



# VERSATILE PHOTONICS PLATFORM ENABLES INTEGRATED SENSORS FOR (BIO)CHEMICAL TESTING

## WHY PHOTONICS?

- **High biochemical sensing performance**
- Robustness: **no alignment/calibration needed**
- **Low power consumption**
- **Low cost at mass-scale** production (CMOS compatible)
- By integrating photonics, micro-electronics and microfluidics on the same chip, complete **lab-on-chip systems** can be designed:
  - Multiple cytokines detection in bioreactors
  - Fast, multiplexed

## APPLICATION POTENTIAL IN LIFE SCIENCES

Typically, biochemical analyses are being executed with benchtop-size tools that use techniques such as absorbance, fluorescence etc. Thanks to imec's photonics and semiconductor technology, these tools and analyses can now be simplified. For example by making them smaller or easier to use, while maintaining high performance (specificity, sensitivity...). This widens the scope for potential applications in areas such as:

- Sequencing
- Microscopy
- Medical imaging
- Non-invasive, non-destructive, continuous monitoring

## IMPACT AREA 1: SIMPLIFIED SENSING METHODOLOGIES

### REFRACTIVE INDEX SENSING - LABEL FREE

- Real-time
- Multiplexed up to few 100 sensors (e.g. measure 100 proteins at the same time)
- Allows trade-offs between high specificity or very fast detection
- Reduced bulk signal interference

### ON-CHIP ELISA: ABSORBANCE OR FLUORESCENCE-BASED IDENTIFICATION OF PROTEINS

- Compact
- Allows multiplexing
- Real-time and wash free: limited manual steps
- 5 minutes time to result
- Highly specific (usage of label results in robustness against non-specific binding)

### CHEMICAL COMPOSITION OF LIQUIDS THROUGH CONTACT SPECTROSCOPY

- Compact (handheld or in-line instrument that can be integrated in a bioreactor)
- No assays needed (direct monitoring of dissolved abundant molecules)

## IMPACT AREA 2: SIMPLIFIED OPTICAL TOOLS

Spectrometers, microscopes, OCT systems: all mainstream analytical tools that currently are rather bulky because of their complex optical setups. Supported by a.o. a grant from the European Research Council (ERC) and involvement in EU-funded programs, imec puts substantial resources in the R&D to miniaturize such tools.

### SPECTROSCOPIC SENSING – RAMAN SPECTROMETER: MOLECULAR SPECTROSCOPY

- 1,000x smaller in volume than a bench-top tool
- High optical throughput and high spectral resolution can be reached
- No free-space optics or mechanical components
- Patented on-chip solution

## IMEC HELPS YOU BRING YOUR INNOVATIONS TO LIFE

We combine extensive chip manufacturing facilities and bio-lab infrastructure with world-renowned expertise in chip technology, MEMS, bio-electronics, sensors, photonics, imagers, microfluidics, and biosciences. We work with strong, multidisciplinary teams of world-class scientists.

Imec provides access to Photonic Integrated Circuit (PIC) prototyping and small volume production based on imec's silicon photonics platform on 200mm and 300mm wafers. We turn your photonic ideas into reality at a single point of contact.

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