Low Temperature Deposition of Magnesium Doped Nitride Films

Tech ID: 21919 / UC Case 2006-678-0

BRIEF DESCRIPTION

A method for growing an improved quality device by depositing a low temperature magnesium doped nitride semiconductor thin film.

BACKGROUND

Magnesium doped gallium nitride has been extensively used in nitride based LEDs, but requires high deposition temperatures. Indium nitride has a high volatility and readily evaporates out of the InGaN films when exposed to a high enough temperature or a low temperature for an extended period of time. This time and temperature value is commonly referred to as the material's thermal budget. As a result, there is a need for improved methods for the growth of low temperature magnesium doped nitride planar films, wherein the thermal budget of the previously deposited indium nitride containing multiple quantum wells is considerably reduced.

DESCRIPTION

Researchers at the University of California, Santa Barbara have developed a method for growing an improved quality device by depositing a low temperature magnesium doped nitride semiconductor thin film. This process includes using deposition temperature for the magnesium doped GaN film that is lower than the one used for the deposition of the multi quantum well. This results in a significant increase in the output power of a nitride LED.

ADVANTAGES

- Reduced damages to the multi quantum well materials
- Increased output power of nitride LED and improved device performance

APPLICATIONS

- Nitride LEDs and Laser Diodes

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

CONTACT

Pasquale S. Ferrari
ferrari@tia.ucsb.edu
tel: .

INVENTORS

- DenBaars, Steven P.
- Iza, Michael
- Nakamura, Shuji
- Sato, Hitoshi

OTHER INFORMATION

KEYWORDS

thin film, indssl, indled, cenIEE

CATEGORIZED AS

- **Engineering**
- **Energy**
  - Lighting
- **Optics and Photonics**
  - All Optics and Photonics
- **Semiconductors**
  - Design and Fabrication

RELATED CASES

2006-678-0

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	7,709,284	05/04/2010	2006-678

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Lateral Growth Method for Defect Reduction of Semipolar Nitride Films
- Vertical Cavity Surface-Emitting Lasers with Continuous Wave Operation
- Eliminating Misfit Dislocations with In-Situ Compliant Substrate Formation
- III-Nitride-Based Vertical Cavity Surface Emitting Laser (VCSEL) with a Dielectric P-Side Lens
- Aluminum-cladding-free Nonpolar III-Nitride LEDs and LDs
- 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
- Transparent Mirrorless (TML) LEDs
- Improved GaN Substrates Prepared with Ammonothermal Growth
- Optimization of Laser Bar Orientation for Nonpolar Laser Diodes
- Method for Enhancing Growth of Semipolar Nitride Devices
- Ultraviolet Laser Diode on Nano-Porous AlGaN template
- Improved Reliability & Enhanced Performance of III-Nitride Tunnel Junction Optoelectronic Devices
- 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
- 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
- (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
- 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
- Semipolar-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
- 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
- Novel Multilayer Structure for High-Efficiency UV and Far-UV Light-Emitting Devices
- III-V Nitride Device Structures on Patterned Substrates
- Method for Increasing GaN Substrate Area in Nitride Devices

- High-Intensity Solid State White Laser Diode
- Nitride Based Ultraviolet LED with an Ultraviolet Transparent Contact
- 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
- Growth of Planar Semi-Polar Gallium Nitride
- High-Efficiency and High-Power III-Nitride Devices Grown on or Above a Strain Relaxed Template
- 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

University of California, Santa Barbara
Office of Technology & Industry Alliances
342 Lagoon Road, ,Santa Barbara,CA 93106-2055 |
www.tia.ucsb.edu
Tel: 805-893-2073 | Fax: 805.893.5236 | padilla@tia.ucsb.edu