



Bioproduction



Advanced micro-nanotechnologies for bioprocess monitoring and analytical control

What it is

This sensing system includes:

- A USP (Up Stream Process) in-line device consisting of a all-in one miniaturized multiparametric platform with electrochemical sensors.
- A DSP (Down Stream Process) functionalized photonic biosensor allowing specific measurement of impurities in real time to control purification process.

This hardware-plus-firmware solution leverages near-sensor compute capabilities to process the sensor data and interface with production equipment.

What it can do

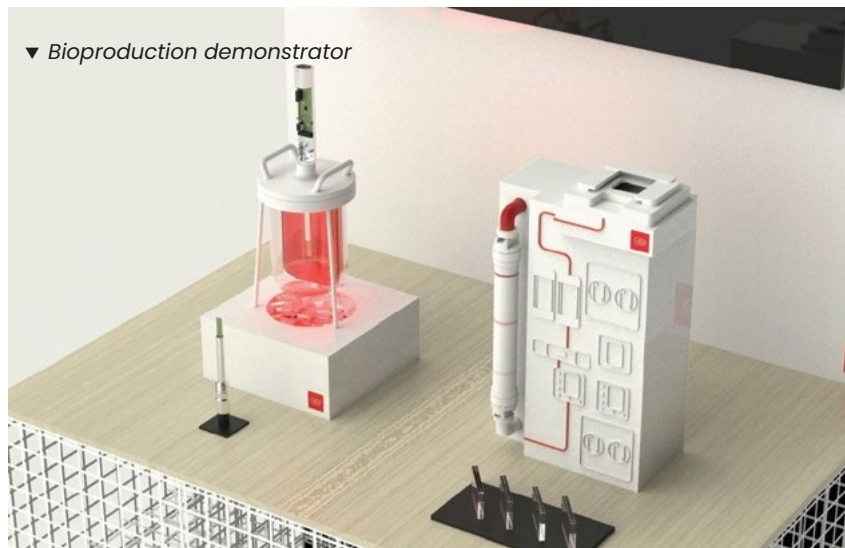
It offers a new approach to managing biomanufacturing processes with cutting-edge monitoring technologies for cell culture, drug substance production and purification steps to obtain a very high level of biomedicine batch quality and a significant increase of productivity. This type of real-time multiparameter sensing could also enable more efficient bioproduction in other industries:

- Human, animal, and plant nutrition
- Food manufacturing
- Brewing and distilling
- Cosmetics
- Biofuels

What makes it unique

The cell culture sensors offers features currently not available with today's commercially available solutions:

- Multiplexed electrochemical sensors
- Smart
- Bioreactor digital twin
- Single unit USP sensor
- Versatile DSP sensor
- Low cost



▼ Bioproduction demonstrator

At a glance

- Makes bioproduction more efficient by increasing production yields and analytical control
- Speeds up the development of new drugs
- Paves the way for AI-enabled industry 4.0 systems like digital twins
- TRL: 4-5 (transfer to bioproduction OEM GPC Bio in progress; expected to reach the market in 2026)

Scientific publications

- Laplatine, L., et al. (2024). "A silicon photonics platform based on Mach Zehnder interferometers for real-time bioprocess monitoring." SPIE Photonics West, 12.3001513.
- Nonglaton, G., et al. (2024). "Technological Advances in Bioproduction: An Innovative Photonic Platform for Real-Time Monitoring of Impurities." IEEE Biosensors Conference, 10.1109.

What's next?

Future bioproduction needs will require next-generation technologies development such as optical sensors, electromechanical sensors, artificial intelligence, algorithms, microfluidic devices, fully in line with CEA expertise.

Partners from Calipso project:



Interested in this technology?

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