Massachusetts Institute of Technology

inSpek

using
PICs

In fabrication of
BioPharmaceuticals

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inSpek at a glance

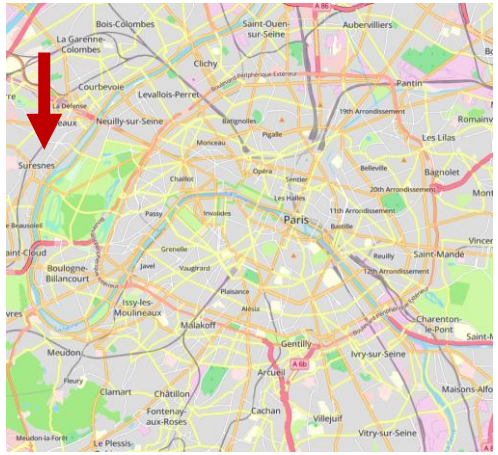
Founded in **2021** Massachusetts Institute of Technology + cnrs

A **team of 12** - expertise in optics & bioprocessing

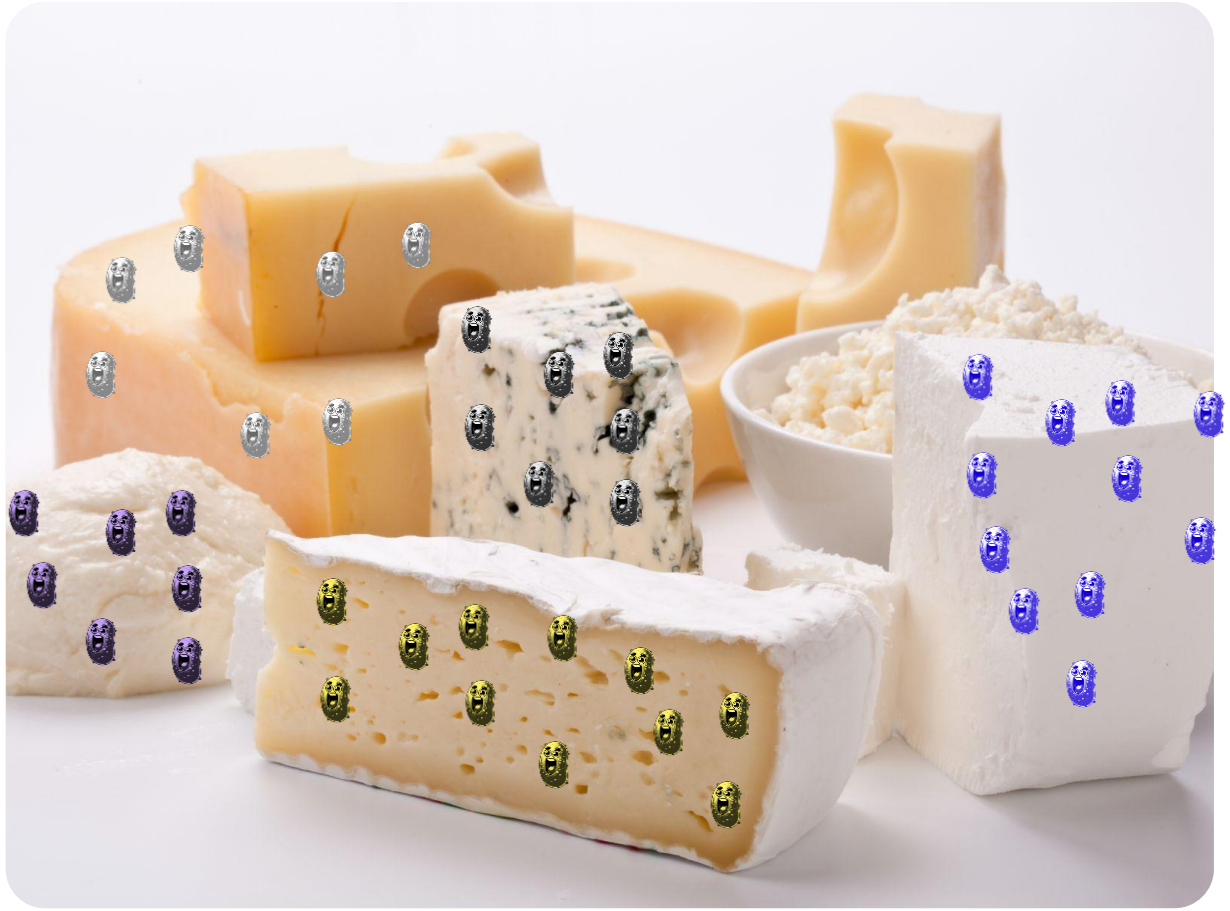
Suresnes, France

Funding: investors, public agencies, PoCs with customers

QUANTO NATION breega WIND Pioneer the Future bpifrance European Innovation Council



What is a bioprocess?



Microorganisms creating value

What is a bioprocess?

Microorganisms creating value

What is a bioprocess?

