Growth of Polyhedron-Shaped Gallium Nitride Bulk Crystals

Tech ID: 21921 / UC Case 2007-809-0

BRIEF DESCRIPTION

A method to grow polyhedron-shaped GaN bulk crystals, which are not possible using existing growth methods.

BACKGROUND

In order to eliminate the problems arising from heteroepitaxial growth, gallium nitride wafers sliced from bulk GaN crystals must be used. A new technique for growing bulk GaN crystals is based on using supercritical ammonia, which has high solubility of source materials, and which has high transport speed of dissolved precursors. This ammonothermal method has a potential for growing large GaN crystals. However, existing technology is limited by the crystal size, because the growth rate is not fast enough to obtain large crystals.

DESCRIPTION

Researchers at the University of California, Santa Barbara have developed a method to grow polyhedron-shaped GaN bulk crystals, which are not possible using existing growth methods. This shape of GaN crystals has an advantage over the existing platelet-shaped GaN since GaN wafers of any orientation can be obtained simply by slicing the polyhedron.

ADVANTAGES

- Allows simple production of GaN wafers of any orientations
- Less impurities on the crystals compared to previous grow methods
- Faster than previous methods and easily scalable
- Cost effective

APPLICATIONS

- Gallium nitride wafers

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

Country	Type	Number	Dated	Case

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OTHER INFORMATION

KEYWORDS

GaN, Galium Nitride Crystals, indssl, indbulk, cenIEE

CATEGORIZED AS

- **Engineering**
- **Energy**
  - Lighting
  - Other
- **Materials & Chemicals**
  - Other
- **Semiconductors**
  - Design and Fabrication

RELATED CASES

2007-809-0

United States Of America	Issued Patent	9,243,344	01/26/2016	2007-809
United States Of America	Issued Patent	8,253,221	08/28/2012	2007-809

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)
- 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
- Method for Enhancing Growth of Semipolar Nitride Devices
- Ultraviolet Laser Diode on Nano-Porous AlGaN template
- 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
- 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
- Technique for the Nitride Growth of Semipolar Thin Films, Heterostructures, and Semiconductor Devices
- MOCVD Growth of Planar Non-Polar M-Plane Gallium Nitride
- Growth of Group III-Nitride Crystals using Supercritical Ammonia and Nitrogen
- 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
- 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

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