Packaging Technique for the Fabrication of Polarized Light Emitting Diodes
Tech ID: 22792 / UC Case 2005-614-0

BRIEF DESCRIPTION
A polarized LED and a method of fabricating and packaging the device.

BACKGROUND
It has recently become possible to prepare AlInGaN LEDs on a-planes and m-planes. These LEDs exhibit linearly polarized light emission. The polarization field is in a particular direction (c-direction) in the plane, and the stress in the QW is anisotropic due to different degrees of lattice mismatch between the substrate and QW in the two perpendicular directions in the plane. Linearly polarized light is an electromagnetic wave that has its electric field only in one plane perpendicular to its propagation. Non-polarized light has its electric field evenly distributed in directions in planes perpendicular to its propagation. A principle application for polarized light is backlighting for liquid crystal displays (LCDs), in which LEDs are beneficial due to their compactness and energy efficiency compared to conventional cold cathode fluorescent tubes. Nitride-based LEDs prepared on a semi-polar plane have also been confirmed to emit polarized light. What is needed is a simplified method of fabricating polarized LEDs and packaging such LEDs.

DESCRIPTION
Researchers at the University of California, Santa Barbara have developed a polarized LED and a method of fabricating and packaging the device. The LED may be attached in a favorable orientation with respect to a package, so that the light polarization direction of emitted light from the package is apparent. The package may include at least one additional marker indicating the light polarization direction. Regardless, if a LCD is large (as for a television screen) or small (as for a cell phone screen), multiple LEDs are used to obtain sufficient brightness. To use an LED array as a linearly polarized light source, the orientation of each die must match. To fabricate these LED arrays as polarized light sources, the marker technique of this technology will make the whole production process simple and reliable, from die attachment into a package to final display unit assembling.

ADVANTAGES
▶ Simple and reliable process

APPLICATIONS
▶ Polarized LEDs (manufacturing and packaging)

This technology is available for licensing.

PATENT STATUS

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CATEGORIZED AS
▶ Engineering
▶ Optics and Photonics
▶ All Optics and Photonics
▶ Semiconductors
▶ Design and Fabrication

RELATED CASES
2005-614-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS
▶ Enhanced Optical Polarization of Nitride LEDs by Increased Indium Incorporation
Lateral Growth Method for Defect Reduction of Semipolar Nitride Films

Vertical Cavity Surface-Emitting Lasers with Continuous Wave Operation

III-Nitride-Based Devices Grown With Relaxed Active Region

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

Improved GaN Substrates Prepared with Ammonothermal Growth

Optimization of Laser Bar Orientation for Nonpolar Laser Diodes

Size-Independent Forward Voltage Micro-LED with an Epitaxial Junction

Method for Enhancing Growth of Semipolar Nitride Devices

III-Nitride Tunnel Junction with Modified Interface

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

Increased Light Extraction with Multistep Deposition of ZnO on GaN

Method for Manufacturing Improved III-Nitride LEDs and Laser Diodes: Monolithic Integration of Optically Pumped and Electrically Injected III-Nitride LEDs

Selective-Area Mesoporous Semiconductors And Devices For Optoelectronic And Photonic Applications

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

(\text{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

Reduced Dislocation Density of Non-Polar GaN Grown by Hydride Vapor Phase Epitaxy

Highly Compact, High-Index Dielectric Nanostructures for Deep-Ultraviolet Devices

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

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

Photoelectrochemical Etching Of P-Type Semiconductor Heterostructures

Semi-polar-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

Improved Manufacturing of Solid State Lasers via Patternning of Photonic Crystals

High Efficiency III-Nitride Devices with Smooth Relaxed InGaN Buffer and Strain Compliant Template

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

Improved Anisotropic Strain Control in Semipolar Nitride Devices

High Light Extraction Efficiency III-Nitride LED

III-V Nitride Device Structures on Patterned Substrates

Activation of P-Type Layers of Tunnel Junctions in Micro-LEDs

Method for Increasing GaN Substrate Area in Nitride Devices

Nitride Based Ultraviolet LED with an Ultraviolet Transparent Contact

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

GaN-Based Thermoelectric Device for Micro-Power Generation

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

LED Device Structures with Minimized Light Re-Absorption
- 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
- 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