FRANÇAIS ENGLISH

cea leti

µPAsense

PATENTS 10 PATENTS

CEA-Leti innovates in chemicals sensing with photo-acoustic solutions

What is µPAsense?

The photoacoustic spectroscopy technique is based on the absorption of light by the molecules of interest and the subsequent generation of acoustic waves. This technique, typically used for high-resolution mid-IR spectroscopy, is today confined to laboratory applications due to its size and cost.

CEA-Leti proposes µPAsense, a compact photoacoustic sensor working in the mid-infrared region, by assembling a multi-wavelength quantum cascade laser (QCL) source with a photonics integrated circuit (PIC) combiner in a small photoacoustic cell (a few cm^3).
This sensor allows multigas detection with very high sensitivity down to a few ppb level.

Applications

Trace gas detection and sensing in:

- Environmental
- Process control
- Quality assurance
- Safety & security
- Early disease diagnosis

What's new?

CEA-Leti's teams are focusing on miniaturization of the sensor at chip or packaging level to address cost reduction, multigas detection and portability.

Key achievements toward miniaturization are:

- The effective fabrication process for QCL sources (originally developed by our startup partner mirSense): the wavelength of each laser is selected independently after the growth of the epitaxial layers
- Low-loss waveguides based on Ge and SiGe alloy to realize the PIC combiner (losses as low as <1dB/cm on the 3-12 µm range)
- Mini acoustic Helmholtz detectors fabricated on silicon and based on MEMS microphones suitable for trace-gas detection

Mirsense, a CEA-Leti's startup company, is currently industrializing and commercializing this mini photoacoustic gas sensor.

What's next?

CEA-Leti currently is working on:

- Transfer of the QCL fabrication process on silicon wafer
- Realization of the photoacoustic detector on silicon
- New designs of the photoacoustic cell to improve resolution and stability
- Ozone detection in the UV band

Key facts

- 10 patents on photoacoustics & sensor integration
- 11 publications (2013-2019)
- Partnership with Mirsense company since 2015

Key features

- Multigas sensors from one to tens of species (with absorption lines in the 3-12 µm wavelength range)
- Ultra-low limit of detection down to few ppb
- Portable system, low volume
- Highly selective identification
- Real-time measurement

Interested in this technology?

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