COVID-19
Coronavirus

Cancer

Genetic diseases

Metabolic Diseases

Skin Diseases

Digestive System Diseases

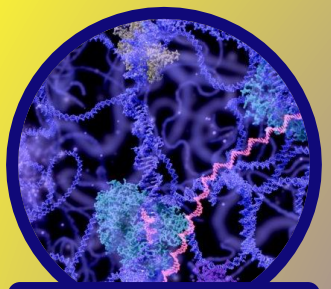
Syndromes

...

Microorganisms creating value

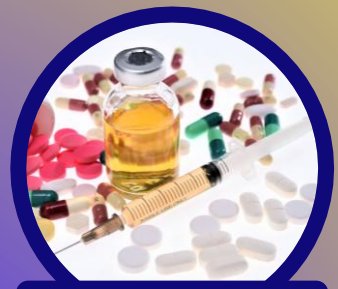
Biomedicines

Synthetic biology


Enzymes

Bioplastics

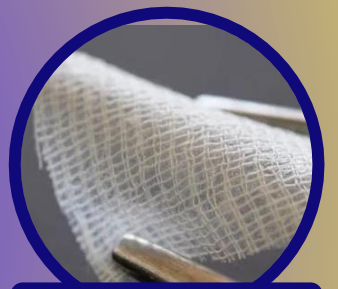
Biofuels


Biopharma

Animal feed

Biodefense

Cultured meat


New materials

Cosmetics

Crop enhancement

Vitamins

Waste management

Tissue engineering

Biochemicals

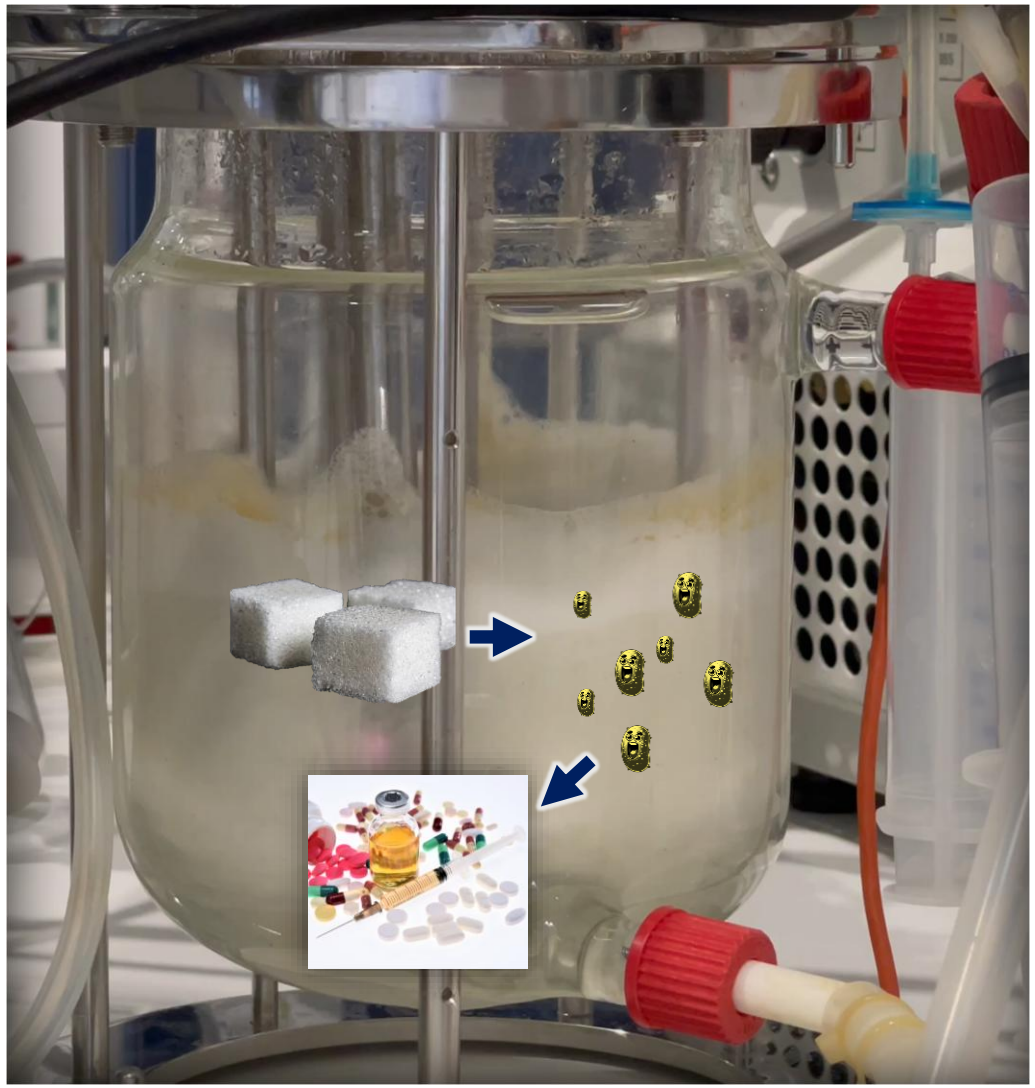
Source: McKinsey, “The Bio Revolution: Innovations transforming economies, societies, and our lives”, 2020

