FRANÇAIS ENGLISH

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Physiolas

PATENTS 10+ PATENTS

Listening to molecules: miniaturized photoacoustic sensors for non-invasive biomarker monitoring

What it is

These new-generation photoacoustic sensors combine laser sources emitting in the mid-infrared range with a photoacoustic cell and integrated microphones. Molecules of interest absorb the light emitted by the laser sources in a unique way, generating acoustic waves that can be used to measure molecule trace concentrations.

This exclusive CEA-Leti technology can be miniaturized to the extreme and is compatible with volume manufacturing. It opens the door to selective real-time monitoring of biomarkers, including glucose, and of certain gases in the environment.

What it can do

This technology and the associated silicon CMOS and MEMS low-cost volume manufacturing processes address several markets:

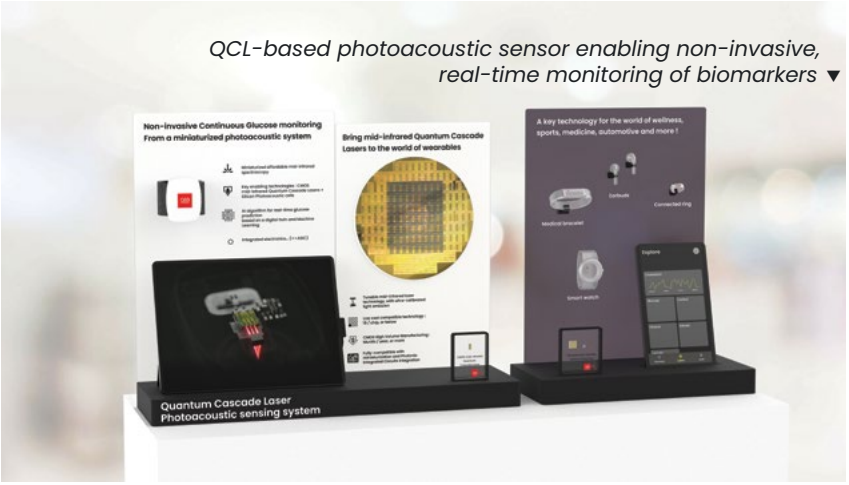
- **Sports, health, nutrition, and wellness**: real-time monitoring of multiple biomarkers with a connected, non-invasive wearable device
- **Medical**: real-time glucose monitoring with a non-invasive wearable device that has already been clinically tested
- **Environment, industrial process control, and quality control**: gas emissions monitoring with a connected stand-alone device
- **Safety**: screening for toxic substances to comply with future transportation-industry standards

What makes it unique

This mid-infrared spectroscopy technique is still little-used outside of laboratory environments at the state of the art due to the cost and size of the equipment. CEA-Leti's innovative concept promises to remove the barriers that have prevented the wider-spread use of current solutions. CEA-Leti brings years of research and development spanning the miniaturization and integration of photonic components on silicon, advanced software, digital twins, and machine learning to this innovation.

- Mid-infrared quantum cascade lasers and photoacoustic cells manufactured using CMOS and MEMS technology, respectively, guaranteeing rapid transfer to a commercial fab for volume markets
- Compatible with volume manufacturing at a cost of $1 per CMOS laser (or less in some cases) and less than $10 per sensor

QCL-based photoacoustic sensor enabling non-invasive, real-time monitoring of biomarkers ▼



Working with CEA-Leti

This technology is ready to be developed and industrialized for partners. Companies of all types and sizes can work with CEA-Leti on projects across the entire value chain through single-partner R&D contracts or multi-partner affiliate programs. CEA-Leti's mission is to bring this breakthrough technology to the market as quickly as possible, enabling new capabilities for next-generation products. And, with CEA-Leti's "lab-to-fab" model, each project is supported until the technology is ready for transfer. Finally, CEA-Leti brings a "compliant by design" approach to developments for medical devices. The institute's knowledge of the regulatory environment ensures that end products are ready for commercialization.

Key figures

- An extremely miniaturizable (<1 cm^3) low-cost system (<$10 each), with medical performance demonstrated in a second clinical trial.
- Very promising results were obtained in representative in-home testing: MARD (Mean Absolute Relative Difference) of around 18% for non-invasive continuous glucose measurement, placing clinical validation within reach.

Scientific publication

Coutard, J.G. et al. (2024). "Neogly™ QCL-based NI-CGM medical device". Proc. SPIE 12838, Biophotonics in Exercise Science, Sports Medicine, Health Monitoring Technologies, and Wearables V, 1283802.

Interested in this technology?

Contact:
Vincent Destefanis
vincent.destefanis@cea.fr
+33 660 908 508

CEA-Leti, technology research institute
17 avenue des Martyrs, 38054 Grenoble Cedex 9, France
cea-leti.com

@CEA-Leti

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