

# HOW TO WORK WITH US?

## DESIGN AND DEVELOPMENT OF A TECHNOLOGY PLATFORM FROM CONCEPT TO PROTOTYPE

### IMEC AS A TECHNOLOGY PROVIDER

- ▶ Based on imec's proven platforms, we build your next-generation product.
- ▶ Imec offers: the possibility to access and tailor its technologies toward your application and strategic needs.
- ▶ Differentiator: in-house application engineers work with you to understand your application and translate it to technology specifications.

## CHIP DESIGN, DEVELOPMENT AND PROTOTYPING

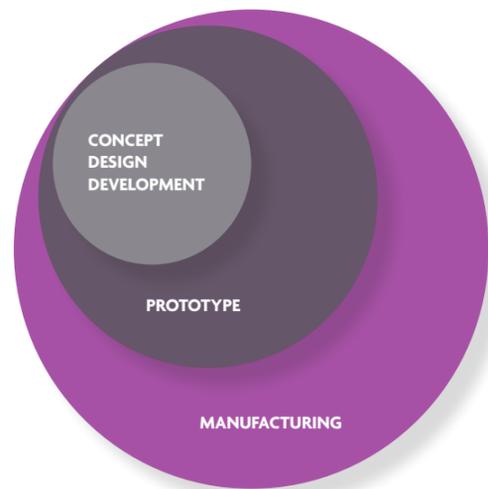
### IMEC AS A PARTNER

- ▶ We develop and prototype your silicon-based product, starting from your product concept or development roadmap.
- ▶ Imec offers: the cumulative engineering expertise and advanced infrastructure to develop your next-generation product.
- ▶ Differentiator: we work with you to design your system, or produce an existing design. Supporting low-volume production and transfer to large-volume manufacturing foundries.

## PROTOTYPE - MANUFACTURING

### IMEC AS A FAB

- ▶ Your manufacturing partner:
- ▶ Through our industrial-grade ISO9001 certified cleanrooms, imec offers its partners the possibility to prototype and manufacture their silicon-based devices.
- ▶ We offer a committed team of processing specialists that will work with you to translate your concept into a stable and scalable manufacturing process.



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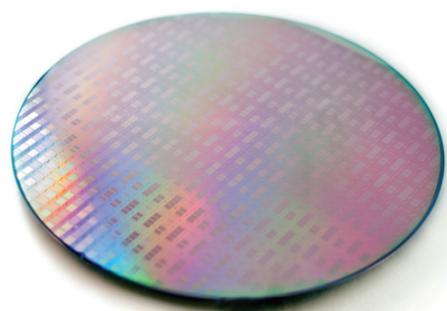
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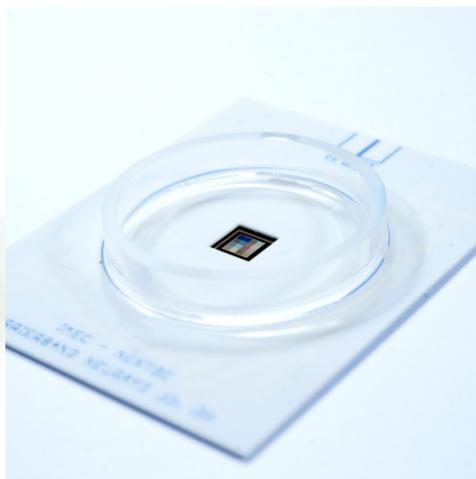
# PIONEERING EFFICIENT HEALTHCARE

NOVEL TOOLS FOR LIFE SCIENCE RESEARCH & DIAGNOSTIC APPLICATIONS

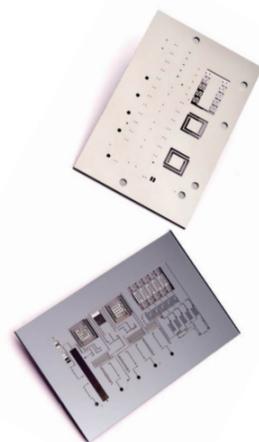
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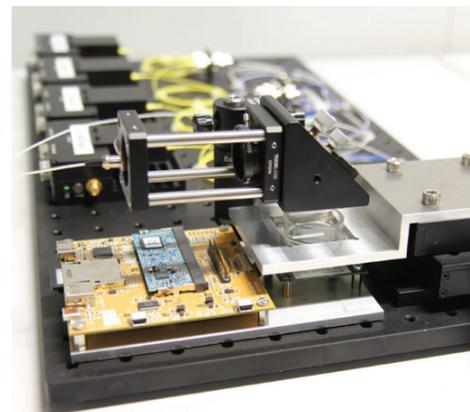
Silicon wafer with photonics biosensor chips.



Microelectrode-array chip.



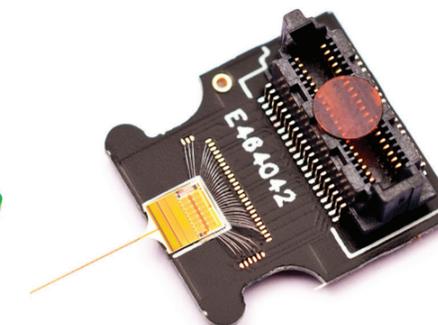
Chip for detection of single nucleotide polymorphisms.