"Up to **30% failure** rate in
cell & gene therapies manufacturing"

"More than **90%** of syn-bio technologies **fail**
because they **can't be scaled**"

Sources: BCG, "Synthetic Biology Is About to Disrupt Your Industry", 2022; BioProcess International

Why bioprocesses fail?



Lack of Understanding!

1. What is in there?

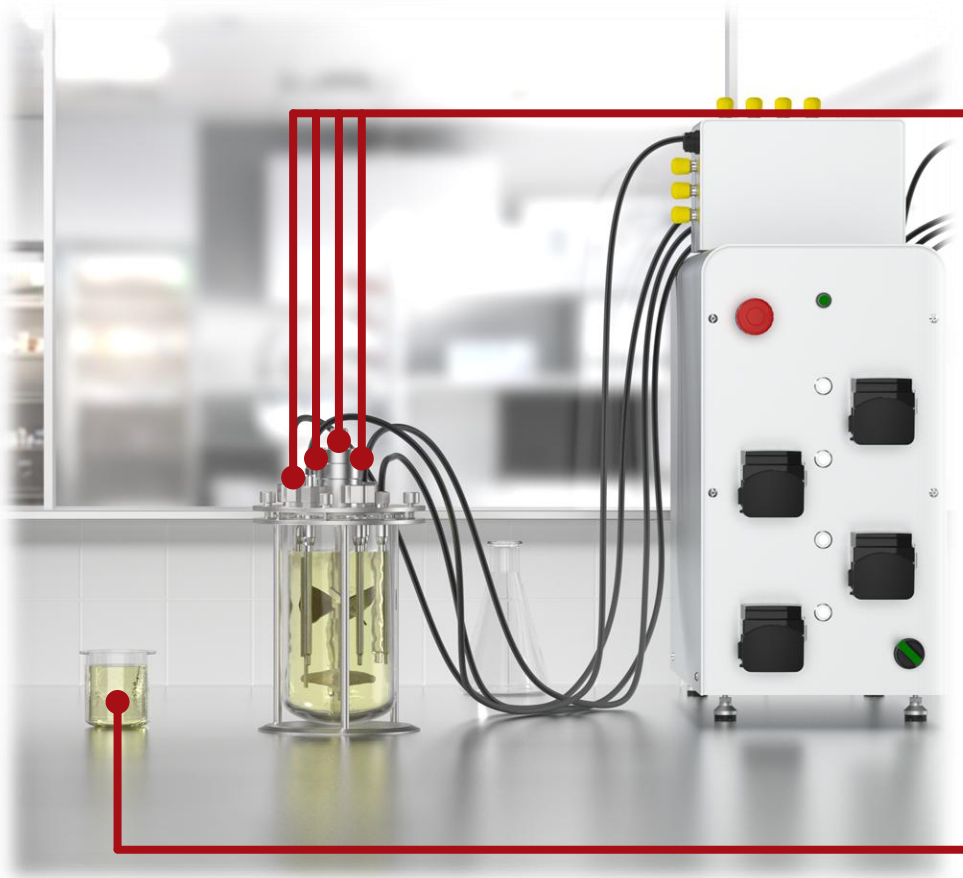
- Microorganisms
- Molecules

2. Are they happy?

- Food (energy source)
- Temperature
- O_2
- pH
- ...

We need **MANY** sensors!

