Improved Manufacturing of Solid State Lasers via Patterning of Photonic Crystals
Tech ID: 22342 / UC Case 2005-144-0

BRIEF DESCRIPTION

A method of fabricating solid state lasers with embedded structures for improved performance via patterning.

BACKGROUND

There is a need to improve the performance of horizontal emitting, vertical emitting, beam shaped and distributed feedback lasers. Traditionally, photonic crystals placed on the surface of the devices have been used to improve performance.

DESCRIPTION

Researchers at UCSB have developed a method of fabricating solid state lasers with embedded structures for improved performance via patterning. The patterned layer(s) may be engineered to act as a mirror, optical confinement layer, grating, wavelength selective element, beam shaping element, etc. for the active layers. The primary advantage of this technology is that it provides for fabrication of all the needed functionality in one lithography step via patterning.

ADVANTAGES

▶ Improved performance of the laser
▶ Improved contact structures and reduced waveguiding loss by contact electrodes
▶ Fabrication via one lithography step makes this invention easily manufacturable at low cost

APPLICATIONS

▶ Fiber optic networks
▶ Instrumentation lasers
▶ Optical spectroscopy

This technology is available for licensing.

PATENT STATUS

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<tr>
<td>United States Of America</td>
<td>Issued Patent</td>
<td>7,723,745</td>
<td>05/25/2010</td>
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ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

▶ Method for Improved Surface of (Ga,Al,In,B)N Films on Nonpolar or Semipolar Substrates
▶ High Efficiency LED with Optimized Photonic Crystal Extractor
▶ Enhanced Optical Polarization of Nitride LEDs by Increased Indium Incorporation
▶ Etching Technique for the Fabrication of Thin (Al, In, Ga)N Layers
▶ Lateral Growth Method for Defect Reduction of Semipolar Nitride Films
▶ Flexible Arrays of MicroLEDs using the Photoelectrochemical (PEC) Liftoff Technique
▶ Vertical Cavity Surface-Emitting Lasers with Continuous Wave Operation
▶ Gallium-containing MicroLEDs for Displays
▶ High Speed Indium Gallium Nitride Multi-Quantum Well (InGaN MQW) Photodetector
Growth of Planar, Non-Polar, A-Plane GaN by Hydride Vapor Phase Epitaxy
Single or Multi-Color High Efficiency LED by Growth Over a Patterned Substrate
GaN-Based Thermoelectric Device for Micro-Power Generation
Limiting Strain-Relaxation in III-Nitride Heterostructures by Substrate Patterning
Improved Manufacturing of Semiconductor Lasers
LED Device Structures with Minimized Light Re-Absorption
Improved Light Extraction with Geometrically Tuned LED Arrays
Growth of Planar Semi-Polar Gallium Nitride
Nonpolar (Al, B, In, Ga)N Quantum Well Design
UV Optoelectronic Devices Based on Nonpolar and Semi-polar AlInN and AlInGaN Alloys
Defect Reduction of Non-Polar and Semi-Polar III-Nitrides
Low-Cost Zinc Oxide for High-Power-Output, GaN-Based LEDs (UC Case 2010-150)
Suppression of Defect Formation and Increase in Critical Thickness by Silicon Doping
Wafer Bonding for Embedding Active Regions with Relaxed Nanofeatures
Enhancing Growth of Semipolar (Al,In,Ga,B)N Films via MOCVD