Cleaved Facet Edge-Emitting Laser Diodes Grown on Semipolar GaN

Tech ID: 21809 / UC Case 2007-423-0

BRIEF DESCRIPTION

Highly-efficient cleaved facet edge-emitting laser diodes grown on semipolar gallium nitride substrates.

BACKGROUND

Current group-III nitride lasers are grown on polar c-plane substrates and usually employ dry-etched facets, which are inherently rough. Since these devices suffer from reduced efficiency due to high polarization-induced electric fields and scattering loss, there is a need for a high-efficiency laser diode that avoids these shortcomings.

DESCRIPTION

Researchers at the University of California, Santa Barbara have developed cleaved facet edge-emitting laser diodes grown on semipolar gallium nitride substrates. Because the devices are grown on a semipolar orientation, they have lower thresholds and higher efficiencies. The efficiency is further increased due to smooth, low loss cavities achieved by cleaved mirror facets. These devices are applicable to high brightness lighting displays, high resolution printers, projection displays, next generation DVD players, medical imaging, and efficient solid-state lighting.

ADVANTAGES

- Lower thresholds and higher efficiencies than standard polar c-plane laser diodes
- May offer higher wall-plug efficiencies than can be achieved with LEDs
- Smooth low loss mirror facets with high reflectivity

APPLICATIONS

- High Brightness Lighting Displays
- High Resolution Printers
- Projection Displays
- Next Generation DVD Players
- Medical Imaging
- Efficient Solid-State Lighting

This technology is available for licensing. See below for a selection of the patents and patent applications related to this invention. Please inquire for full patent portfolio status.

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OTHER INFORMATION

KEYWORDS

LED, laser diode, indssl, indled, cenIEE, indfeat

CATEGORIZED AS

- **Engineering**
- **Energy**
  - Lighting
  - Other
- **Optics and Photonics**
  - All Optics and Photonics
- **Semiconductors**
  - Design and Fabrication

RELATED CASES

2007-423-0

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	8,541,869	09/24/2013	2007-423

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- 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
- Eliminating Misfit Dislocations with In-Situ Compliant Substrate Formation
- III-Nitride-Based Vertical Cavity Surface Emitting Laser (VCSEL) with a Dielectric P-Side Lens
- Aluminum-cladding-free Nonpolar III-Nitride LEDs and LDs
- Low-Cost Zinc Oxide for High-Power-Output, GaN-Based LEDs (UC Case 2010-183)
- Defect Reduction in GaN films using in-situ SiNx Nanomask
- Enhanced Light Extraction LED with a Tunnel Junction Contact Wafer Bonded to a Conductive Oxide
- Low Temperature Deposition of Magnesium Doped Nitride Films
- Transparent Mirrorless (TML) LEDs
- Improved GaN Substrates Prepared with Ammonothermal Growth
- Optimization of Laser Bar Orientation for Nonpolar Laser Diodes
- Method for Enhancing Growth of Semipolar Nitride Devices
- Ultraviolet Laser Diode on Nano-Porous AlGaN template
- Improved Reliability & Enhanced Performance of III-Nitride Tunnel Junction Optoelectronic Devices
- Growth of Polyhedron-Shaped Gallium Nitride Bulk Crystals
- Nonpolar III-Nitride LEDs With Long Wavelength Emission
- Improved Fabrication of Nonpolar InGaN Thin Films, Heterostructures, and Devices
- Growth of High-Quality, Thick, Non-Polar M-Plane GaN Films
- Method for Growing High-Quality Group III-Nitride Crystals
- Controlled Photoelectrochemical (PEC) Etching by Modification of Local Electrochemical Potential of Semiconductor Structure
- Oxyfluoride Phosphors for Use in White Light LEDs
- Technique for the Nitride Growth of Semipolar Thin Films, Heterostructures, and Semiconductor Devices
- (In,Ga,Al)N Optoelectronic Devices with Thicker Active Layers for Improved Performance
- Thermally Stable, Laser-Driven White Lighting Device
- MOCVD Growth of Planar Non-Polar M-Plane Gallium Nitride
- Methods for Fabricating III-Nitride Tunnel Junction Devices
- Low-Droop LED Structure on GaN Semi-polar Substrates
- Contact Architectures for Tunnel Junction Devices
- Semi-polar LED/LD Devices on Relaxed Template with Misfit Dislocation at Hetero-interface
- Semipolar-Based Yellow, Green, Blue LEDs with Improved Performance
- III-Nitride-Based Devices Grown On Thin Template On Thermally Decomposed Material
- Growth of Semipolar III-V Nitride Films with Lower Defect Density
- III-Nitride Tunnel Junction LED with High Wall Plug Efficiency
- Tunable White Light Based on Polarization-Sensitive LEDs
- Growth of High-Performance M-plane GaN Optical Devices

- Packaging Technique for the Fabrication of Polarized Light Emitting Diodes
- Improved Anisotropic Strain Control in Semipolar Nitride Devices
- Novel Multilayer Structure for High-Efficiency UV and Far-UV Light-Emitting Devices
- III-V Nitride Device Structures on Patterned Substrates
- Method for Increasing GaN Substrate Area in Nitride Devices
- High-Intensity Solid State White Laser Diode
- Nitride Based Ultraviolet LED with an Ultraviolet Transparent Contact
- 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
- High-Efficiency and High-Power III-Nitride Devices Grown on or Above a Strain Relaxed Template
- UV Optoelectronic Devices Based on Nonpolar and Semi-polar AlInN and AlInGaN Alloys
- Defect Reduction of Non-Polar and Semi-Polar III-Nitrides
- III-Nitride Based VCSEL with Curved Mirror on P-Side of the Aperture
- Enhancing Growth of Semipolar (Al,In,Ga,B)N Films via MOCVD

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