Lens-free microscope-on-chip for cell monitoring.



High-content, high-throughput cell sorter.



Cerebro neural probe system.

## FUTURE HEALTHCARE

Imec's vision on future healthcare is one of high-quality and affordable diagnosis and treatment. We want to enable that vision by providing innovative game-changing electronic solutions to our partners.

Semiconductor technologies constitute the building blocks of all modern electronic equipment and have revolutionized the way we communicate, work and interact. Imec aims to utilize the power of semiconductor technologies to develop the next generation of life science tools; tools that will transform the way we conduct research, diagnose illnesses and treat patients.

Imec aspires to lead the development of advanced technologies by leveraging on its CMOS expertise. This will support and enable the research, development and manufacturing activities of the imec partners.

## A SELECTION OF SYSTEMS UNDER DEVELOPMENT

### INTELLIGENT CULTURE PLATES

**Imagine you can perform 1,000 patch-clamp studies in a single culture well.**

Imec develops intelligent culture plates to perform real-time, label-free cardio toxicity screening and electrophysiology experiments. At the heart of the system is an array of 16,000 microelectrodes, each able to measure the intracellular potential of a single cell.

#### Key Advantages:

- ▶ **Generate biologically relevant data:** the system is compatible with adherent primary cell cultures, stem cells as well as cell lines.
- ▶ **Intracellular measurements:** the system non-destructively measures the intracellular potentials of cells, effectively generating data of similar quality to patch-clamp data.
- ▶ **Perform long-term recordings:** the system does not lyse the cells to measure intracellular potentials. The user is able to do repeat measurements for extended periods of time.
- ▶ **Integrate it into your process flow:** the system is compatible with conventional microscopy.

### MICRO-PCR

**Perform your PCR-based diagnostic in a matter of minutes.**

Imec is developing integrated sample-to-answer devices to perform molecular diagnostic tests on chip. The device is a chip about half the size of a credit card that performs fast, simple and sensitive detection of genetic markers, specifically single nucleotide polymorphisms (SNPs). In its current implementation the device is optimized to specifically isolate, amplify and detect up to 5 SNPs in parallel.

#### Key Advantages:

- ▶ **Your PCR assay, just smaller and faster:** performs full PCR analysis from blood in 30-60 minutes.
- ▶ **Measure multiple targets at the same time:** can be optimized to measure between 1 and 50 single nucleotide polymorphisms in parallel.
- ▶ **Results at your fingertips:** sample-to-answer device in 3cm<sup>2</sup>.

### LENS-FREE MICROSCOPY

**Image your cells without any manual intervention.**

Imec has developed a new imaging system that allows high-resolution imaging of cell cultures without the need of bulky lenses and optics. Lens-free imaging solutions enable the creation of holographic images constructed from diffraction patterns that originate from light hitting the object of interest. Advanced software algorithms are used to dissect the images and recover important information about small changes in cell morphology. The system is successfully demonstrated to analyze cell morphology, growth and stem cell differentiation.

#### Key Advantages:

- ▶ **Get more out of your images:** the lens-free imager records phase information and intensity information with a large field of view.
- ▶ **Low-cost, high-quality microscopy:** the system is much cheaper than conventional phase-contrast microscopy because it doesn't need optical components such as lenses.
- ▶ **Automated cell imaging:** the lens-free imaging technologies have a compact foot print, enabling easy integration into your existing workflows, culture plates or robotic tools.

### HIGH-THROUGHPUT CELL SORTING

**Imagine you could sort 20 million cells per second and retain each cell of interest for downstream molecular analysis.**

Imec is developing an image-based cell sorting system that is fully integrated on a chip approximately the size of a microscope slide. The system enables to image, classify and sort cells in blood in a matter of minutes, making it accessible for point-of-need applications.

#### Key Advantages:

- ▶ **Label-free:** the cell sorter employs lens-free imaging techniques to analyze single-cell morphology in microfluidic channels. No targets or labels are required to identify or sort cells.
- ▶ **Scalable:** we target to sort 2,000 cells per second and per channel. By using semiconductor manufacturing processes, we can process 1,000s of channels next to each other, reaching composite sorting speeds of up to 20 million cells per second.
- ▶ **Compact:** the system is currently no larger than a microscope slide, making it accessible at the point of need.

### MINIMALLY INVASIVE IMPLANTS

**Imagine you could record the electrical communication between thousands of neuronal cells with a single probe.**

Imec is developing fully integrated implantable neural microsystems with advanced capabilities to detect, process and interpret neural data at a cellular scale. Our neural probes perform all data analysis on chip thereby effectively replacing large bulky amplification equipment and enabling long-term neural recordings.

#### Key Advantages:

- ▶ **Minimally invasive:** imec's neural probes include signal amplification circuitry on chip, enabling sensitive measurement of neuronal systems in a compact system.
- ▶ **High-density measurements:** current efforts aim at integrating more than 500 electrodes and more than 64 active channels onto ultra-thin probes to enable the simultaneous read-out of large populations of neurons.