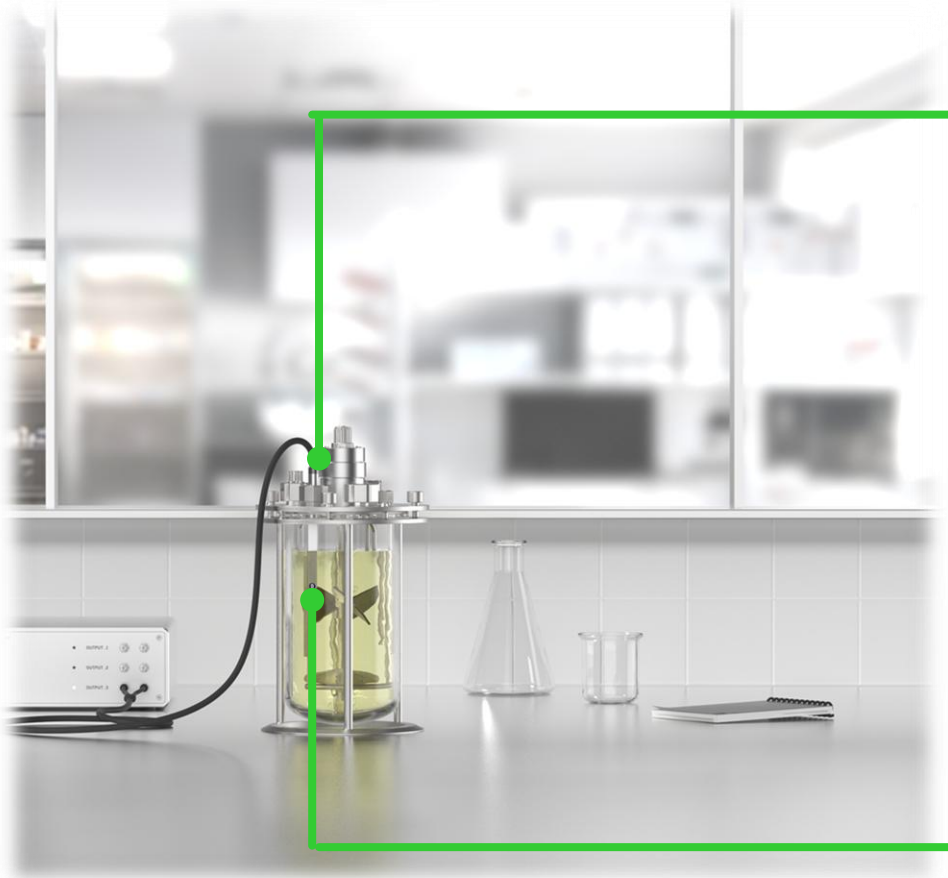
Limitations of present sensors



Currently

- Multiple sensors
- Sterilisation for re-use
- Off-line monitoring

New generation of sensors

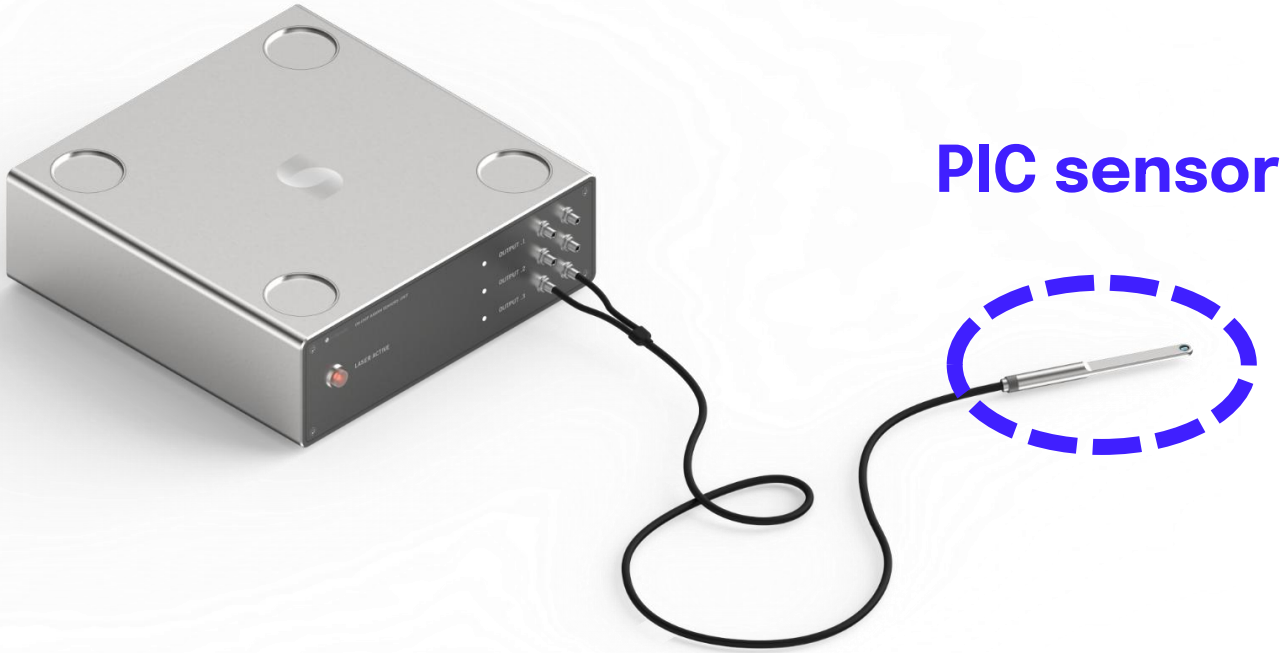


Currently	InSpek
Multiple sensors	“All-in-one” sensor
Sterilisation for re-use	Single-use
Off-line monitoring	On-line monitoring

