Growth of Planar Semi-Polar Gallium Nitride
Tech ID: 21912 / UC Case 2005-471-0

BRIEF DESCRIPTION
A technique for the growth of planar films of semi-polar nitrides, in which a large area of (Al, In, Ga)N is grown parallel to the substrate surface.

BACKGROUND
Current nitride technology for electronic and optoelectronic devices employs nitride films grown along the polar c-direction. However, conventional c-plane quantum well structures in III-nitride based optoelectronic and electronic devices suffer from the undesirable quantum-confined Stark effect (QCSE), due to the existence of strong piezoelectric effects and spontaneous polarizations. The strong built-in electric fields along the c-direction cause spatial separation of electrons and holes that in turn give rise to restricted carrier recombination efficiency, reduced oscillator strength, and red-shifted emission. The growth of non-polar GaN remains challenging and has not yet been widely adopted in the III-nitride industry.

DESCRIPTION
Researchers at the University of California, Santa Barbara have developed a technique for the growth of planar films of semi-polar nitrides, in which a large area of (Al, In, Ga)N is grown parallel to the substrate surface. For example, samples can be grown on 10 mm x 10 mm or 2 inch diameter substrates. The advantage of semi-polar over c-plane nitride films is the reduction in polarization and the associated increase in internal quantum efficiency for certain devices.

ADVANTAGES
» Reduction in polarization and the associated increase in internal quantum efficiency for certain devices
» Easier to grow compared to non-polar nitride films

APPLICATIONS
» Production of planar semi-polar gallium nitride

This technology is available for a non-exclusive license. See below for a selection of the patents and patent applications related to this invention. Please inquire for full patent portfolio status.

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

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

INVENTORS
» Baker, Troy J.
» DenBaars, Steven P.
» Fini, Paul T.
» Haskell, Benjamin A.
» Nakamura, Shuji
» Speck, James S.

KEYWORDS
GaN, Gallium Nitride, indssl, indbulk, cenIEE

CATEGORIZED AS
» Engineering
» Semiconductors
» Design and Fabrication

RELATED CASES
2005-471-0
Improved Manufacturing of Solid State Lasers via Patterning of Photonic Crystals
- Solid Solution Phosphors for Use in Solid State White Lighting Applications
- Multifaceted III-Nitride Surface-Emitting Laser
- Tunable White Light Based on Polarization-Sensitive LEDs
- Cleaved Facet Edge-Emitting Laser Diodes Grown on Semipolar GaN
- III-Nitride VCSEL with a High Indium Content Active Region
- 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
- Photoelectrochemical Etching for Chip Shaping Of LEDs
- 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
- Burying Impurities And Defects In Regrown III-Nitride Structures
- 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
- Improved Manufacturing of Semiconductor Lasers
- LED Device Structures with Minimized Light Re-Absorption
- Improved Light Extraction with Geometrically Tuned LED Arrays
- 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
- 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