

TAILORED SOLUTIONS

Imec Industrial Affiliation Programs

The Imec Industrial Affiliation Program is imec's premier 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. The IIAP model is recognized worldwide as one of the most successful models for open innovation.

IIAPs focus on a specific topic or technology area. Each industrial partner joins an IIAP research program on a bilateral basis, with a 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.

Proprietary programs

Proprietary programs are defined and executed by the industrial partner that may use 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 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-)22nm 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
- Early insight in breakthrough research results
- Highest value return

Having access to the full CMOS nanoelectronics platform research ensures core partners a fundamental understanding in each area. It enables them to stay on the forefront of semiconductor research 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 fablite and fabless companies.

LET US TAKE ON THE SCALING CHALLENGE TOGETHER

Why imec?

- Imec's core competence is formed by its unique combination of research in advanced process modules and device fabrication.
- Imec bridges the gap between fundamental 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 chain, from IC manufacturers to equipment, material and software suppliers.

Imec's 300mm research facility

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

Very flexible research facility:

- Cleanroom: >4,000 m² ballroom style; class 1,000; vibration class D and better for 300mm process equipment, 450mm ready.
- FOUP wafer transport with mini-environments up to class 1 (300mm SMIF).
- 3-level cleanroom with: fab level for process equipment, subfab level for supporting equipment and lower level for utilities.

Ultrashort cycle time:

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

Potential partners

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

IMEC CORE CMOS

Boosting chip performance



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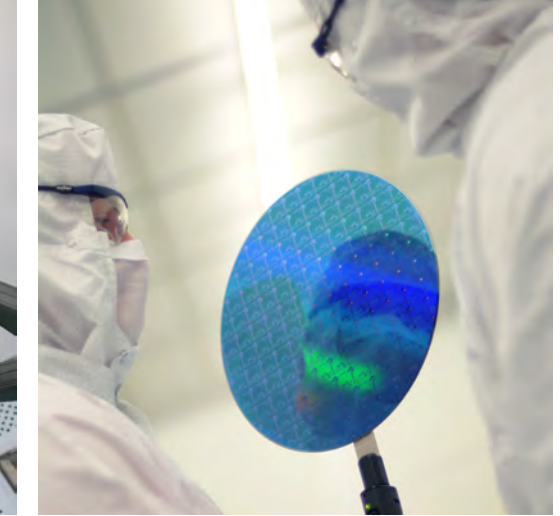
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IMEC'S CENTRALIZED RESEARCH PLATFORM: AN ANSWER TO THE SEMICONDUCTOR RESEARCH DILEMMA

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.

To address these challenges, the Imec Industrial Affiliation Programs (IIAPs) on (sub-)22nm CMOS technologies benefit from the 300mm process research facility, which was established in close collaboration with IC manufacturers and equipment suppliers. IIAP participants have access to this highly advanced infrastructure to 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 strategic collaboration with world-leading IC manufacturers.

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

(SUB-)22NM CMOS RESEARCH PROGRAMS

FOCUS

Imec's research platform on (sub-)22nm CMOS technologies aims at building understanding of fundamental material properties and align these to actual device performance.

OBJECTIVE

Imec's research platform on (sub-)22nm CMOS technologies aims performing focused research on advanced materials, process steps, modules and novel device concepts (beyond conventional CMOS) for technologies at least **two generations ahead of manufacturing**.

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

01 Enabling lithography

- 193nm immersion lithography, including double-patterning
- EUV lithography
- Alternative lithography technologies
- Fundamental R&D on resists, masks, ...

02 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

03 New device concepts

- Planar devices scaled for optimum performance
- Emerging device architectures: 3D architectures, MUGFET/FINFET, ...
- High-mobility channel devices: Ge-III/V, ...
- Exploratory concepts such as tunnelFET, ...

04 Advanced memory

- High-k capacitors and periphery transistor for DRAM
- Non-volatile memories: floating-gate, charge trapping
- Emerging concepts: Resistive RAM, FBRAM, ...

05 Advanced inter- connect solutions for future devices

- Cu/low-k integration assessment and analysis
- New interconnect materials and concepts
- 3D integration: 3D through silicon via technology

06 Generic research supporting funda- mental analysis in performance- driven programs

- Process steps R&D: epitaxial layers, deposition techniques, cleaning, contamination control and surface preparation, ...
- Reliability studies, physical characterization and analysis, ...

07 R&D studying the system-level impact of new technologies

- INSITE: a program offering a system-level view on advanced technology
- Technology related design programs: 3D design, ...

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.