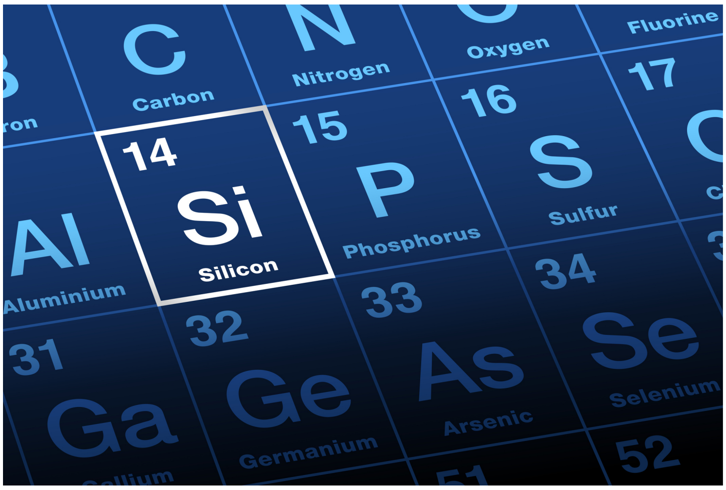
Monolithic III-Nitride Near-Infrared Disk-in-Nanowire Array Lasers Directly on (001) Silicon

TECHNOLOGY NUMBER: 7444



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Hardware
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OVERVIEW

A monolithic diode laser which can be grown directly on a (001) silicon substrate

- Emission wavelength of 1.3 microns with negligible attenuation in Si-based devices
- Provides power sufficiently large for silicon photonics-based applications

BACKGROUND

Silicon photonics have been heralded as an opportunity to break through the processing speed limitations currently faced by electronics due to the limited to the speed of electricity. Light, being much faster than electricity, can improve the speed of the next generation of computing devices as the medium through which information is transferred, both on processing chips and over great distances off-chip. Photonics could benefit chip and systems design to diminish input and output bottlenecks. Currently available complementary-metal-oxide semiconductor (CMOS) chips are based on (001) silicon (Si) substrates, so photonic devices also have to be compatible with (001) silicon. Given that Si itself cannot emit light, lasers made of other materials must be placed on the Si substrate. A need therefore exists for improved development of silicon photonics.

INNOVATION

Researchers have developed a monolithic diode laser which can be grown directly on a (001) silicon substrate with an emission wavelength of around 1.3 microns. The 1.3 micron wavelength produces the least dispersion in silicon dioxide (SiO2), it is transparent to silicon, and it allows eye-safe operation. The emitted light has negligible attenuation in Si-based devices, and additional signals (or channels) can be accompanied if the light is guided through SiO2-based waveguides. This technology is appropriately sized to allow silicon photonics-based applications, such as on-chip communication. With a waveguide and detector, these lasers can serve as a complete on-chip monolithic photonic link or optical interconnect. With future increase of the wavelength to 1.55 microns, the Si-based lasers could be used in long-haul fiber-optic links. These lasers show a very high temperature stability, permitting deployment in a variety of applications where the environment can be challenging, such as within smart car engine systems.

PATENT APPLICATION

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