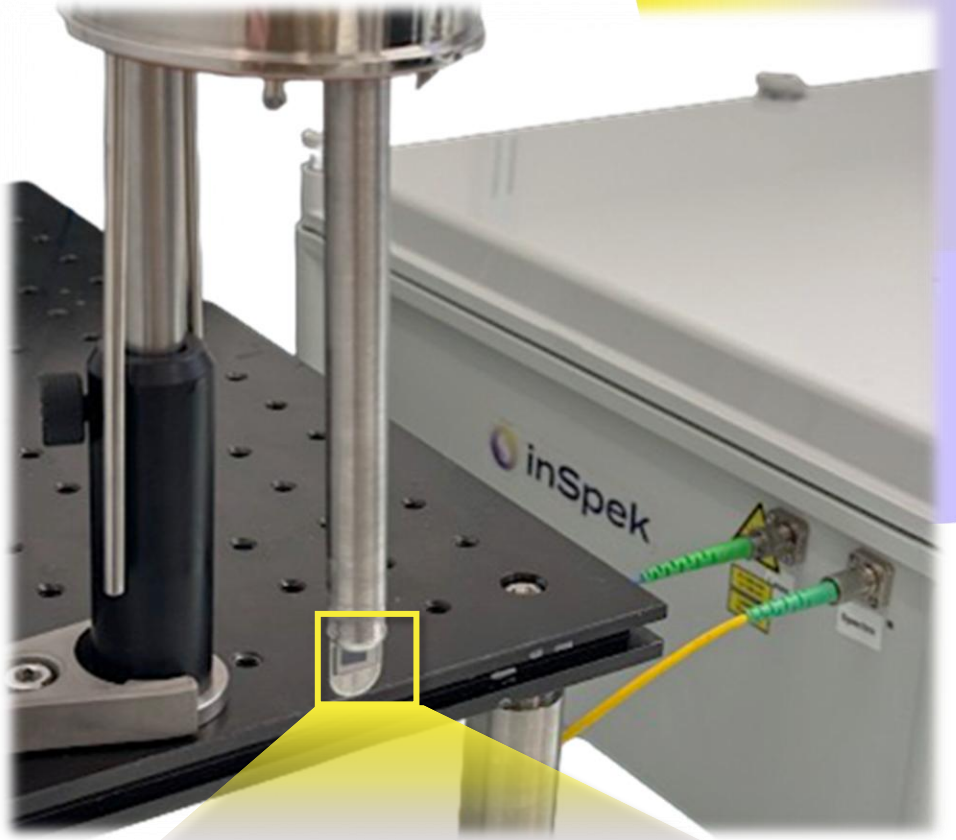
All-in-one biosensor on a **PIC**

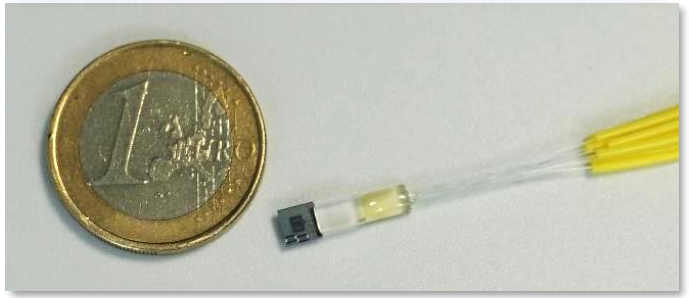
Our product

Control unit
(laser + spectrometer)



PIC sensor





Software

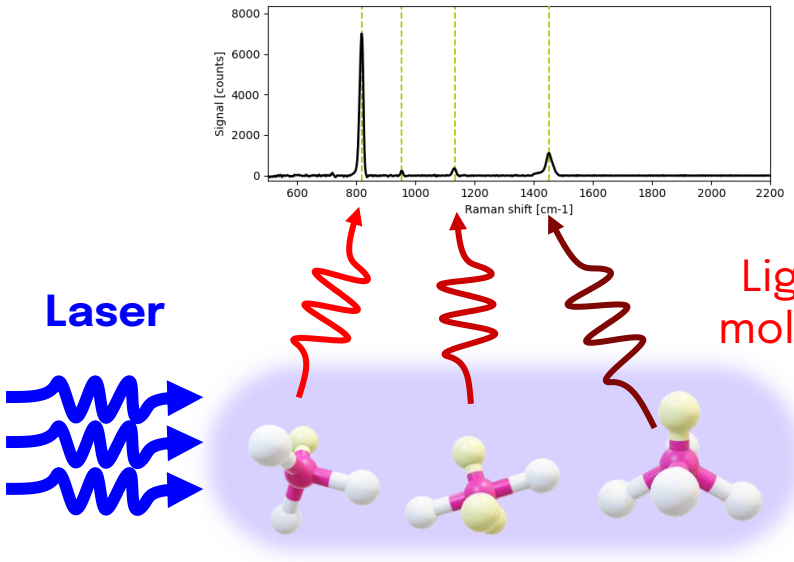
Product roadmap

Available now for PoC

Chemical sensing

Sensing modality
Raman spectroscopy (→ chemicals)

