DFB laser concept

Nanosystems and Technologies GmbH
nanoplus

nanoplus DFB lasers

A key product of nanoplus are complex coupled distributed feedback laser diodes. nanoplus provides these monomode semiconductor lasers at any wavelength between 760 nm and 14000 nm.

Key features of nanoplus DFB lasers

- ✓ stable longitudinal and transversal single mode emission
- ✓ precise selection of target wavelength
- ✓ narrow laser line width
- ✓ mode-hop-free wavelength tunability
- ✓ fast wavelength tuning
- ✓ typically > 5 mW output power
- ✓ typically > 40 dB side mode suppression ratio (SMSR)
- ✓ small size
- ✓ easy usability
- ✓ high efficiency
- ✓ long-term stability

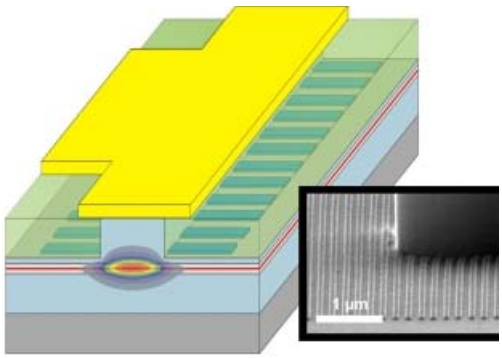

Fig.1 Schematic design of a laterally couples DFB laser diode and electron micrograph of a metal grating DFB structure defined by E-Beam Lithography

Unique concept of nanoplus DFB lasers

Distributed Feedback Lasers (DFB) provide longitudinal and transversal single mode emission at a precise wavelength with an extremely narrow line width. They guarantee high output power and mode-hop-free tunability compared to Distributed Bragg Reflectors. DFB lasers perfectly meet the high requirements of gas sensing applications based on Tunable Diode Laser Absorption Spectroscopy (TDLAS).

The unique and patented nanoplus DFB concept (shown schematically in Figure 1) is based on an over-growth-free etching process. In nanoplus DFB lasers complex coupling is obtained by combining a ridge waveguide structure with metal gratings on top of the waveguide layer on both sides of the laser ridge. This production technology avoids the need of high quality orientation independent growth as well as the per se insertion of patterning induced defects near the active layer.

nanoplus DFB laser concept can be:

- ✓ transferred to any material system (GaAs, InP and GaSb, ICL, QCL)
- ✓ easily customized (short time to market)
- ✓ high yield for low-cost volume-applications

With its unique DFB concept nanoplus manufactures:

Bipolar Laser Diodes (LD) from 760 nm to 3000 nm	Interband Cascade Lasers (ICL) from 3000 nm to 6000 nm	Quantum Cascade Lasers (QCL) from 6000 nm to 14000 nm
Electrons and holes have an optical interband recombination at the p-n junction of a semiconductor diode. This transition has a high energy gap. This is why we reach a shorter wavelength range with these devices.	Electrons and holes have an optical interband recombination at the W-shaped quantum well (QW) of the semiconductor material. The energy of this transition is between those of a LD and a QCL. This is why we reach a medium wavelength range with these devices.	Valence band (VB) is irrelevant to the optical transition. Electrons and holes have an optical intraband recombination within the conductive band (CB) of the semiconductor material. The energy of this transition is low. This is why we reach a longer wavelength range with these devices.

ATTENTION! OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICE

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