Oxyfluoride Phosphors for Use in White Light LEDs
Tech ID: 23416 / UC Case 2009-704-0

BRIEF DESCRIPTION

A novel Ce³⁺-doped oxyfluoride phosphor material for solid-state lighting applications.

BACKGROUND

White light generation for most commercial light emitting diode (LED) lamps employ yellow Ce³⁺ phosphors excited by blue InGaN diodes due to their unsurpassed efficiency. However, the Ce³⁺ phosphors have relatively weak emissions in the red region. Moreover, the color output from these phosphors is strongly dependent on temperature and current, creating problems for high power LEDs.

DESCRIPTION

Researchers at the University of California, Santa Barbara have invented a novel Ce³⁺-doped oxyfluoride phosphor material for solid-state lighting applications. This invention produces much higher photoluminescence intensities than commercial Ce³⁺, allowing for tunability of emission color and excitation band, resulting better light quality with high efficiency. Moreover, this material can be used for white light generation with a number of phosphor combinations (near UV light with red, green-orange or yellow phosphors) and allows for greater color rendering.

ADVANTAGES

- High efficiency
- Good color rendering properties
- Variety of applications

APPLICATIONS

- LEDs
- Liquid Crystal Displays

This technology is available for licensing. Click here to request more information.

PATENT STATUS

<table>
<thead>
<tr>
<th>Country</th>
<th>Type</th>
<th>Number</th>
<th>Dated</th>
<th>Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States Of America</td>
<td>Issued Patent</td>
<td>8,535,565</td>
<td>09/17/2013</td>
<td>2010-022</td>
</tr>
<tr>
<td>United States Of America</td>
<td>Issued Patent</td>
<td>8,344,611</td>
<td>01/01/2013</td>
<td>2009-704</td>
</tr>
</tbody>
</table>

INVENTORS

- DenBaars, Steven P.
- Im, Won Bin
- Seshadri, Ram

CONTACT

University of California, Santa Barbara
Office of Technology & Industry Alliances
dobis@tia.ucsb.edu
tel: View Phone Number.

OTHER INFORMATION

KEYWORDS
phosphor, white light, LED, indphosphor, indssl, ceniEE, oxyfluoride, indfeat, indadvmat

CATEGORIZED AS
- Energy
- Lighting
- Other
- Materials & Chemicals
- Other

RELATED CASES
2009-704-0, 2010-022-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS
Reduced Dislocation Density of Non-Polar GaN Grown by Hydride Vapor Phase Epitaxy

Growth of Planar, Non-Polar, A-Plane GaN by Hydride Vapor Phase Epitaxy

Nonpolar (Al, B, In, Ga)N Quantum Well Design

Cleaved Facet Edge-Emitting Laser Diodes Grown on Semipolar GaN

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

GaN-Based Thermoelectric Device for Micro-Power Generation

Growth of High-Quality, Thick, Non-Polar M-Plane GaN Films

Growth of Planar Semi-Polar Gallium Nitride

Defect Reduction of Non-Polar and Semi-Polar III-Nitrides

MOCVD Growth of Planar Non-Polar M-Plane Gallium Nitride

Low Temperature Deposition of Magnesium Doped Nitride Films

Improved Manufacturing of Solid State Lasers via Patterning of Photonic Crystals

Single or Multi-Color High Efficiency LED by Growth Over a Patterned Substrate

High Efficiency LED with Optimized Photonic Crystal Extractor

Packaging Technique for the Fabrication of Polarized Light Emitting Diodes

LED Device Structures with Minimized Light Re-Absorption

(In,Ga)N Optoelectronic Devices with Thicker Active Layers for Improved Performance

III-V Nitride Device Structures on Patterned Substrates

Growth of Semipolar III-V Nitride Films with Lower Defect Density

Enhanced Optical Polarization of Nitride LEDs by Increased Indium Incorporation

Semipolar-Based Yellow, Green, Blue LEDs with Improved Performance

Hexagonal Wurtzite Type Epitaxial Layer with a Low Alkali-Metal Concentration

Photoelectrochemical Etching Of P-Type Semiconductor Heterostructures

Highly Efficient Blue-Violet III-Nitride Semipolar Laser Diodes

Defect Reduction in GaN films using in-situ SiNx Nanomask

Semi-polar LED/LD Devices on Relaxed Template with Misfit Dislocation at Hetero-interface

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

Suppression of Defect Formation and Increase in Critical Thickness by Silicon Doping

High Efficiency Semipolar AlGaN-Cladding-Free Laser Diodes

Low-Cost Zinc Oxide for High-Power-Output, GaN-Based LEDs (UC Case 2010-183)

Low-Cost Zinc Oxide for High-Power-Output, GaN-Based LEDs (UC Case 2010-150)

Method for Increasing GaN Substrate Area in Nitride Devices

Flexible Arrays of MicroLEDs using the Photoelectrochemical (PEC) Lift off Technique

Optimization of Laser Bar Orientation for Nonpolar Laser Diodes

UV Optoelectronic Devices Based on Nonpolar and Semi-polar AlInN and AlInGaAlN Alloys

Low-Drop LED Structure on GaN Semi-polar Substrates

Improved Fabrication of Nonpolar InGaN Thin Films, Heterostructures, and Devices

Growth of High-Performance M-plane GaN Optical Devices

Method for Enhancing Growth of Semipolar Nitride Devices

Transparent Mirrorless (TML) LEDs

Solid Solution Phosphors for Use in Solid State White Lighting Applications

Technique for the Nitride Growth of Semipolar Thin Films, Heterostructures, and Semiconductor Devices

Planar, Nonpolar M-Plane III-Nitride Films Grown on Miscut Substrates

High-Efficiency, Mirrorless Non-Polar and Semi-Polar Light Emitting Devices

High Light Extraction Efficiency III-Nitride LED

Tunable White Light Based on Polarization-Sensitive LEDs

Method for Improved Surface of (Ga,Al,Ga,B)N Films on Nonpolar or Semipolar Substrates

Improved Anisotropic Strain Control in Semipolar Nitride Devices

III-Nitride Tunnel Junction with Modified Interface

Enhanced Light Extraction LED with a Tunnel Junction Contact Wafer Bonded to a Conductive Oxide

Increased Light Extraction with Multistep Deposition of ZnO on GaN

Hybrid Growth Method for Improved III-Nitride Tunnel Junction Devices

Stand-Alone Ceramic Phosphor Composites for Laser-Excited Solid-State White Lighting

Contact Architectures for Tunnel Junction Devices

New Blue Phosphor for High Heat Applications

Methods for Fabricating III-Nitride Tunnel Junction Devices

Single-Phase Full-Color Phosphor for LEDs

Reduction in Leakage Current and Increase in Efficiency of III-Nitride MicroLEDs

Vertical Cavity Surface-Emitting Lasers with Continuous Wave Operation

Laser Lighting System Incorporating an Additional Scattered Laser

Metal Organic Chemical Vapor Deposition Growth for III-Nitride Based Tunnel Junctions

Improved Reliability & Enhanced Performance of III-Nitride Tunnel Junction Optoelectronic Devices