Analytical Instrumentation, Methods & Materials

High-Performance Quantum Well Lasers with Strained Quantum Wells and Dilute Nitride Barriers

View U.S. Patent No. 7,457,338 in PDF format.

WARF: P05440US

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing high-performance GaAs-based optoelectronic devices with an emission wavelength of 1200 nm or higher.

Overview

Conventional 1300 nm lasers are based on the InGaAsP or InGaAlAs quantum well active material system on an InP substrate. However, these 1300 nm lasers experience poor lasing performance when operated at high temperatures. The InGaAsN material system is an alternative with enormous potential for realizing light emitters on GaAs in the wavelengths of interest for optical communications. Unfortunately, InGaAsN quantum well lasers suffer from poor lasing performance due to the utilization of nearly lattice-matched InGaAsN. High-performance InGaAs quantum well lasers that have a long emission wavelength but use minimal nitrogen in the quantum well are needed.

The Invention

UW–Madison researchers have developed a GaAs-based multiple semiconductor layer structure for an improved optoelectronic device. The active region of the device includes at least one well layer composed of a compressively-strained semiconductor that is substantially free of nitrogen. Each well layer is disposed between two barrier layers composed of a nitrogen- and indium-containing semiconductor. This device is capable of generating light at wavelengths of 1.3 μm and higher.

Applications

- Projection televisions
- Optical communications

Key Benefits

- Elimination of nitrogen from the well layer improves crystal quality, leading to improved device performance and reduced risk of device failure.
- Including low levels of nitrogen in the dilute nitride barrier layers reduces the quantum size effect for carriers in the quantum well and extends the emission wavelength.
- Device is capable of generating light at relatively long wavelengths.

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