAM EPITAXY OF InAs-on-InP QUANTUM-DASH LASERS FROM O-BAND TO C-BAND

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Quantum Dots and Quantum Dashes are good candidates to replace Quantum Wells as gain-medium for Datacom and Telecom applications. Quasi-0-Dimensional carrier-confinement, resulting in a discrete energy level has shown to improve laser performances as compared to mainstream Quantum-Well lasers [1]: lower temperature-dependence and higher maximum operating-temperature. However, lower threshold current density and increased material gain remain challenging.

At 1.3 μm,there are already market-available high-performance InAs/GaAs Quantum-Dot lasers on GaAs [2;3]. Extending wavelength in C-band on GaAs is however challenging. A significant amount of work has focused on 1.55 μm Quantum-Dash lasers on InP [4]. Only a few papers have investigated 1.3 μm-emission of QD on InP [5].

We demonstrate here the growth of InP-based QD lasers with good performances in the 1.3 to 1.5 μm wavelength range, by accurately controlling size and strain of InAs-on-GaInAsP quaternary alloys. Growths were performed in a 3x2" gas-source MBE system. 300K Photo-Luminescence with Full-Width-at-Half-Maximum of 56 to 68 nm have been obtained as shown figure-1, demonstrating the quality of epi-structures.

Lasers were processed using buried processes (Buried-Ridge-Stripe BRS and Semi-Insulating-Buried-Heterostructure, SIBH).

Continuous-Wave (CW) laser operation with threshold current density of 914.3 A/cm² (unmounted) was measured. At 200 mA, laser output power is as high as 21.6 mW/facet (inset fig.1). A dramatic 170 nm blue shift has been observed, due to intermixing, after SIBH process. BRS-processed C-band and O-band laser structures, initial results have shown a significantly reduced blue shift, below 60 nm and 20 nm respectively.