Methods for Locally Changing the Electric Field Distribution in Electron Devices

Tech ID: 29539 / UC Case 2006-129-0

BRIEF DESCRIPTION

A surface treatment that can shape the electric field profile in electronic devices in 1, 2, or 3 dimensions.

BACKGROUND

Field effect transistors are commonly used as power amplifiers, where the maximum output power is proportional to the maximum current of the device and to the maximum voltage swing at the drain electrode. To maximize the output power of a transistor, both the drain current and the voltage swing need to be increased. Current technology is not suited for the break down of high power application to maximize the current of the device. In order to increase the breakdown voltage, the electric field needs to be spread out. Current processes for doing this, recess engineering and plated structures, present several problems: introduction of parasitic resistances, unavailability of resources, increase of leakages, inability to function with high frequency devices. New techniques are needed for locally changing the electric field distribution.

DESCRIPTION

Researchers at the University of California, Santa Barbara developed a surface treatment that can shape the electric field profile in electronic devices in 1, 2, or 3 dimensions. The ability to locally change the electric field distribution can improve the performance of different kinds of devices, including high electron mobility transistors (HEMTs), light emitting diodes (LEDs), and ultraviolet detectors. In HEMTs, the electric field shaping technology allows a reduction in the peak electric field in the channel, increasing the breakdown voltage and decreasing the gate leakage without harming the high-frequency transistor. For LEDs and lasers, the surface treatment can passivate lattice defect like dislocation, point defects, or sidewalls. This reduces leakage current and enhances the luminous efficiency of optical devices.

ADVANTAGES

- HEMTs - increase breakdown voltage & decrease the gate leakage safely
- LED/Lasers - passivate lattice defect, reduces leakage current, enhances luminous efficiency of optical devices

APPLICATIONS

- LED

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OTHER INFORMATION

KEYWORDS

LED, Light Emitting Diode, Lasers, HEMTs, Ultraviolet, indfeat, indled

CATEGORIZED AS

- **Optics and Photonics**
  - All Optics and Photonics
- **Energy**
  - Lighting
- **Semiconductors**
  - Design and Fabrication

RELATED CASES

2006-129-0

- Lasers
- HEMTs
- Ultraviolet detections

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	8,114,717	02/14/2012	2006-129

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- High-Quality N-Face GaN, InN, AlN by MOCVD
- Defect Reduction in GaN films using in-situ SiNx Nanomask
- A Structure For Increasing Mobility In A High-Electron-Mobility Transistor
- Improved Fabrication of Nonpolar InGaN Thin Films, Heterostructures, and Devices
- 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
- GaN-based Vertical Metal Oxide Semiconductor and Junction Field Effect Transistors
- Novel Current-Blocking Layer in High-Power Current Aperture Vertical Electron Transistors (CAVETs)
- Iii-N Transistor With Stepped Cap Layers
- III-N Based Material Structures and Circuit Modules Based on Strain Management

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