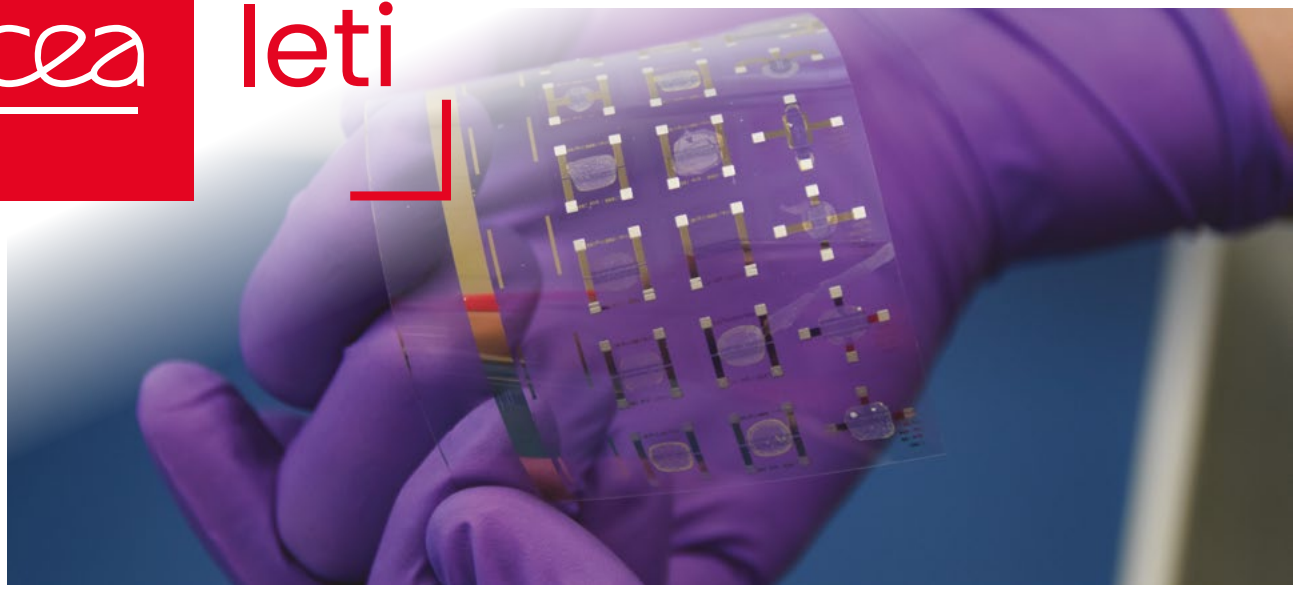
FRANÇAIS ENGLISH

cea leti



Multiplexed biosensors

PATENTS 10+ PATENTS

Ultrasensitive detection of rare biomarkers

What is multiplexed biosensors?

By providing a direct conversion of a biological event to an electronic signal, biosensor devices offer real-time information on biomarkers.

CEA-Leti provides state-of-the-art transducer-based biosensors such as NEMS and MEMS, photonic/plasmonic electrochemical, Field Effect Transistor (FET) (graphen, SGFET, and silicon nanowires) biosensors with biofunctionalisation capabilities and microfluidic integration. This enables enhanced multimodal and multiplexed detection and the quantification of rare events (single cell, low concentrated biomarkers) from tiny volumes of body fluids (nanoliters), a technology that would be effective to detect early-stage infections, for instance.

Multiplexed biosensors provide a powerful means of detecting microorganisms in bodily fluid more rapidly, thus allowing efficient, fast treatment to patients.

Applications

Human and veterinarian healthcare for monitoring purposes:

- Point-of-Care testing and diagnostics of sepsis and strokes
- Liquid biopsies for drug screening
- Companion testing
- In-line or in-bioreactor production monitoring
- Wearable devices for non-invasive physiological monitoring
- Post-surgical infections

Environmental and industrial applications for monitoring purposes:

- Water, air, and soil quality
- Agriculture and food

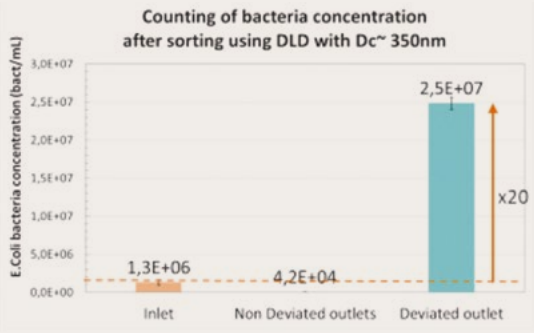
What's new?

CEA-Leti biosensors offer a wide range of improvements for both healthcare practitioners and scientists:

- A fully integrated analytical chain from biosensor design to detection
- Ultrasensitive detection of unique cells, exosome masses (in the atogram range), circulating tumor cells (CTC), extracellular vesicles (EVs), viruses, and bacteria. **This is twenty times more efficient than conventional methods.**
- Nanofluidic for the detection of microorganisms from nanoliter samples
- Real-time and continuous multiplex and label-free detection using combinations of optical, electrochemical, and mechanical modalities
- Hybrid passive and active microfluidic integration: cyclic olefin copolymer (COC), silicon, polydimethyl siloxane (PDMS), glass
- Improved specificity by formulating bio-sensitive layers (surface biofunctionalisation, biomaterials engineering).

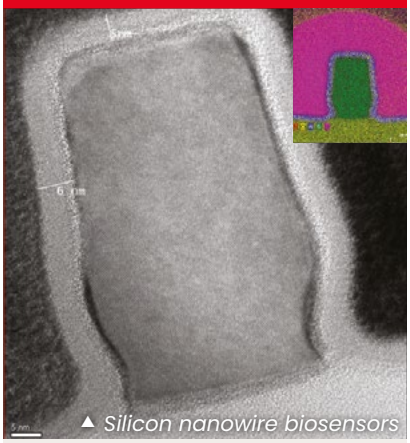
Example: Bacteria concentration (E.COLI) ▼

20 times more efficient
350 µL/H (Dc~350 nm) < Flow Rate < ~6 mL/H (Dc~1 µm)



Publications

- *"High-throughput measurement of single-cell growth rates using serial microfluidic mass sensor arrays,"* Olcum et al, Nature Biotechnology, 34, 1052-1059 (2016)
- Deterministic lateral displacement (DLD): *"Finite element modeling and experimental validation for particle trajectory and separation,"* Agache et al, Advanced Materials (2017)



▲ Silicon nanowire biosensors

What's next?

The CEA-Leti team is currently developing:

- Multimodal biosensor platforms
- Sensor networks for both cell cultures and on-chip organs
- Resorbable sensors
- Sensors on paper
- Integration in lab-on-chip

Interested in this technology?

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Research for industrial innovation