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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<td>7,220,324</td>
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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

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OTHER INFORMATION

KEYWORDS

GaN, Gallium Nitride, indssl, indbulk, cenIEE

CATEGORIZED AS

▶ Engineering
▶ Semiconductors
▶ Design and Fabrication

RELATED CASES

2005-471-0
Nitride Based Ultraviolet LED with an Ultraviolet Transparent Contact
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
Nonpolar (Al, B, In, Ga)N Quantum Well Design
UV Optoelectronic Devices Based on Nonpolar and Semi-polar AlInN and AlInGaN Alloys
Integration And Mass Transfer Of Microleds
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