INVESTIGATION OF THE USE OF AlGaAs/InGaAs QUANTUM WELL FOR NIR EMITTERS

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Near infrared emitters (NIR) lasers are used in many different applications from material processing, communication, consumer electronics, atmospheric monitoring to the medical.
One particular type of laser structure that is suitable for many of these applications due to its flexibility is the vertical external cavity laser (VECSEL). This structure is comprised of a mirror and an active area that consist of quantum wells. The composition and design of these quantum wells allows to modify the emission energy of the laser.
In our work we are focused on the fabrication and optimization of a source that emits at 976nm. This wavelength finds different application one of which is the generation of 488nm light via frequency doubling.
To due to the power lost during the conversion of light it is particularly important to improve the output power of the device.

To achieve this we studied how a different QW design in which InGaAs/GaAs QW are substituted by InGaAs/AlGaAs/GaAs structure can allow to increase the photoluminecese (PL) intensity. During the work structures were grown on semi-insulating GaAs substrate using molecular beam epitaxy technique.

Different series of samples were analysed, in the first series samples with one quantum well were grown. The Al content in the barriers was varied from 0% up to 30%, the thickness of the barriers was changed from 5nm up to 25nm. The In content in the quantum well was 21%.
The PL spectra of all the structures was measured. Matching computational simulations and the spectra of the grown structures we were able to compare the effect of different barriers design, and growth conditions.
The second series of samples was grown to study the effect of Al in a full VECSEL chip geometry were 12 QWs are used.