



## Tunable White Light Based on Polarization-Sensitive LEDs

Tech ID: 25554 / UC Case 2008-653-0

### BRIEF DESCRIPTION

Polarized white LEDs that can improve system efficiency by removing the need for an external polarizer.

### BACKGROUND

Commercially available white light-emitting diodes (LEDs) emit unpolarized light and have a fixed color after they are fabricated. Options for polarizing the emission involve costly polarization plates. Tuning the white light involves using a number of different-colored LEDs and changing their intensity individually, or introducing different-colored, fluorescent organic dyes as quantum-well light emitting layers or conjugated hybrid polymers. These methods have manufacturing hurdles and low efficiency.

### DESCRIPTION

UC Santa Barbara researchers have created polarized white LEDs that can improve system efficiency by removing the need for an external polarizer. Alternatively, the color-rendering properties of these LEDs can be manipulated through use of a polarizing element. The color of the LED can be easily changed after it is produced by simply rotating the polarizing element. This allows an end user to adjust the LED to their preference for white light.

### ADVANTAGES

- ▶ Polarized white emission can reduce system complexity and cost
- ▶ Hue of white light is tunable by end user after fabrication
- ▶ Less costly and simpler than other white light LED manufacturing methods

### APPLICATIONS

- ▶ LEDs
- ▶ Applications that require uniform color illumination such as display backlighting, two- and three-dimensional image projectors, and architectural lighting

### PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,951,912	04/24/2018	2008-653

### CONTACT

Pasquale S. Ferrari  
[ferrari@tia.ucsb.edu](mailto:ferrari@tia.ucsb.edu)  
tel: .

### INVENTORS

- ▶ [DenBaars, Steven P.](#)
- ▶ [Fellows-DeMille, Natalie F.](#)
- ▶ [Masui, Hisashi](#)
- ▶ [Nakamura, Shuji](#)

### OTHER INFORMATION

#### KEYWORDS

LED, indled, indssl, indfeat

#### CATEGORIZED AS

- ▶ [Engineering](#)
- ▶ [Energy](#)
  - ▶ [Lighting](#)
  - ▶ [Other](#)
- ▶ [Semiconductors](#)
  - ▶ [Design and Fabrication](#)

#### RELATED CASES

2008-653-0

## ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ 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 AlGaIn 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 InGaIn 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
- ▶ 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
- ▶ 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

University of California, Santa Barbara  
Office of Technology & Industry Alliances  
342 Lagoon Road, Santa Barbara, CA 93106-2055 |  
www.tia.ucsb.edu  
Tel: 805-893-2073 | Fax: 805.893.5236 | padilla@tia.ucsb.edu



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