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 AlnGanP 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

RELATED CASES

2019-420-0

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  
▶ Flexible Arrays of MicroLEDs using the Photoelectrochemical (PEC) LiftOff Technique  
▶ 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
3D Hole Injectors for InAlGaN Light-Emitting Diodes
Contact Architectures for Tunnel Junction Devices
Semi-polar LED/LD Devices on Relaxed Template with Misfit Dislocation at Hetero-interface
Semi-polar-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
In-Situ Methods Of Preventing Interfacial Impurities And Dry Etch-Induced Damage In Regrown III-Nitride Structures
Enhanced Hole Injection by P-Type Active Region and Lateral Injection in InAlGaN LEDs
Improved Manufacturing of Solid State Lasers via Patterned 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
Burying Impurities And Defects In Regrown III-Nitride Structures
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 Patternning
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