



# Epitaxial Laser Integration on Silicon Based Substrates

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## BRIEF DESCRIPTION

A low-cost, highly scalable approach to integrating a compound-semiconductor laser or light source with silicon-photonic circuitry.

## BACKGROUND

There has been an increased interest in silicon photonics as it has various applications. These applications include, but are not limited to, data center interconnects, sensing, high performance computing, and space-based communications. Unfortunately, the development of silicon-photonic integrated circuits is complicated. The desirability, scalability, and commercial success of conventional approaches for integrating compound semiconductor devices and silicon-based integrated-optics substrates has been limited by the high cost of compound-semiconductor substrates as compared to silicon-based substrates, as well as the incurrence of extra processing steps and processing complexity associated with the integration. As a result, there remains a need for a simple, low-cost approach to integrating compound-semiconductor devices and silicon-based integrated-optics substrates to form practical, commercially viable silicon-photonics systems.

## DESCRIPTION

Researchers at the University of California, Santa Barbara have created a low-cost, highly scalable approach to integrating a compound-semiconductor laser or light source with silicon-photonic circuitry. The present invention discloses a silicon-photonic integrated circuit comprising a compound-semiconductor-based quantum-dot laser structure that is epitaxially grown on an indirect-bandgap substrate comprising a surface waveguide. The present invention provides an enabling technology for the low-cost manufacture of efficient lasers on silicon, as well as their optical coupling to silicon-based waveguides.

## ADVANTAGES

- ▶ Cost reduction
- ▶ Lower threshold currents
- ▶ Increased temperature stability of lasing threshold
- ▶ Longer lifetimes

## APPLICATIONS

## CONTACT

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## INVENTORS

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## OTHER INFORMATION

### KEYWORDS

Semiconductors, Photonics,  
Lasers, indadvmat

### CATEGORIZED AS

- ▶ **Optics and Photonics**
  - ▶ [All Optics and Photonics](#)
- ▶ **Communications**
  - ▶ [Optical](#)
- ▶ **Semiconductors**
  - ▶ [Other](#)

### RELATED CASES

2016-912-0

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,761,266	09/01/2020	2016-912

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Bonding of Heterogeneous Material for Improved Yield and Performance of Photonic Integrated Circuits
- Integrated Reconfigurable Circulator
- Magneto-Optic Modulator
- Quantum Dot Photonic Integrated Circuits
- Integrated Dielectric Waveguide and Semiconductor Layer
- Orthogonal Mode Laser Gyro
- Monolithically Integrated Laser-Nonlinear Photonic Devices
- Misfit Dislocation Free Quantum Dot Lasers

