

Why IMEC?

IMEC'S 300MM RESEARCH FACILITY

Key features

Very flexible research facility:

- Cleanroom: 3,200m² ballroom style; class 1000; vibration class D and better
- FOUP wafer transport with mini-environments up to class 1 (300mm SMIF)
- 3-level clean room with: fab level for process equipment, sub-fab level for supporting equipment and lower level for utilities

Ultra-short cycle time:

- Fully single wafer (wherever possible)
- Full continuous operation (24hrs/7days)

State-of-the-art processing equipment including the world's most advanced litho clusters

Making the difference

- IMEC's core competence is formed by its unique combination of research in advanced process modules and device fabrication
- IMEC bridges the gap between basic research at universities and technology development in industry
- IMEC continues to focus on fundamental understanding in its R&D
- IMEC, as an independent R&D organization, has a strong network of partners worldwide; IMEC can count on the world's largest industry commitment for research including IDMs, foundries, memory suppliers etc
- IMEC's business model is based on sharing costs, risks, resources and IP (intellectual property), ensuring a competitive time-to-market
- IMEC has a unique state-of-the-art infrastructure (built around the latest immersion and EUV lithography tools)
- IMEC brings together different players in the process flow, from IC manufacturers to equipment, material and software suppliers

Join IMEC's research programs

TAILORED SOLUTIONS TO YOUR SPECIFIC NEEDS

IMEC Industrial Affiliation Programs

The Industrial Affiliation Program is IMEC's premier R&D cooperation formula for joint R&D between industrial researchers and IMEC research teams. The concept is based on a sharing of cost, risk, talent and IP. IIAP is worldwide recognized as one of the most successful international partnership models for joint development of next-generation technologies.

IIAPs focus on a specific topic or technology area. Each industrial partner joins the IIAP research program on a bilateral basis, with clearly defined technical scope and deliverables, allowing the partner to tune the program to its industrial needs. Partners can delegate a senior industrial researcher to IMEC to join IMEC's research teams, for one or more year(s). The cooperation formula allows for a flexible intellectual property ruling on a case-by-case basis. Most of the results are co-owned, although there is room for a limited amount of proprietary results.

Customized programs

Proprietary programs are defined and executed by the industrial partner who can make use of IMEC's facilities for that purpose. IMEC supports the research activities of the industrial partner by providing operational assistance and know-how. This system of contracting allows for the generation of company-specific IP that is exclusively owned by the industrial partner.

Core partnership

IMEC's core partnership offers a unique business model to gain an overall insight in the challenges of advanced CMOS scaling and nanotechnology. Core partners commit themselves to actively participate in a core set of IIAPs on sub-32nm CMOS, executed on best-in-class equipment within IMEC's 300mm cleanroom infrastructure.

Core partner benefits include:

- Increased involvement in the steering and execution of the research programs
- An early insight to breakthrough research results
- Formula with highest value return, giving access to the full CMOS nanoelectronics platform research

Having access to these programs ensures core partners to stay on the forefront of semiconductor research, thanks to a fundamental understanding in each area, and to discover the CMOS limits. IMEC's core program can be tuned towards the needs of various communities such as foundries, logic IDMs, memory suppliers, and fabless and fabless companies.

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SCALING-DRIVEN NANOELECTRONICS



NANOSIZING THE BUILDING BLOCKS OF CHIPS ►

IMEC's centralized research platform

AN ANSWER TO THE SEMICONDUCTOR RESEARCH DILEMMA

Joint R&D guarantees fast time-to-market

Fewer and fewer companies can afford the rapidly increasing cost of R&D for next-generation process technologies. On top of that, the rate at which new products appear on the market keeps accelerating. Partnering for research may very well be the only way to attain the fast time-to-market that's needed to establish and maintain product differentiation in a highly competitive global environment. It gives companies the opportunity to explore generic technologies in a cost- and time-efficient way, before adapting them to their specific applications. But joint R&D is not only about sharing costs, risks and talent. It also requires a well-founded approach to deal with IP sharing and customized research. Within IMEC, an ideal environment exists to guarantee a successful partnership.

IMEC's offering

To address these challenges, IMEC Industrial Affiliation Programs (IAPs) benefit from the 300mm process research facility, which was established in close collaboration with IC manufacturers and equipment suppliers. The activities are organized into a set of programs for sub-32nm CMOS technologies, enabling participants to benefit from and actively perform cost-effective advanced research, two to three generations ahead of manufacturing technology.

On the one hand, IMEC can count on a number of leading providers of equipment, materials and software. This guarantees that the research is performed in a state-of-the-art environment. On the other hand, suppliers can fine-tune their technology to the industrial needs thanks to IMEC's partnership with a number of world-leading IC manufacturers.

IMEC addresses the changing landscape in the semiconductor industry by expanding the programs to address the needs of all semiconductor players – from IDMs and foundries, to fablite and fabless companies. And following the growing importance of memory technology, IMEC has brought logic and memory research on equal footing.

Objective

IMEC's process research platform aims at performing focused research on:

- advanced materials, process steps and modules
- novel device concepts ("beyond classical CMOS")
- for technologies at least two generations ahead of manufacturing ("N+2" and "N+3")

Focus

- to build understanding of fundamental material properties
- to align these fundamental material properties to actual device performance

Potential partners

- IC manufacturers (foundries, logic IDMs, memory suppliers, fablite and fabless companies)
- Equipment suppliers
- Material suppliers
- Software providers

By gathering the full scope of companies involved in the processing chain, IMEC guarantees an optimal platform for collaborative research and fine-tuned results.



SUB-32NM CMOS RESEARCH PROGRAMS

Advanced process module and device research is conducted on the following subjects

1. ENABLING LITHOGRAPHY

- High- and hyper-NA 193nm liquid immersion lithography
- Double-patterning 193nm lithography
- EUV lithography
- Generic lithography enabling breakthroughs in sub-32nm CMOS programs
- Alternative lithography technologies

2. NEW MATERIALS IN DEVICES

- Advanced gate stacks: high-k dielectrics and metal gates
- Silicides & strained silicon, mobility enhancement techniques, ultra-shallow junctions
- Assessment of novel materials on device performance

3. NEW DEVICE CONCEPTS

- Planar devices scaled for optimum performance
- Emerging device architectures: 3D architectures, MUGFET/FINFET, ...
- Exploratory devices: Ge-III/V, tunnelFET, ...

4. ADVANCED MEMORY

- High-k integration and emerging device concepts for DRAM
- Non-volatile memories: floating-gate, charge trapping and alternative memory concepts (PCM, ...)

5. ADVANCED INTERCONNECT SOLUTIONS FOR FUTURE DEVICES

- Cu/low-k integration assessment and analysis
- New interconnect materials and concepts
- 3D integration: 3D SIC, 3D WLP and 3D SOC

6. GENERIC RESEARCH SUPPORTING FUNDAMENTAL ANALYSIS IN PERFORMANCE DRIVEN PROGRAMS

- Cleaning, contamination control and surface preparation



All research carried out at IMEC concerning new materials, advanced processing steps and devices is inextricably linked with quantitative material and device characterization and fundamental reliability analysis. IMEC's metrology experts also continuously try to optimize current techniques to enhance sensitivity, resolution, quantification and specificity.

Based on its interdisciplinary research in the domains of systems-on-a-chip and of systems-in-a-package (both from the systems and from the technology point of view), IMEC clearly has the skills and assets to extend current CMOS technology with extra functionality. In due time, this will allow broadening the focus and activities at the 300mm Si research platform from the scaling of feature sizes towards the combination of heterogeneous technologies.