



IMEC SOLAR RESEARCH

IMEC PV TECHNOLOGY

Collaborations with industrial solar cell and PV module companies and research partners towards

- further lowering the \$/Wp of PV modules
- increasing the kWh PV module performance for following technologies

SI-PV CELL TECHNOLOGY

- The development of n-PERT bifacial cells with efficiency 22-24% based on screenprinted contacts
- The development of n-PERT bifacial cells with efficiency up to 22-25% based on plated contacts (co-plating by immersion at front- and rear side)
- The development passivated contacts using thin poly-Si and 'TOPCON'
- Development of p-PERC cell technology for monofacial and bifacial cells using plated or screenprinted contacts.
- The transfer of technology for n-PERT and p-PERC cells.
- The development and modification of process steps for specific homojunction Si solar cell architectures on specific request of the customer

PV-MODULE TECHNOLOGY

- R&D on novel technologies for cell interconnection
- R&D on reliability in high performance PV-modules
- Module material evaluations, testing and optimization
- Development of PV module technology for integration in buildings, facades, vehicles, infrastructure

ENERGY YIELD MODELLING AND FORECASTING

- Highly accurate bottom up physics based energy yield modelling of PV modules including "what-if" scenario (i.e. what happens to the PV performance if materials or processes are changed), taking into account regional climate variations
- PV systems and power plant Energy yield forecasting with high spatial and temporal granularity

NON SI-PV CELL TECHNOLOGY

- R&D on semi-transparent and opaque perovskite cell architectures, focus on efficiency, stability and upscaling
- R&D on semi-transparent and opaque perovskite PV-modules (both traditional P1-P2-P3 processing as well as freeform module technology)
- R&D on high-Eg alternatives for CIGS based on Cu, Sn, Zn, Si, Ge, Se and S

STACKED CELLS & MODULES TO REACH PERFORMANCE > 30%

- Stacking perovskite cells and modules on top of crystalline silicon or CIGS cells and modules
- Focus on high energy production, upscaling and stability



IMEC PV COMPETENCES AND RESOURCES

imec is a globally leading R&D-institute in the domain of nanotechnology, but has been working since its foundation in 1984 on applying its vast expertise in semiconductor materials, devices and process technology in the domain of photovoltaic cell technology. The resources allocated to this domain have been active in the development of both high-performance and cost-effective crystalline Si solar cell technology as well as non-Si PV cell technology based on inorganic and organic materials. The ultimate goal is to combine the best of crystalline Si PV technology with the best of non-Si PV technology to get to an 1-sun efficiency of >30% in a cost-effective way.

In order to reach this goal the PV-activity at imec has the following assets & competences:

- A (pre)pilot-line for Si solar cell technology development compatible with 6 inch wafer size and using equipment compatible with industrial practices (wet processing for saw damage removal, texturing and cleaning, diffusion equipment, PECVD-furnaces, spatial atomic layer deposition, laser ablation for contact hole opening, metallization by screenprinting or plating)
- PV-module equipment to demonstrate PV-modules based on traditional and innovative interconnection technology
- A line for solution-processed solar cells based on organic materials or perovskites. Processing sizes up to 30x30 cm² glass, steel or flexible substrates
- Processing equipment for development of new polycrystalline compound materials to replace CIGS: CuZnSnS₂ and variations towards high-E_g materials
- In collaboration with Solliance:
 - A coating line for R2R-processing of solution-processable devices
 - A coating line for CIGS
- Full characterization capability for materials and solar cells, in particular:
 - Minority carrier lifetimes in Si and non-Si materials
 - AM1.5 analysis for cells and modules
 - Energy yield measurements in indoor- and outdoor setups
 - Spectral analysis of the cell response
 - Detailed power loss analysis for solar cells and modules

These facilities and competences combined with experienced and world class skilled researchers have resulted in confirmed world-leading results both in crystalline Si solar technology as well as non-Si based PV approaches.

See www.imec-int.com for more information on imec. For press releases see www.imec-int.com/en/imec-press-releases

COLLABORATION MODELS

Imec works together with its industrial partners in win-win collaboration models. We can be flexible in how such collaboration is set-up, but popular models are:

- For longer term pre-competitive research we run industrial affiliation programs in which companies along the value chain (material, equipment and cell & module manufacturing and academic partners) join forces in sharing the cost, risk and IP of new and innovative processes and device developments.
- For shorter term topics we define bilateral research projects together with a customer focusing on the customer's specifically requested technology development or technology transfers

CONTACT US

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