



MOVPE growth and characterization of (In,Ga)N quantum structures for laser diodes emitting at 440 nm

By Veit Hoffmann

Cuvillier Verlag Mrz 2012, 2012. Buch. Condition: Neu. Neuware - The thesis describes growth and characterization of nitride-based quantum well structures for laser diodes emitting in the wavelength range between 400 nm and 450 nm. In order to optimize the epitaxial growth process by metal organic vapor phase epitaxy and thus the performance of the laser diode structures, the material properties of the indium gallium nitride (InGaN) active region were correlated with device characteristics. By analyzing optically pumpable laser structures in a first step, growth conditions and growth schemes were revealed that prevent 3D growth and the formation of additional defects in the active region. In the next step, using growth parameters that provide a high material gain broad area current injection laser diodes emitting around 400 nm were realized on sapphire substrate. These devices feature threshold current densities in the range of 6 kA/cm in pulsed operation. For laser diodes emitting at longer wavelengths, the heterostructure layout was optimized by comparing optical pumping results with device simulation. Using a layer sequence with increased modal gain, first broad area current injection laser diodes emitting around 440 nm were demonstrated. The structures were grown on low defect density bulk GaN substrates and exhibit...



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