Single or Multi-Color High Efficiency LED by Growth Over a Patterned Substrate
Tech ID: 22788 / UC Case 2005-145-0

BRIEF DESCRIPTION

New LED structures that provide increased light extraction efficiency while retaining a planar structure.

BACKGROUND

As semiconductor materials have improved, the efficiency of semiconductor devices has also improved and new wavelength ranges have been used. Gallium nitride (GaN) based light emitters are probably the most promising for a variety of applications. GaN provides efficient illumination in the ultraviolet (UV) to amber spectrum, when alloyed with varying concentrates of indium (In), for example. Unfortunately, most of the light emitted within a semiconductor LED material is lost due to total internal reflection at the semiconductor-air interface. Typical semiconductor materials have a high index of refraction, and thus, according to Snell's law, most of the light will remain trapped in the materials, thereby degrading efficiency. By choosing a suitable geometry for the LED, a higher extraction efficiency can be achieved.

DESCRIPTION

Researchers at the University of California, Santa Barbara have developed new LED structures that provide increased light extraction efficiency while retaining a planar structure. The planar structure makes the new LED structures easy to manufacture and at low cost.

ADVANTAGES

▶ Increased light extraction efficiency
▶ Lower manufacturing costs

APPLICATIONS

▶ LED manufacturing

This technology is available for licensing.

PATENT STATUS

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<th>Country</th>
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<td>8,390,011</td>
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CATEGORIZED AS

▶ Engineering
▶ Energy
▶ Lighting
▶ Optics and Photonics
▶ All Optics and Photonics
▶ Semiconductors
▶ Design and Fabrication

RELATED CASES

2005-145-0

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
▶ Vertical Cavity Surface-Emitting Lasers with Continuous Wave Operation

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OTHER INFORMATION

KEYWORDS

LED, photonic crystal, indssl, indled, indphoto, cenIEE, indfeat

RELATED CASES

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▶ Lateral Growth Method for Defect Reduction of Semipolar Nitride Films
▶ Vertical Cavity Surface-Emitting Lasers with Continuous Wave Operation
- UV Optoelectronic Devices Based on Nonpolar and Semi-polar AlInN and AlInGaN Alloys
- Integration And Mass Transfer Of Microleds
- 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