Improved Manufacturing of Semiconductor Lasers
Tech ID: 18968 / UC Case 2005-721-0

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 key advantage of this improvement is that it places the photonic crystal layer above the active layer for better performance. Conventional approaches place the photonic crystal layer below the active layer.

ADVANTAGES
▶ Improved performance of the laser
▶ Improved contact structures and reduced waveguiding loss by contact electrodes

APPLICATIONS
▶ Fiber optic networks
▶ Instrumentation lasers
▶ Optical spectroscopy

This technology is available for licensing.

PATENT STATUS

<table>
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<th>Country</th>
<th>Type</th>
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<td>United States Of America</td>
<td>Issued Patent</td>
<td>7,768,024</td>
<td>08/03/2010</td>
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RELATED TECHNOLOGIES
▶ Mirrorless LED With High Luminous Efficiency

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
▶ Edge-Emitting Laser Diode with Via-Activated Tunnel Junction Contact
▶ Lateral Growth Method for Defect Reduction of Semipolar Nitride Films
▶ Flexible Arrays of MicroLEDs using the Photoelectrochemical (PEC) Liftoff Technique
GaN-Based Thermoelectric Device for Micro-Power Generation

Limiting Strain-Relaxation in III-Nitride Heterostructures by Substrate Patterning

LED Device Structures with Minimized Light Re-Absorption

Growth of Planar Semi-Polar Gallium Nitride

UV Optoelectronic Devices Based on Nonpolar and Semi-polar AllnN and AllnGaN Alloys

III-Nitride Based VCSEL with Curved Mirror on P-Side of the Aperture

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

Enhancing Growth of Semipolar (Al,In,Ga,B)N Films via MOCVD