Integration And Mass Transfer Of Microleds
Tech ID: 32079 / UC Case 2019-420-0

BACKGROUND

Conventional methods for the integration and mass transfer of red, green, and blue μLEDs onto integrated circuit boards are challenged by low yield. Unlike current display technologies, μLEDs require a significant number of individual devices and a specific construction depending on the color of the μLED. There is a need for new μLED integration techniques that address the manufacturing obstacles that slow the adoption of μLED technology.

DESCRIPTION

Researchers at the University of California, Santa Barbara have resolved the complexities of creating μLED displays by combining AlInGaNP red μLEDs with InGaN-based blue and green μLEDs on integrated circuit boards via wafer or flip-chip bonding. This method of integration involves fixing multiple μLEDs to a diced segment (tile) of the substrate which is the size of a single conventional LED. Transferring μLED arrays using tiles allows for parallel processing of μLEDs and integrated circuits, which is advantageous over serial processing in the conventional pick-and-place method. Thus, the invention offers advantages in rapid fabrication and integration times as well as eliminating the possibility of dead pixels by examining the μLED arrays separately on the diced substrate after bonding and using a procedure that leverages existing LED manufacturing processes.

ADVANTAGES

▶ Increases manufacturing efficiency
▶ Implementable with existing equipment and techniques
▶ Eliminates possibility of dead pixels

APPLICATIONS

▶ μLEDs
▶ LEDs
▶ Laser Diodes

PATENT STATUS

Patent Pending

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

▶ Method for Improved Surface of (Ga,Al,In,B)N Films on Nonpolar or Semipolar Substrates
▶ Enhanced Optical Polarization of Nitride LEDs by Increased Indium Incorporation
▶ Etching Technique for the Fabrication of Thin (Al, In, Ga)N Layers
▶ Lateral Growth Method for Defect Reduction of Semipolar Nitride Films
▶ Vertical Cavity Surface-Emitting Lasers with Continuous Wave Operation
▶ 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
▶ Volumetric Hole Injection with Intentional V-Defects
▶ Transparent Mirrorless (TML) LEDs
- Optimization of Laser Bar Orientation for Nonpolar Laser Diodes
- High Efficiency Semipolar AlGaN-Cladding-Free Laser Diodes
- Method for Growing Self-Assembled Quantum Dot Lattices
- III-Nitride Tunnel Junction with Modified Interface
- Improved Fabrication of Nonpolar InGaN Thin Films, Heterostructures, and Devices
- Growth of High-Quality, Thick, Non-Polar M-Plane GaN Films
- Selective-Area Mesoporous Semiconductors And Devices For Optoelectronic And Photonic Applications
- High-Efficiency, Mirrorless Non-Polar and Semi-Polar Light Emitting Devices
- Technique for the Nitride Growth of Semipolar Thin Films, Heterostructures, and Semiconductor Devices
- MOCVD Growth of Planar Non-Polar M-Plane Gallium Nitride
- Reduced Dislocation Density of Non-Polar GaN Grown by Hydride Vapor Phase Epitaxy
- Reduction in Leakage Current and Increase in Efficiency of III-Nitride MicroLEDs
- Methods for Fabricating III-Nitride Tunnel Junction Devices
- 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
- Cleaved Facet Edge-Emitting Laser Diodes Grown on Semipolar GaN
- Growth of High-Performance M-plane GaN Optical Devices
- Improved Anisotropic Strain Control in Semipolar Nitride Devices
- High Light Extraction Efficiency III-Nitride LED
- Photoelectrochemical Etching for Chip Shaping Of LEDs
- 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
- Limiting Strain-Relaxation in III-Nitride Heterostructures by Substrate Patterning
- Growth of Planar Semi-Polar Gallium Nitride
- Defect Reduction of Non-Polar and Semi-Polar III-Nitrides
- Suppression of Defect Formation and Increase in Critical Thickness by Silicon Doping