Enabling Epitaxial Growth On Thin Substrates
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BACKGROUND

Current epitaxial growth is performed on substrates which are thick enough to maintain mechanical integrity during growth. However, when a substrate is too thick for subsequent device processing, it requires expensive substrate removal methods, which also lengthen production timelines. To help reduce thickness, typical GaN devices are fabricated on SiC substrates that are both expensive and in limited supply.

DESCRIPTION

Researchers at the University of California, Santa Barbara have simplified epitaxial growth on substrates by starting with a thin substrate (100 microns or less) which is wafer bonded to a carrier wafer. The carrier wafer is easily removed after growth or standard processing steps. The thin nature of the sapphire substrate circumvents disadvantages such as low thermal conductivity of sapphire. With this technology, GaN devices can also be fabricated with a thin epitaxial layer structure on inexpensive and widely-available sapphire substrates without the need for expensive substrate removal techniques.

ADVANTAGES

▶ Reduces substrate costs
▶ Reduces production time
▶ Avoids poor thermal conductivity of thicker sapphire substrates

APPLICATIONS

▶ LEDs
▶ Laser Diodes
▶ Power Electronics

PATENT STATUS

Patent Pending

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

▶ Achieving “Active P-Type Layer/Layers” In III-Nitride Epitaxial Or Device Structures Having Buried P-Type Layers
▶ High-Quality N-Face GaN, InN, AlN by MOCVD
▶ Defect Reduction in GaN films using in-situ SiNx Nanomask
▶ Device Structures Utilizing Barrier Enhancement Conductive Materials on N-polar III-N
▶ Laser Diode With Tunnel Junction Contact Surface Grating
▶ High Mobility Group-III Nitride Transistors with Strained Channels
▶ A Structure For Increasing Mobility In A High-Electron-Mobility Transistor
▶ Fabrication of Relaxed Semiconductor Films without Crystal Defects
▶ Improved Fabrication of Nonpolar InGaN Thin Films, Heterostructures, and Devices
▶ Methods for Locally Changing the Electric Field Distribution in Electron Devices
▶ Near-Infrared, Flip-Chip, TCO-Clad, InGaN Quantum Dot Laser Diode
▶ Incorporating Temperature-Sensitive Layers in III-N Devices
▶ Controlling Linearity in N-Polar GaN MISHEMTs
▶ 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
N-polar III-N Semiconductor Device Structures Enabled by Wet Chemistry
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
Polarization-Doped Field Effect Transistors with Increased Performance
Wafer Bonding for Embedding Active Regions with Relaxed Nanofeatures
III-N Based Material Structures and Circuit Modules Based on Strain Management