



TECHNOLOGY

Enhanced Tuning of i-line Fabricated Optoelectronics for Greatly Increased Performance

OVERVIEW

Background

i-line photolithography is a staple of modern microelectronics manufacturing, particularly optoelectronic devices such as laser diodes. As such, it is a very established and mature technology. However, microscale roughness is a known issue with i-line manufacturing, and devices manufactured with this method are ultimately constrained in performance due to this roughness, such as reduced optical efficiency in optical waveguides.

Innovative Technology

Researchers at the University of Maryland have meticulously tuned an i-line photolithography process to reduce the surface roughness of the semiconductor sidewalls in microelectronic and photonic devices. Using this process, typical roughness was reduced from 64 nm peak-to-peak RMS in the standard process to 10 nm peak-to-peak RMS in the new process. Consequently, the typical linear optical loss in a 0.8 μm wide optical waveguide was reduced from 4.7 dB/cm to 0.7 dB/cm in the new process, a significant improvement. This new process will extend the life and thus increase the value of products currently manufactured using i-line photolithography.

Advantages

- Fabrication processes easily accessible in a standard fab
 - o Extended life of installed i-line photolithography tool
- Significantly reduced sidewall surface roughness in etched structures
 - o Improved optical efficiency of lasers and waveguides
 - o Lower electrical power consumption of devices
 - o Improved quality factor in resonators (optical or mechanical)

Applications

- Optoelectronics
 - o Photonic integrated circuits (PIC)
 - o Optical communications devices
 - o Semiconductor lasers and waveguides
- Micro Electro Mechanical Systems (MEMS)

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Additional Information

INSTITUTION

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PATENT STATUS

Pending

LICENSE STATUS

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CATEGORIES

- Microelectronics

EXTERNAL RESOURCES

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