Photoelectrochemical Etching Of P-Type Semiconductor Heterostructures
Tech ID: 23783 / UC Case 2008-533-0

BRIEF DESCRIPTION
A novel process to achieve PEC etching of p-type semiconductors simply and efficiently.

BACKGROUND
Photoelectrochemical (PEC) wet etching is applied to a variety of semiconductors including GaAs, InP, and GaN. PEC etching GaN is of great interest due to the limited alternatives for room temperature, wet etching. This process consists of a light source and an electrochemical cell with the semiconductor being the anode and metal patterned directly onto it to act as the cathode. Typically, this etching is confined to the surface of n-type materials while electrons are confined to the surface in p-type materials. The electrons at p-type surfaces constrain etching and make PEC etching of p-type semiconductors difficult.

DESCRIPTION
Researchers at the University of California, Santa Barbara have developed a novel process to achieve PEC etching of p-type semiconductors simply and efficiently. This method utilizes heterostructures to open up the possibility for a wide range of device fabrication processes requiring etching of p-type materials. The wet etch nature of the process provides the capability for rapid, low-damage etching compared to the traditional ion-assisted plasma etching techniques.

ADVANTAGES
▶ Ability to wet etch p-type materials
▶ Form deep, anisotropic trenches
▶ Bandgap selectivity
▶ Defect selectivity

APPLICATIONS
▶ Semiconductors

PATENT STATUS
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OTHER INFORMATION
KEYWORDS
PEC, cenIEE, indssl

CATEGORIZED AS
▶ Engineering
▶ Energy
▶ Lighting
▶ Other
▶ Semiconductors
▶ Design and Fabrication

RELATED CASES
2008-533-0

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
- Edge-Emitting Laser Diode with Via-Activated Tunnel Junction Contact
- Backside-Illuminated Photoelectrochemical (Bipec) Etching
- Lateral Growth Method for Defect Reduction of Semipolar Nitride Films
- Flexible Arrays of MicroLEDs using the Photoelectrochemical (PEC) Liftoff Technique
- Vertical Cavity Surface-Emitting Lasers with Continuous Wave Operation
- Gallium-containing MicroLEDs for Displays
- Low-Cost Zinc Oxide for High-Power-Output, GaN-Based LEDs (UC Case 2010-183)
- Internal Heating for Ammonothermal Growth of Group-III Nitride Crystals
- 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
- Phosphor-Free White Light Source
- Control of Photoelectrochemical (PEC) Etching by Modification of the Local Electrochemical Potential of the Semiconductor Structure
- Low Temperature Deposition of Magnesium Doped Nitride Films
- Transparent Mirrorless (TML) LEDs
- Improved GaN Substrates Prepared with Ammonothermal Growth
- Laser Diode With Tunnel Junction Contact Surface Grating
- Optimization of Laser Bar Orientation for Nonpolar Laser Diodes
- High Efficiency Semipolar AlGaN-Cladding-Free Laser Diodes
- 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
- Near-Infrared, Flip-Chip, TCO-Clad, InGaN Quantum Dot Laser Diode
- Incorporating Temperature-Sensitive Layers in III-N Devices
- 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
- MOCVD Growth of Planar Non-Polar M-Plane Gallium Nitride
- Reduced Dislocation Density of Non-Polar GaN Grown by Hydride Vapor Phase Epitaxy
- Heterogeneously Integrated GaN on Si Photonic Integrated Circuits
- (Al, In,Ga, B)N Device Structures
- Reduction in Leakage Current and Increase in Efficiency of III-Nitride MicroLEDS
- Methods for Fabricating III-Nitride Tunnel Junction Devices
- Formation of Transparent Integrated MicroLED Displays
- 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
- 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
- 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

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

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

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 Nanostructures

Enhancing Growth of Semipolar (Al,In,Ga,B)N Films via MOCVD