

New mid-infrared sources for photonic sensors

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STREP

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Web site

<http://www.fzu.cz/departments/semiconductors/movpe/projects.htm#nemis>

Timeline

Start Date: 1 Sept. 2006

End Date: 31 Aug. 2009

Budget

Overall Cost: 2.51 million €

Funding: 2.0 million €

Project Partners

- TECHNISCHE UNIVERSITAET MUENCHEN, DE
- UNIVERSITE MONTPELLIER II, FR
- INSTITUTE OF PHYSICS OF THE ACADEMY OF SCIENCES OF THE CZECH REPUBLIC, CZ
- CHALMERS TEKNISKA HOEGSKOLA AKTIEBOLAG, SE
- VERTILAS GMBH, DE
- OMNISENS SA, CH
- SIEMENS AG, DE

Vision & Aim

The objectives of the NEMIS project are the development and realisation of compact and packaged vertical-cavity surface-emitting semiconductor laser diodes (VCSEL) for the 2-3.5 μ m wavelength range and to demonstrate a pilot photonic sensing system for trace gas analysis using these new sources. The availability of electrically pumped VCSELs with their low-cost potential in this wavelength range that operate continuously at or at least near room-temperature and emit in a single transverse and longitudinal mode (i. e. single-frequency lasers) is considered a basic breakthrough for laser-based optical sensing applications. These devices are also mode-hop-free tuneable over a couple of nanometers via the laser current or the heatsink temperature. They are therefore ideal and unmatched sources for the spectroscopic analysis of gases and the detection of many environmentally important and/or toxic trace-gases, which is a market in the order of 10 million Euro today with an expected increase into several 100 million Euro with the availability of the new VCSELs.

The semiconductor technology underlying the VCSELs relies on GaSb-based quantum well structures and the devices are based on insulating apertures as well as on buried tunnel junctions for the lateral current and mode confinement. The project is organized into six workpackages dedicated to specifications/design, epitaxy, VCSEL technology, VCSEL characterisation, applications, and project management. The consortium comprises seven complementary and highly skilled partners from five European countries: Technische Universität München, Germany (buried-tunnel-junction VCSEL), Université Montpellier 2, France (insulator-confined VCSEL), Institute of Physics of the Academy of Sciences, Czech Republic (VCSEL characterisation), Chalmers University of Technology, Sweden (Design), VERTILAS GmbH, Germany (VCSEL packaging and characterisation), Omnisens, Switzerland (Applications) and Siemens AG, Germany (Applications).