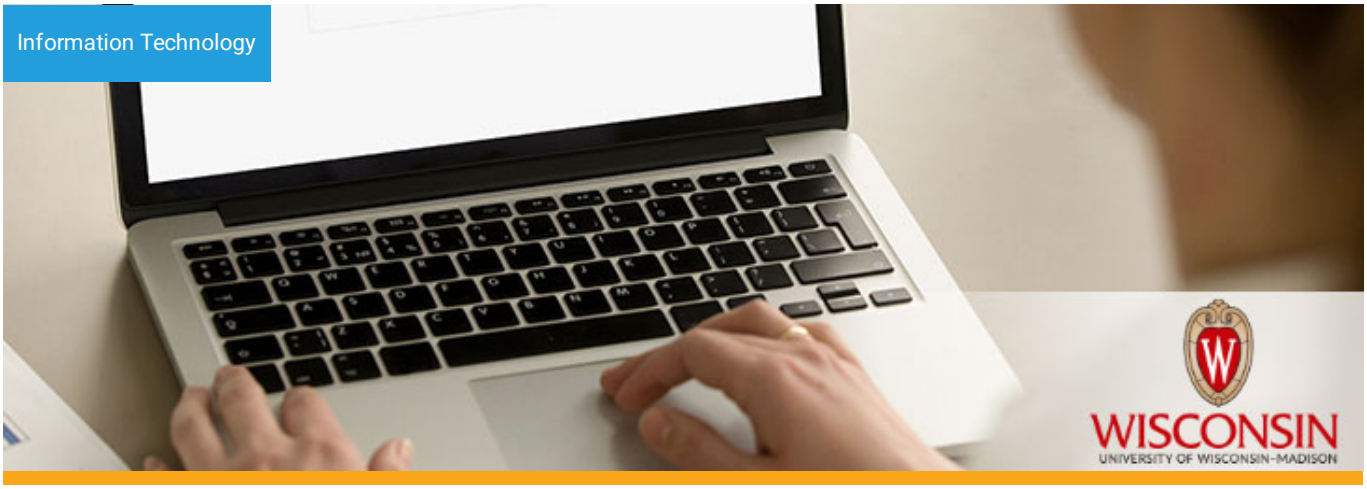
Information Technology



Steering and Tuning Lasers Formed by Nanoscale Microtubes

View U.S. Patent No. 8,792,528 in PDF format.

WARF: P08124US01

Inventors: Robert Blick, Luke Mawst

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a new method to modulate and direct lasers emitted by semiconductor microtubes.

Overview

Microtubes are minute structures of layered metal that have shown wide promise in many fields. Beyond wireless sensing and drug delivery, they are poised to improve optical technologies. Fiber optic data transmission, atmosphere monitoring, printing and computer mice are a fraction of applications that stand to be impacted by laser-emitting microtubes.

The nanometer-sized cylinders are formed by multiple strata of metal alloys grown on a substrate. Some of the layers are subjected to tensile, compressive or other strain, which causes the structure to curve and roll upon itself when severed from the substrate. Highly regular, reproducible microtubes can be fabricated in this way to construct arrays of very small lasers.

Overcoming traditional laser limitations—like the single, vertical direction of discharged light—and producing microtubes with the range and feedback to operate as true lasers, are essential.

The Invention

UW–Madison researchers have developed semiconductor microtube lasers that are wavelength-tunable and can be steered when an electromagnetic field is applied.

The microtube is a heterostructure of various group III/V alloys integrated for different purposes. The structuring involves three essential components: a strained layer to make the tube curl, an optically active lattice to emit laser light (interband or intersubband), and a grating structure to provide optical feedback. Thickness of the layers may range from five to 2000 nm.

Unlike existing lasers, the diameter of the microtube can be altered to produce different wavelengths of light. Through piezoelectric coupling or the addition of an insulating layer that leads to a change in lattice spacing, the tube can be made to expand or contract, corresponding to modulated emissions.

Additionally, the microtubes can be anchored in devices with electrodes that cause them to rise and tilt, steering the direction in which their light is given off.

Applications

- Telecommunications
- LED displays
- Atmospheric monitoring and analysis of gaseous mixtures
- Optical fiber data transmission

- Analog broadband signal transmission
- Absorption spectroscopy
- Laser printers and computer mice

Key Benefits

- Produces lasers that can be steered and modulated
- Potential for enhanced data transfer rates
- Precision bandwidth tuning

Additional Information

For More Information About the Inventors

- Luke Mawst

Related Technologies

- WARF reference number P01123US describes an improved method of coupling arrays of vertical-cavity surface-emitting semiconductor lasers (VCELs).

Tech Fields

- Analytical Instrumentation, Methods & Materials : Lasers
- Information Technology : Networking & telecommunications

For current licensing status, please contact Jennifer Gottwald at jennifer@warf.org or 608-960-9854