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

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OTHER INFORMATION
KEYWORDS
phosphor, white light, LED, indphosphor, indssl, ceniIEE, oxyfluoride, indfeat, indadvmat

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

RELATED CASES
2009-704-0, 2010-022-0
This technology is available for licensing. Click here to request more information.

### PATENT STATUS

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### 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
- Flexible Arrays of MicroLEDs using the Photoelectrochemical (PEC) Lift-off Technique
- Vertical Cavity Surface-Emitting Lasers with Continuous Wave Operation
- Gallium-containing MicroLEDs for Displays
- 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
- Highly Efficient Blue-Violet III-Nitride Semipolar Laser Diodes
- Hybrid Growth Method for Improved III-Nitride Tunnel Junction Devices
- Low Temperature Deposition of Magnesium Doped Nitride Films
- Transparent Mirrorless (TML) LEDs
- Laser Diode With Tunnel Junction Contact Surface Grating
- Optimization of Laser Bar Orientation for Nonpolar Laser Diodes
- High Efficiency Semipolar AlGaN-Cladding-Free Laser Diodes
- Stand-Alone Ceramic Phosphor Composites for Laser-Excited Solid-State White Lighting
- Method for Enhancing Growth of Semipolar Nitride Devices
- III-Nitride Tunnel Junction with Modified Interface
- Improved Fabrication of Nonpolar InGaN Thin Films, Heterostructures, and Devices
- Growth of High-Quality, Thick, Non-Polar M-Plane GaN Films
- Increased Light Extraction with Multistep Deposition of ZnO on GaN
- Selective-Area Mesoporous Semiconductors And Devices For Optoelectronic And Photonic Applications
- High-Efficiency, Mirrorless Non-Polar and Semi-Polar Light Emitting Devices
- Near-Infrared, Flip-Chip, TCO-Clad, InGaN Quantum Dot Laser Diode
- Incorporating Temperature-Sensitive Layers in III-N Devices
- 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
- MOCVD Growth of Planar Non-Polar M-Plane Gallium Nitride
- Reduced Dislocation Density of Non-Polar GaN Grown by Hydride Vapor Phase Epitaxy
- Heterogeneously Integrated GaN on Si Photonic Integrated Circuits
- (Al, In, Ga, B)N Device Structures
- Reduction in Leakage Current and Increase in Efficiency of III-Nitride MicroLEDs
- Methods for Fabricating III-Nitride Tunnel Junction Devices
- Formation of Transparent Integrated MicroLED Displays
- 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
- Photoelectrochemical Etching Of P-Type Semiconductor Heterostructures
- Semipolar-Based Yellow, Green, Blue LEDs with Improved Performance
- Growth of Semipolar III-V Nitride Films with Lower Defect Density
- III-Nitride Tunnel Junction LED with High Wall Plug Efficiency
- Improved Manufacturing of Solid State Lasers via Patternning of Photonic Crystals
- Solid Solution Phosphors for Use in Solid State White Lighting Applications
- 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
High Light Extraction Efficiency III-Nitride LED
III-V Nitride Device Structures on Patterned Substrates
Hexagonal Wurtzite Type Epitaxial Layer with a Low Alkali-Metal Concentration
Method for Increasing GaN Substrate Area in Nitride Devices
Growth of Planar, Non-Polar, A-Plane GaN by Hydride Vapor Phase Epitaxy
Single or Multi-Color High Efficiency LED by Growth Over a Patterned Substrate
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
Improved Light Extraction with Geometrically Tuned LED Arrays
Growth of Planar Semi-Polar Gallium Nitride
Nonpolar (Al, B, In, Ga)N Quantum Well Design
UV Optoelectronic Devices Based on Nonpolar and Semi-polar AlInN and AlInGaN Alloys
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