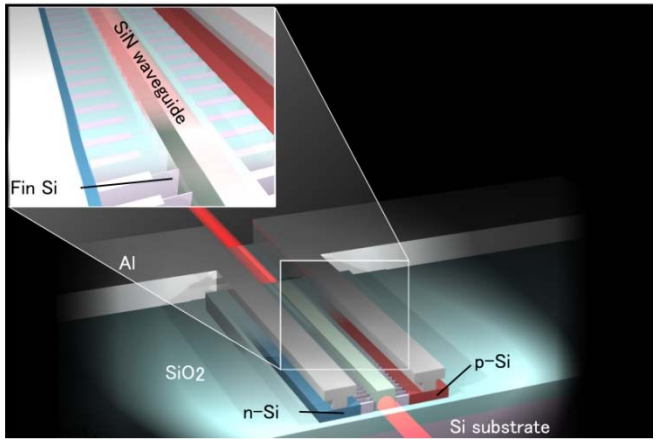
Electronics field

Central Research Laboratory
Communication Electronics Research Department

Hitachi, Ltd., web site【21st Sep 2010 News Release】http://www.hitachi.co.jp/New/cnews/month/2010/09/0921d.html

Stimulated emission observed in silicon fin light-emitting diode



Silicon laser diodes will dramatically increase network speed and reduce power consumption in IT devices. Stimulated emission, a necessary condition to realize the practical application of silicon laser diode, was observed in a device structure suitable for mass production.

On the road towards achieving a silicon laser diode, Hitachi observed electroluminescence in Year 2006, and stimulated emission from a single quantum well structure in Year 2008. In Year 2010, Hitachi developed a “fin type” multi-quantum well structure to enhance the luminescence intensity for usage at a practical level. The present silicon fin light-emitting diode will pave the way towards realizing a practical silicon laser diode.

■Characteristics

Fin-type structure is composed of more than 1000 sheets of 1-nanometer-thick ultra-thin silicon films arranged perpendicular to the silicon substrate.
This structure can be fabricated using existing manufacturing technology, thus making it suitable for mass production.

■Plan

To develop technology for greater optical amplification in the silicon laser diode.

■Conference presentation

This result was presented at the 2011 International Conference on Solid State Devices and Materials on the 22nd September 2010, at the University of Tokyo.

■A word from the development team

We faced difficulty in etching the 1 nanometer thick fin-type silicon perpendicular to the substrate but succeeded in observing stimulated emissions which is a prerequisite in realizing the silicon laser diode. We will continue to pursue this development.