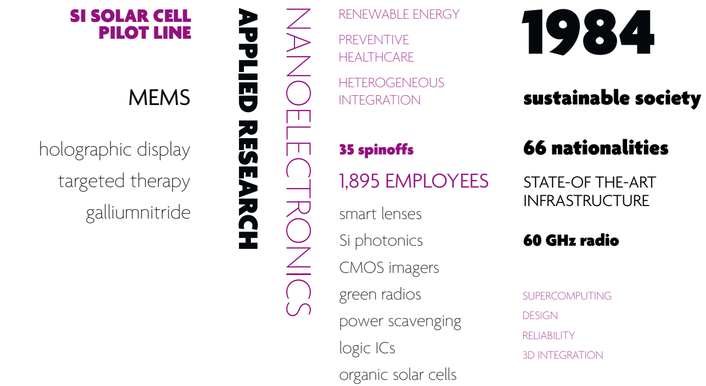
RESEARCH INSTITUTE



THE IMEC CAMPUS

To stay on the forefront of research on nanotechnology and nanoelectronics, imec disposes of an ultramodern research facility that is continuously expanding. The imec campus comprises 30,481m² office space, small laboratories, training facilities and technical and IT support rooms.

The two clean rooms form the heart of imec. They count for about 10,000m² and are backed up by over 32,259m² support infrastructure. Warehouse facilities cover 3,659m². Since 2010 imec's clean rooms are extended, making imec's clean room facilities 450mm-ready so that imec's advanced research in chip process technology can continue to follow the industry standards.

The imec campus also houses laboratories for solar cell research, research on sustainable wireless communication, biomedical research and long-term brain research in the framework of NERF.

An important part of imec's lab-infrastructure is directed towards pilot lines: for deep-submicron CMOS processing, for silicon and organic solar cells and for prototypes of systems-in-a-package and heterogeneous systems-on-chip.

Imec is headquartered in Leuven, Belgium, and has offices in Belgium, the Netherlands, Taiwan, US, China and Japan.

Contact us

imec Belgium
Kapeldreef 75
B-3001 Leuven
Belgium
Tel: +32 16 28 12 11
Fax: +32 16 22 94 00
www.imec.be/contact

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IMEC AT A GLANCE

ASPIRE INVENT ACHIEVE

imec

IMEC R&D

Imec aims to find solutions – with nanoelectronics – for the challenges faced by society in the coming decennium. These challenges include climate change and the depletion of the earth's sources (renewable energy), the ageing population and the rising costs of healthcare (biomedical electronics), sustainable mobility, efficient communication etc.

IMEC COLLABORATES

Imec collaborates with industry, universities and other research institutes worldwide. Large international semiconductor companies and system houses are well-known partners of imec, but also medical, pharmaceutical and energy companies work with imec in joint R&D programs.

Imec's partnerships take the form of industrial affiliation programs (IIAPs), bilateral collaborations, technology transfers and licenses, EC consortium programs, training and services (such as ASIC design and prototyping). Next to this, imec also sets up spinoff companies based on successful research results.

IMEC ACADEMY

Imec's training center organizes courses and workshops for a variety of target groups. A broad scope of topics is addressed, ranging from IC process technology, chip- and system design to basic knowledge on IC technology, biology and multimedia. Imec also supports teachers of Flemish schools and universities.

Moreover, imec offers an international platform called 'center for advanced learning in information technologies (CALIT)' where CEOs, policy makers and scientists can meet and exchange ideas.

IMEC INFORMS

The progress in science and technology can increase everyone's well-being. Imec takes on the challenge to inform both the public and the scientific world about technology in general and imec's results in particular.

Imec's outreach group sets up initiatives to inform the public: nocturnes at which people can visit imec, publications (inspiration books on nanotechnology with Ad!dict Creative Lab), and exhibitions.

Together with RVO-Society, an organization promoting technology to youngsters using all kinds of projects, imec has also published picture books about technology for children aged 4 to 7.

IMEC SERVICES

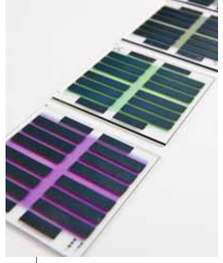
Imec's CMORE services range from development-on-demand over prototyping to low-volume manufacturing of systems needing heterogeneous integration. The CMORE solutions are implemented in imec's 200mm and 300mm clean room using 130nm/90nm/65nm CMOS processes. An extended technology portfolio is offered including a versatile SiGe above-IC MEMS process, silicon photonics (in collaboration with imec's associated lab at the Ghent University), 3D packaging, design, characterization and modeling.

Imec also offers an ASIC (Application Specific Integrated Circuit) design, prototyping and small-volume production service. Imec helps customers to make their ASIC production-ready. Next, the designs of several customers (universities and private companies) are collected on a single mask set (multi-project wafer) and manufactured on a small volume of wafers.

Imomec, imec's associated lab at the university of Hasselt offers reliability and testing services.

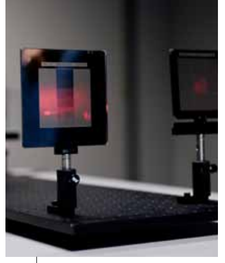
01 | 300mm silicon wafer with hundreds of chips.

