A Method for a GaN Vertical Microcavity Surface Emitting Laser (VCSEL) that is compatible with conventional LED processing

Description:

Attempts to commercialize GaN VCSELs have been unsuccessful to date due to the challenges of manufacturability of DBR mirrors, difficulties associated with current blocking, and the complexity of laser liftoff. The new process flow overcomes all three challenges enabling the manufacturing of III-Nitride VCSEL without liftoff and with much reduced complexity and the possibility of on-wafer testing.

Advantages:

- The use of GaN/air-gap DBR (no complex epitaxial (Al, Ga)N/GaN DBR).
- Avoids the wafer lift off process, making the entire processing compatible with conventional and mature LED processing.
- True micro-cavity with a cavity length on the order of the lasing wavelength.
- Current blocking layer on the n-side of VCSEL improves the VCSEL performance.
- Process is substrate-independent, e.g., sapphire, GaN, Si, or SiC substrates.
- Uses conductivity-based electrochemical etching which is much simpler than the photo-electrochemical process.

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