The first product - **Raman spectroscopy**



Detection

Light scattered by molecular vibrations

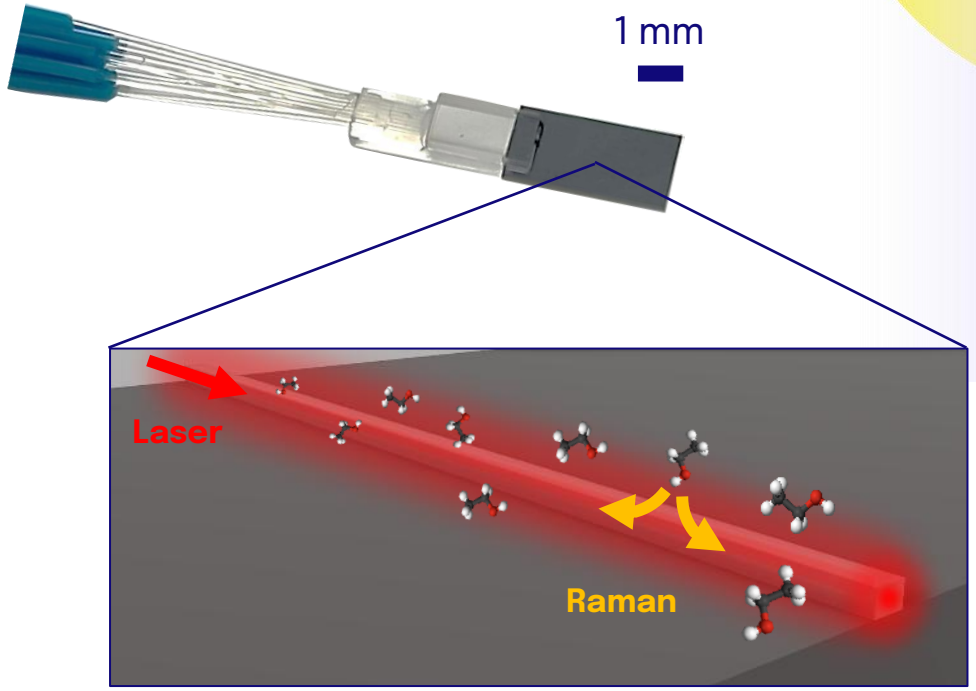
- ✓ “Multiplex” analysis
- ✓ Fast & Quantitative
- ✓ No sampling required
- ✓ Suitable for aqueous media

