



(In,Ga,Al)N Optoelectronic Devices with Thicker Active Layers for Improved Performance

Tech ID: 23146 / UC Case 2013-329-0

BRIEF DESCRIPTION

A novel invention to enable the fabrication of (In,Ga,Al)N optoelectronic devices with thick active layers containing a high concentration of indium (In).

BACKGROUND

Currently, the fabrication of heterojunctions for optoelectronic devices is limited to the combination of layers with either the same lattice constants or layers where the thickness of the lattice mismatched layers did not exceed its critical thickness. However, thick active regions are attractive for light emitting diodes (LEDs) with significantly reduced droop and solar cells requiring thick active regions for efficient absorption. Moreover, LED development is restricted by the green gap due to deep green LED sources being difficult to produce.

DESCRIPTION

Researchers at the University of California, Santa Barbara have developed a novel invention to enable the fabrication of (In,Ga,Al)N optoelectronic devices with thick active layers containing a high concentration of indium (In). The In content of the active region can be increased while maintaining a low lattice mismatch between the active region and the current carrying layers, mitigating deterioration of device performance in the green gap. Consequently, relaxed (In,Ga,Al)N films with a lattice constant between GaN and InN can be fabricated on GaN layers of all orientations, including (0001) c-plane GaN.

ADVANTAGES

- Improved performance of existing devices which require a combination of layers with large lattice mismatch
- Mitigation of defect formation in active layers
- Increase the thickness of the active layers

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OTHER INFORMATION

KEYWORDS

TIAlighting, lattice mismatch, heterojunctions, LED, solar, indssl, indled, cenIEE, indfeat

CATEGORIZED AS

- ▶ [Energy](#)
 - ▶ [Lighting](#)
 - ▶ [Solar](#)
- ▶ [Semiconductors](#)
 - ▶ [Design and Fabrication](#)

RELATED CASES

2013-329-0

APPLICATIONS

- LEDs
- Solar Cells

This technology is available for licensing.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,076,927	07/07/2015	2013-329

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- ▶ Vertical Cavity Surface-Emitting Lasers with Continuous Wave Operation
- ▶ Eliminating Misfit Dislocations with In-Situ Compliant Substrate Formation
- ▶ Enhanced Light Extraction LED with a Tunnel Junction Contact Wafer Bonded to a Conductive Oxide
- ▶ Methods to Produce and Recycle Substates for III-Nitride Materials with Electrochemical Etching
- ▶ A Structure For Increasing Mobility In A High-Electron-Mobility Transistor
- ▶ III-Nitride Tunnel Junction with Modified Interface
- ▶ Improved Reliability & Enhanced Performance of III-Nitride Tunnel Junction Optoelectronic Devices
- ▶ Thermally Stable, Laser-Driven White Lighting Device
- ▶ GaN-based Vertical Metal Oxide Semiconductor and Junction Field Effect Transistors
- ▶ III-Nitride Tunnel Junction LED with High Wall Plug Efficiency
- ▶ Iii-N Transistor With Stepped Cap Layers
- ▶ A Method To Lift-Off Nitride Materials With Electrochemical Etch
- ▶ Activation of P-Type Layers of Tunnel Junctions in Micro-LEDs
- ▶ High-Intensity Solid State White Laser Diode
- ▶ Nitride Based Ultraviolet LED with an Ultraviolet Transparent Contact
- ▶ Epitaxial Light Control Features in Light Emitting Diodes
- ▶ High-Efficiency Vertical Cavity Surface Emitting Laser Fabrication
- ▶ A Wafer-Scale, Low Defect Density Strain Relaxed Template for III-Nitride-Based High Efficiency and High-Power Devices
- ▶ III-N Based Material Structures and Circuit Modules Based on Strain Management