02 | ECG necklace with ultralow-power radio.



03 | Tandem organic solar cells.

04 | Imec's 60GHz receiver module.



05 | Set-up for holographic display technology.

IMEC R&D

Technologies for future chips and systems

Together with world-leading IC manufacturers, foundries, and equipment and material suppliers, imec tackles the roadblocks for continued transistor scaling into the 22nm node and beyond resulting in increased IC performance both for logic and memory (DRAM and flash).

Imec's research comprises innovative use of new materials, transistor architectures and lithographic techniques, advanced memory concepts, interconnects with focus on 3D and connected IC process technology with system design. Research builds on an extensive knowhow in characterization and modeling.

The CMOS processes currently used to fabricate chips promise to be the drivers of a whole new industry. They can be tuned and expanded with new processing steps to make complete miniaturized systems by adding functions other than logic and memory to chips. Examples of this heterogeneous integration are smart sensors, MEMS (micro-electromechanicalsystems), power scavengers, actuators, optical chips, biochips, etc.

Organic semiconductors are flexible, lightweight and cheap, and thus are an important technology to create the next generation of smart systems. They are especially suited for applications such as intelligent clothing, RFID labels, rollable displays, organic memory, or plastic signaling and lighting.

Electronics for healthcare and life sciences

The idea of leveraging IC technology for healthcare is gathering worldwide attention. There is a growing hope that, with the help of electronics, more people can be treated, at a lower price per person, and for a wider range of conditions, even including preventive healthcare.

Imec and Holst Centre, an open innovation R&D center setup by imec and TNO, develop technologies for wearable and implantable body area networks, with low-power components, radios and sensors. These body area networks can for example be used for autonomous monitoring of patients in daily life.

Also, imec researches new diagnostics and therapy systems based on nanoelectronics, and synthesis and biofunctionalization of nanoparticles. These include for example lab-on-chip technologies and targeted therapy concepts based on nanoparticles.

And imec develops technologies for in-vitro and in-vivo cell-IC interfaces. By integrating multi-modal (electrical, chemical, microfluidic, optical) sensors and actuator arrays based on micro- and nanoelectronics with biocompatible packaging and signal processing electronics, novel devices are realized for use in fundamental R&D, pharmaceutical, biotech, and clinical environments.

At the imec premises, NERF (neuroelectronics research Flanders), set up by imec, K.U.Leuven and VIB, aims to unravel the neuronal circuitry of the human brain.

Sustainable energy solutions

Imec's energy research focuses on key technologies for the future smart grid, a grid in which energy will be generated, stored, transported, and consumed in an interlligent and sustainable way.

Imec's silicon solar cell research belongs to the top in the world. It deals with the main challenge to make silicon solar cells cheaper with a factor 3 to 4, and improve conversion efficiency. This is needed to reach grid parity, the point at which buying solar power is no more expensive than buying power from, say, an electricity plant running on coal. Imec also studies organic solar cells which are less efficient than silicon solar cells, but outperform them when it comes to flexibility, lightness, and cost. High-efficiency III-V-based solar cells complete imec's solar cell portfolio.

Imec studies power electronics and efficient solid-state lighting based on III-Nitride materials – of which GaN (gallium-nitride) is best known. These technologies are of key importance for a more sustainable use of energy. Power electronics convert electric power through solid-state components. The market for such components is destined to grow considerably, because of the drive to use more hybrid electrical vehicles in transport, or more solar installations, wind farms, and smart grids to connect it all.

In the field of energy storage, we are looking for new solutions for highly efficient supercapacitors and batteries.

Sustainable wireless communication

Imec develops cognitive reconfigurable radio systems for next-generation wireless communication. Flexible radio chips that can swich between communication standards, looking for the best trade-off in each situation. These will be used in intelligent, multi-standard terminals, such as smartphones of the future.

With the evolution towards ambient high-resolution multimedia, radio ICs for the wireless communication of massive data streams, for example for high-definition television, also becomes indispensable. Such data streams require a massive throughput, in the order of GBits per second. Imec focuses on cost-effective, low-power 60GHz radio ICs in standard CMOS, which show a lot of potential for the consumer market of for example wireless television screens.

Imec, together with Holst Centre, also develops ultralow-power radios that can run on a power supply that is 10-100 times lower than conventional low-power systems. These will be a key enabler for tomorrow's wireless transducer systems, such as wireless sensors in intelligent buildings, machinery, or body area networks.

Imaging and future 3D visualization

Imec develops visualization and imaging systems by combining software and technology into an optimal solution for a given market. This research has 4 application drivers.

Imec's research into smart lenses pioneers the miniaturization of conventional camera systems working on replacing the bulky and expensive elements of lens systems

With respect to hyperspectral imaging, imec develops miniaturized modules that will be the heart of fast and low-cost hyperspectral cameras. Such cameras will replace today's large and complex systems, making hyperspectral imaging available for many new applications.

Imec also works on backside-illuminated imagers, innovative CMOS imagers that uses a novel arrangement of the imaging elements to increase the amount of light that is captured.

Imec designs a high-definition holographic display enabling a natural 3D experience for multiple viewers, without the undesirable side effects of current 3D stereoscopic visualization.