CONFIDENTIAL

Improving Raman spectroscopy by using **Raman-on-chip**

Traditional Raman: Light in free-space ↔ Analyte

Waveguide-enhanced Raman: Light in waveguide ↔ Analyte



Cost
100x lower

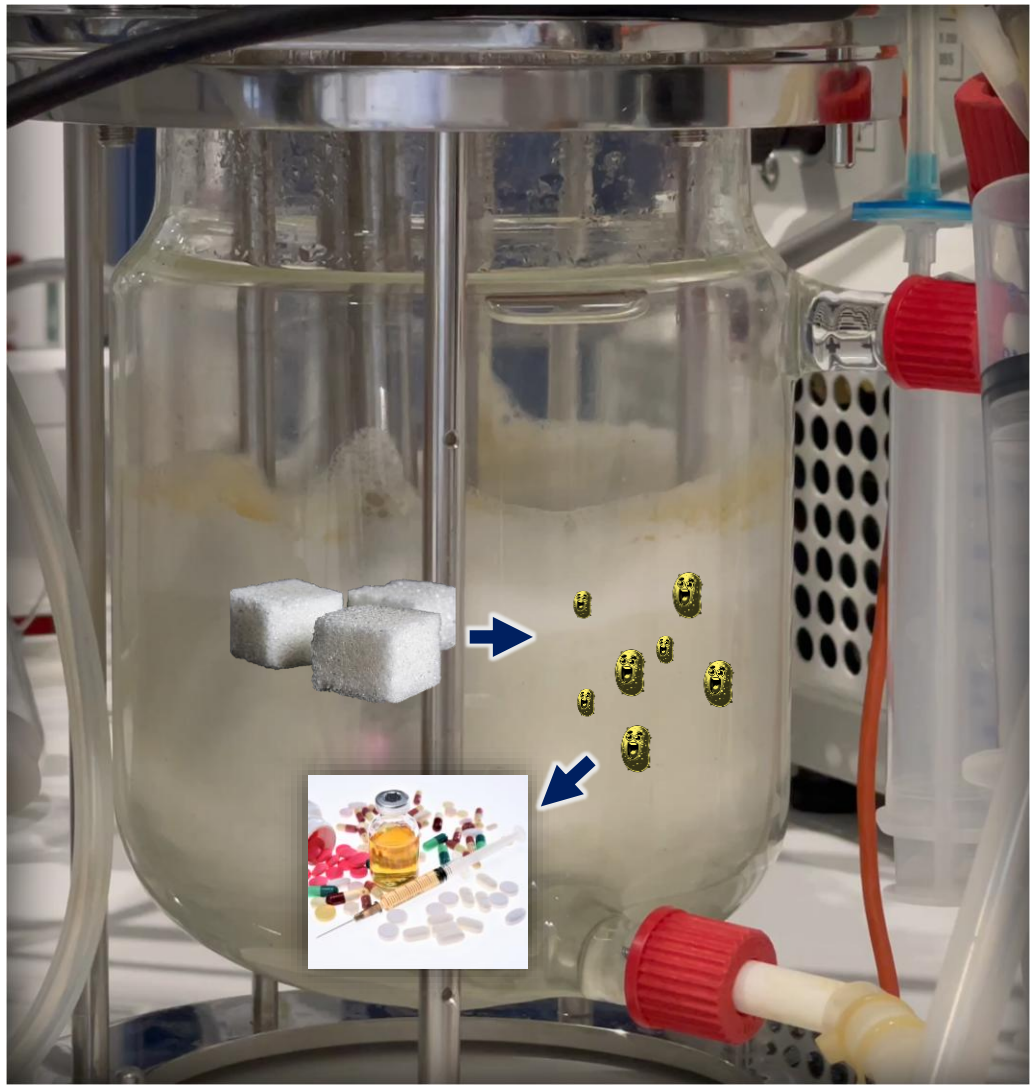
Sensitivity
10x higher

Size
10x lower

Ambient light
insensitive

CONFIDENTIAL

Why bioprocesses fail?



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Raman sensor

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Temperature
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…

