shown that the size of carrier density effects can depend strongly result in an underestimate of the thermal impedance. It has been that neglecting the carrier-associated refractive index changes can ignore the heating effects present within the duration of a current 

Conclusion: We have presented an improved method for the measurement of the thermal impedance of semiconductor lasers. This overcomes the limitations of previously established methods which ignore the heating effects present within the duration of a current pulse. We have also shown that carrier density induced refractive index changes are significant and can lead to an underestimated thermal impedance if ignored.

Acknowledgment: We acknowledge support from the DTI Link Practical Optical Pump Sources (POPS) programme.

References

Vertical-cavity surface-emitting lasers with periodic gain and aluminium top contacts


Indexing terms: Vertical cavity surface emitting lasers, Lasers

The authors report low threshold current operation of InGaAs/AlGaAs vertical-cavity surface-emitting lasers. A periodic gain structure allows more strained wells to be used than in conventional multiquantum-well devices, offering advantages for high-power devices. Aluminium oxide contacts grown by molecular beam epitaxy are used on lasers for the first time.
mirror reflectivity are reduced total thickness and greater scope for making an asymmetric cavity for increased output coupling.

24~ circles, measured at the active layer, gave CW threshold current density double the smallest devices that could be probed, albeit with inconsistent characteristics, were 10μm squares. CW threshold currents and maximum powers were ~1.7mA and 270μW for three-well devices, and 3.5mA and 460μW for six-well devices.

The low minimum threshold current density, equal to the lowest reported CW value [2], attests to the quality of our structures. The six-quantum-well VCSEL, gave a threshold current density double that of the three-well design, but exhibited lower series resistance and higher maximum power as expected. Because of their higher threshold current, six-well devices had a slightly higher threshold voltage, 3.0V compared to 2.85V for 40μm squares, but well above the threshold they gave a higher maximum overall electrical-to-optical power conversion efficiency, 1.2% compared to 1.0%. Although our devices have not been optimised for high-power operation [3], the results show that increasing the number of wells is a possible route to further increasing the output power. Other potential advantages of the less severe requirements for the mirror reflectivity are reduced total thickness and greater scope for making an asymmetric cavity for increased output coupling efficiency.

Fig. 2 Room-temperature CW power-voltage-current characteristics of nominally 40μm square devices from two wafers.

(i) device with three quantum wells (bold)
(ii) device with six quantum wells

Acknowledgments: The authors thank J.A. Stegeman for operating the electron microscope, T.J. Eijkemans for assistance in the optical measurements and F.W. Ragay for valuable discussions. This work was supported by the Dutch Ministry of Economic Affairs through the IOP Electro-Optics program.

References

Generally graded TLM mesh using the symmetrical supercondensed node

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Indexing terms: Transmission line matrix method, Modelling

An implementation of an improved all-link line symmetrical condensed node for the TLM method is presented. The novel node has the advantage of containing no stubs but is still capable of modeling inhomogeneous media in a generally graded mesh; it requires less storage and run time than the stub-loaded and hybrid nodes, can operate on a higher time-step than previous nodes and it is shown to have a reduced velocity error for axial propagation.

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