High Speed Indium Gallium Nitride Multi-Quantum Well (InGaN MQW) Photodetector
Tech ID: 30186 / UC Case 2019-179-0

BRIEF DESCRIPTION
A way to increase the bandwidth of InGaN MQW photodetectors to make them compatible with high-speed VLC links.

BACKGROUND
Over the past few years, visible light communication (VLC) technology has become well known as an alternative wireless communication technology, with great potential when paired with InGaN based photodetectors. However, the speed performance of InGaN based photodetectors is not fast enough for the optical receivers in VLC links. Researchers have turned their focus towards InGaN photodetectors with multi-quantum-well (MQW) structures in order to avoid issues with epitaxy of thick InGaN layers, but current studies pay little attention to the speed-performance of devices using these structures.

DESCRIPTION
Researchers at the University of California, Santa Barbara have found a way to increase the bandwidth of InGaN MQW photodetectors to make them compatible with high-speed VLC links. The invention shows how implementing thin quantum barriers in the MQW structure stops carrier escape, improves the bandwidth of InGaN MQW photodetectors, and offers an alternative way to create wide bandgap semiconductors without the difficult process of growing thick InGaN layers.

ADVANTAGES
▶ Increased bandwidth
▶ Alternative solution to difficult growth of thick semiconductor layers
▶ Compatible with VLC links and prior bandgap semiconductor infrastructure
▶ Low development cost

APPLICATIONS
▶ Wide bandgap semiconductors
▶ Optoelectronics
▶ High-power electronics
▶ Vehicular communication
▶ Underwater communication
▶ Indoor positioning systems

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
▶ Flexible Arrays of MicroLEDs using the Photoelectrochemical (PEC) Lift off Technique
▶ Vertical Cavity Surface-Emitting Lasers with Continuous Wave Operation
▶ Gallium-containing MicroLEDs for Displays
▶ 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
Methods for Fabricating III-Nitride Tunnel Junction Devices
3D Hole Injectors for InAlGaN Light-Emitting Diodes
Formation of Transparent Integrated MicroLED Displays
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 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
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 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