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Product roadmap

Available now for PoC

Chemical sensing

Sensing modality
Raman spectroscopy (→ chemicals)

~2026

All-in-one sensor

Sensing modality
Raman (→ chemicals)
+ T + pH + pO_2 + …
+ optical density (→ biomass)

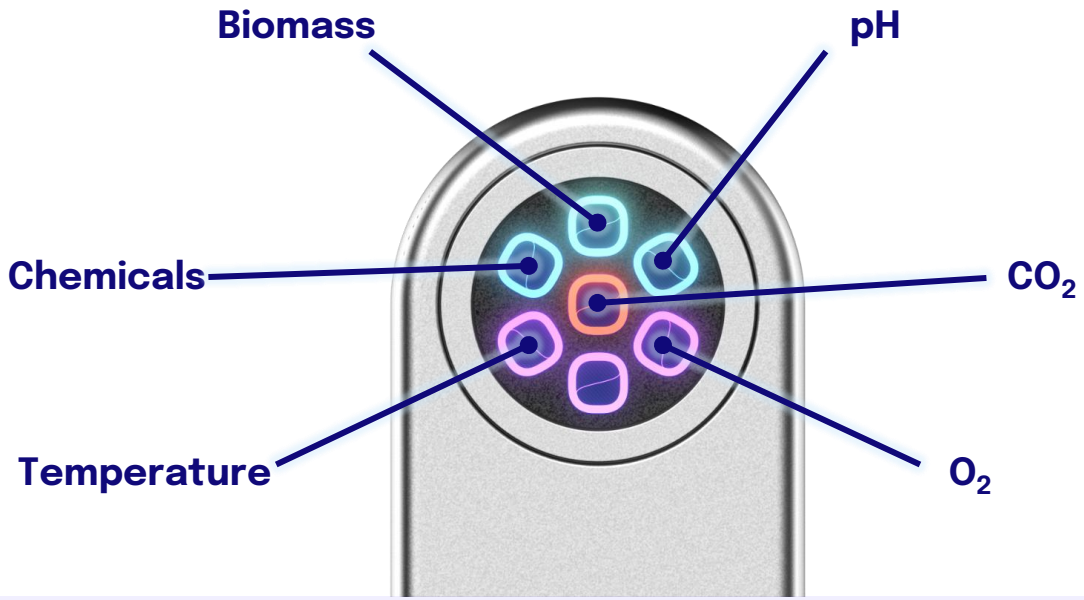
Single use!

~2027

Data solutions

Advanced bioprocess control

inSpek



Looking for partners for:

Single use Packaging

Integration

Proofs of Concepts

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