Analytical Instrumentation, Methods & Materials

Type II Quantum Well Optoelectronic Devices That Exhibit High Performance in the Mid-Infrared Region

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing an InP-based, type II quantum well laser device that exhibits high performance in the mid-infrared (2 to 5 micron) wavelength range.

Overview

Lasers that operate in the mid-infrared (2 to 5 micron) wavelength region are needed for a variety of applications, including laser-based radar, free-space optical links, chemical and gas sensing systems and infrared countermeasures against heat-seeking missiles that threaten both military and commercial aircraft. However, conventional InP-, InAs- and GaSb-based lasers that operate at long wavelengths have proven extremely temperature-sensitive, a characteristic that severely impacts their CW (continuous wave) performance.

The Invention

UW-Madison researchers have developed an InP-based, type II quantum well laser device that exhibits high performance in the mid-infrared (2 to 5 micron) wavelength range. They designed a novel active region that includes electron quantum well layers composed of nitrogen-containing semiconductor materials, such as InAsN and InGaAsN. The active region also includes a hole quantum well layer composed of antimony-containing semiconductors, such as GaAsSb and InGaAsSb. By creating compressive strain in the hole quantum well layer alone, or by straining both the electron and hole quantum well layers, the researchers were able to generate laser light of the desired wavelengths.

Applications

- Many types of optoelectronic devices, including amplifiers, light-emitting diodes, and edge- and surface-emitting lasers that use optical feedback to provide lasing action

Key Benefits

- Unlike previous mid-infrared lasers, the laser of this invention exhibits high performance in the 2 to 5 micron wavelength at room temperature.
- Active region structures can be deposited onto InP substrates, eliminating the need for antimonide processing, which is less mature than InP processing.
- Since it is InP-based, this laser can be readily integrated with other optoelectronic devices on the same chip.
- InP substrates enable optical pumping with a conventional, high-power, 980 nm pump laser, allowing for efficient and high-power optically pumped mid-infrared sources.
- Active region structures can be grown by [illegible] vapor deposition).

Additional Information

For More Information About the Inventors

- Luke Mawst

Tech Fields

- Analytical Instrumentation, Methods & Materials : Lasers

For current licensing status, please contact Michael Carey at mcarey@warf.org or 608-960-9867