Nitride Based Ultraviolet LED with an Ultraviolet Transparent Contact

Tech ID: 32271 / UC Case 2021-567-0

BACKGROUND

In conventional UVLED nitride devices, a metal mirror is often used as an electrical contact and requires the incorporation of other metals in order to obtain a low resistance electrical contact with the semiconductor material. These additional metals, however, are not transparent to emitted photons which causes a significant decrease in device efficiency. Although dielectric mirrors provide a potential alternative, their poor electrical properties are not suitable for high efficiency devices.

DESCRIPTION

Researchers at the University of California, Santa Barbara have developed a nitride based UVLED with an ultraviolet transparent contact (UVTC) that is an alloy composition of (Ga, Al, In, B)O semiconductors, such as Ga_2O_3. The n-type, p-type and UVTC regions are all transparent to UV light and minimize internal reflections within the UVLED by eliminating mirrors and/or mirrored surfaces. As a result, the UVLED output is drastically increased via the minimization of light re-absorption. Therefore, the improved light emission efficiency of UVLEDs enables the expansion of ultraviolet semiconductor device applications into a variety of commercial products.

ADVANTAGES

- Increased light efficiency
- Expands UVLED applications

APPLICATIONS

- UVLEDs
- LEDs
- Micro-LEDs

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	20230420617	12/28/2023	2021-567

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

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OTHER INFORMATION

KEYWORDS

UVLED, LED, micro-LED, UVTC, transparent, ultraviolet transparent contact

CATEGORIZED AS

- **Energy**
  - Lighting
- **Semiconductors**
  - Design and Fabrication

RELATED CASES

2021-567-0

- 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
- High-Efficiency, Mirrorless Non-Polar and Semi-Polar Light Emitting Devices
- 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
- Cleaved Facet Edge-Emitting Laser Diodes Grown on Semipolar GaN
- 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
- 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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