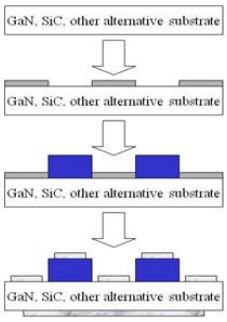
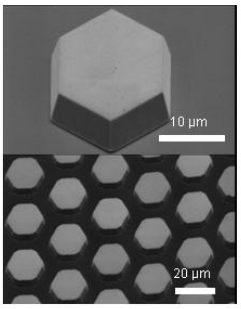
NAVAL RESEARCH LABORATORY

TECHNOLOGY LICENSING OPPORTUNITY

IMPROVED GROWTH METHOD FOR III-V NITRIDE DEVICES



(Left) Schematic of the confined epitaxy process that results in improved material (blue). (Right) Micrograph of single confined epitaxy region (top) and an array of such regions (bottom).



The Naval Research Laboratory (NRL) has developed a materials growth method that results in significantly improved crystalline quality of wide bandgap semiconducting nitrides precisely where it is needed most in the active region of a vertical conduction device. The NRL technique, shown schematically above, is applicable to a wide range of substrates and uses a dielectric mask to confine epitaxial growth to a vertical column. This approach results in a reduction in the extended defect density in the column wherein the active region of the device (drift layer, junction, etc.) can be placed. This approach also avoids the need for plasma etch delineation of device regions and maintains a current conduction path that includes the substrate, enabling higher integration levels of devices such as power switches, detectors, and light emitters. The technique has been demonstrated to be effective in improving the performance of UV detectors and easing implementation of UV imaging arrays.

References

"Improved GaN Materials and Devices Through Confined Epitaxy," Applied Physics Letters 90 (2007) 162101 (1-3).

"Approaches to Reduced-Defect Active Regions for III-N Devices," ECS Transactions 3 (2006) 117-123.

Available for License: US Patent Nos. 7,198,970 and 7,470,989.

Advantages/Features

Improved material quality in epi-defined device active region

Eliminates need for plasma etch delineation of devices, which can lead to damage and surface leakage

Applicable to a wide range of substrates and compatible with standard semiconductor processing

Applications

Vertical conduction devices: power switches, lasers, LEDs, detectors

Distributed devices: large area power switches, imaging arrays

For more information contact:

Rita Manak, Ph.D.
Head, Technology Transfer Office

202 767-3083

rita.manak@nrl.navy.mil

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