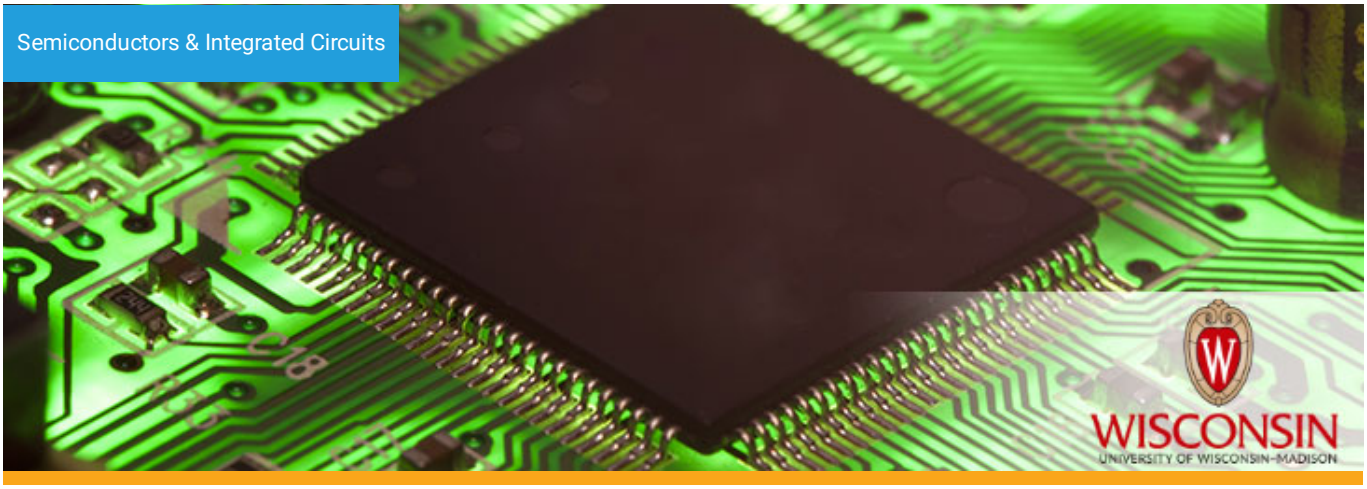

Thinner Reflector Stacks for Vertical-Cavity Surface-Emitting Lasers

View U.S. Patent No. 9,337,622 in PDF format.

WARF: P140364US01

Inventors: Zhenqiang Ma, Jung-Hun Seo

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing ultrathin distributed Bragg reflectors for use in high-performance VCSELs.

Overview

Distributed Bragg reflectors (DBRs) are found in photodetectors, solar cells and other optical sensors. Stacks of DBRs are incorporated in vertical-cavity surface emitting lasers (VCSELs), which are a type of compact light source used in a variety of applications, including fiber optic networks.

Slimmer VCSELs are highly desirable but their bulky stacks of DBRs are a problem. Conventional fabrication methods (e.g., epitaxial growth, chemical vapor deposition, etc.) yield DBRs with thick layers, rough surfaces or structural flaws that degrade performance.

The Invention

UW–Madison researchers have developed a method to create ultrathin DBRs that can be used in VCSELs. The DBRs are made of alternating layers of single-crystalline Group IV semiconductors (e.g., silicon or germanium) and silicon dioxide. The single-crystalline layers are incorporated into the stack using a thin film transfer and bonding process, while the silicon dioxide layers can be thermally grown or deposited.

The process results in very thin DBRs that can provide extremely high reflectance.

Applications

- Ultrathin distributed Bragg reflectors for VCSELs

Key Benefits

- Improves laser performance at a fraction of overall device thickness
- Makes it possible to obtain high quality silicon dioxide
- Yields precisely controlled/uniform layers
- Minimizers scattering loss
- Easier, cheaper manufacturing process
- No lithography
- Process supports a wide variety of substrates.

Additional Information

For More Information About the Inventors

- Zhenqiang Ma

Related Technologies

- WARF reference number P06047US describes methods for fabricating active semiconductor devices on single-crystal semiconductor membranes and transferring these membranes to different substrates.
- WARF reference number P08398US describes vertical cavity light-emitting sources that utilize patterned membranes as reflectors.

Tech Fields

- Semiconductors & Integrated Circuits : Components & materials

For current licensing status, please contact Jeanine Burmania at jeanine@warf.org or 608-960-9846