



PHOTOACOUSTIC SPECTROSCOPY

LETI INNOVATES IN CHEMICALS SENSING WITH NON-DISPERSIVE INFRARED SOLUTIONS

HAT IS PHOTOACOUSTIC SPECTROSCOPY?

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 is typically used for high-resolution mid-IR spectrometry, but confined to laboratory applications due to its size and cost.

Leti proposes 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 cm³). This sensor allows multigas detection with very high sensitivity down to a few ppb level.



Trace gas detection and sensing in:

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

+ WHAT'S NEW?

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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 (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 by 3D-metal printing and based on MEMS microphones suitable for trace-gas detection

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



PATENTS, PUBLICATIONS, PARTNERSHIPS

- 10 patents

 on photoacoustics
 & sensor integration
- 8 publications (2013-1018)
- Partnership with the startup company mirSense 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

WHAT'S NEXT?

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

INTERESTED IN THIS TECHNOLOGY?

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