



**NUS**  
National University  
of Singapore



Solar Energy Research  
Institute of Singapore



# Next-Generation Industrial Solar Cells & Modules Cluster

*Solar Cell Processing  
Technical Consulting & Training*

**NATIONAL RESEARCH FOUNDATION**  
PRIME MINISTER'S OFFICE  
SINGAPORE



**EDB:**  
SINGAPORE

SERIS is a research institute at the National University of Singapore (NUS). SERIS is supported by NUS, the National Research Foundation Singapore (NRF), the Energy Market Authority of Singapore (EMA) and the Singapore Economic Development Board (EDB).

## SOLAR CELL PROCESSING

SERIS operates state-of-the-art industrial high-throughput silicon solar cell processing equipment from leading manufacturers for its internal R&D. To support the global PV research community, we offer a range of processing services in our Silicon Solar Cell Lab to external customers. Selected examples of processing services for research-type silicon solar wafers and cells are listed below.

### Processing of large-area silicon solar wafers and cells

- M2 and M6 wafer size (up to 166 mm × 166 mm)
- Batch-type wet-chemical processes including cleaning, etching and texturing
- Inline wet-chemical processes (both acid and alkaline chemistries) including cleaning and etching
- PECVD of dielectric layers ( $\text{SiN}_x$ ,  $\text{AlO}_x$ ,  $\text{SiO}_x$ , etc)
- PECVD of intrinsic or doped (boron, phosphorus) a-Si layers for applications in polysilicon based passivated-contact solar cells
- PECVD of intrinsic or doped (boron, phosphorus) a-Si layers for applications in silicon heterojunction solar cells
- LPCVD of intrinsic or doped (boron, phosphorus) poly-Si layers
- ALD of  $\text{Al}_2\text{O}_3$ ,  $\text{SnO}_2$  and AZO layers
- PVD of various thin films (metals, TCOs, TMOs) by sputtering and evaporation
- Thermal processes including oxidation, forming gas anneal, co-annealing
- Laser processing using ns pulses (green) and ps or fs pulses (UV, green, IR light)
- Inkjet printing of masking layers for patterning applications
- Screen printing of metal contacts (Ag, Al, Cu) and fast firing in a belt furnace



PECVD tool for deposition of intrinsic and doped amorphous silicon layers for applications in heterojunction solar cells.

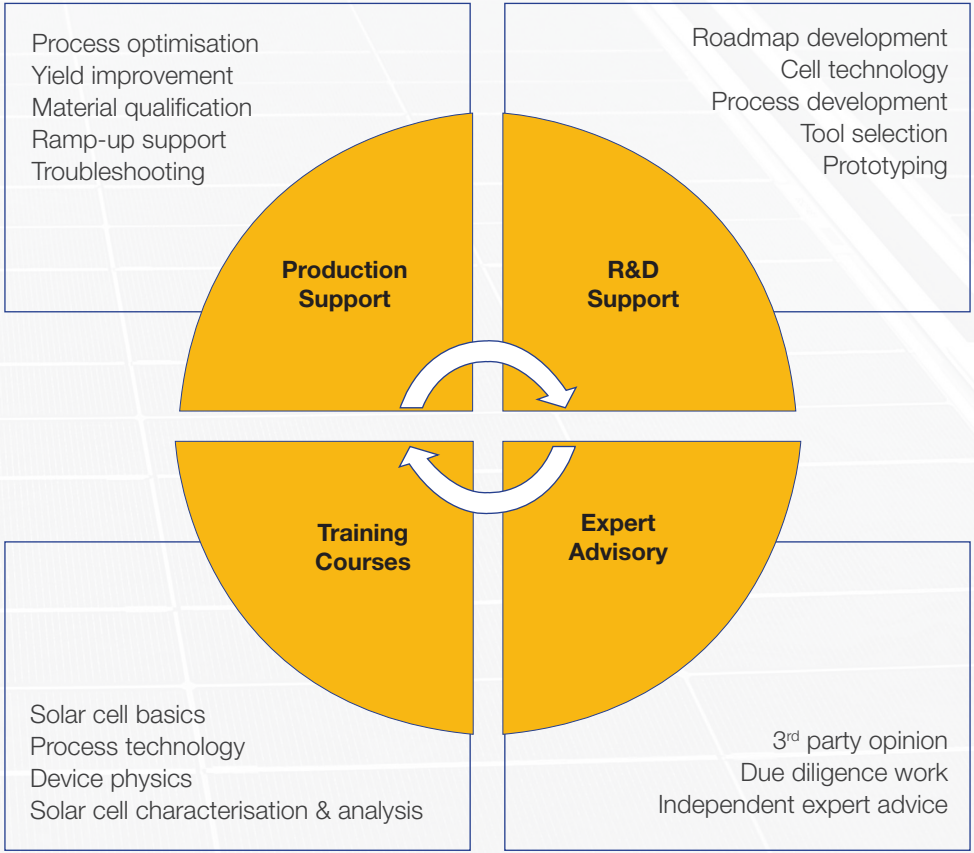


The PVD sputtering platform at SERIS is used for depositing metal layers, transparent conductive oxides and multi-layer stacks for silicon and thin-film solar cells, as well as heterojunction silicon wafer solar cells.

# TECHNICAL CONSULTING AND TRAINING

SERIS can assist you in identifying issues and/or optimising the performance of your PV cell production lines. For this purpose we follow a procedure based on a combination of high-precision measurements, modelling, and employing the know-how of our in-house PV experts.

SERIS is constantly developing and extending characterisation techniques for applications in the PV sector. Our experts team up with innovative companies to bring these new developments into the market.



## ABOUT THE NEXT-GENERATION INDUSTRIAL SOLAR CELLS & MODULES CLUSTER AT SERIS

Solar photovoltaic (PV) power generation is booming and poised to become the world's largest source of electricity. To accelerate the deployment of PV technologies in Singapore and abroad, and to support the transformation of the global energy systems towards sustainability, continuous improvements of the efficiency, manufacturing cost, and long-term stability of industrial solar cells and modules are required. This Cluster researches next-generation industrial solar cells and modules that provide superior performance and lower cost than today's technologies. The experimental work in our solar cell laboratories focuses on (i) low-cost high-efficiency devices based on monocrystalline silicon substrates and (ii) upscaling of perovskite-silicon tandem solar cells (SERIS flagship project). The Cluster also hosts, manages and operates the REC@NUS Corporate R&D Laboratory for Next Generation Photovoltaics established at NUS in 2023.

### R&D Groups:

Advanced Solar Cells

Corporate Laboratory



A unique prototype PECVD tool for ultra-fast deposition of doped silicon and metal oxide thin films in SERIS cleanroom



Automated batch tool for wet-chemical processing in SERIS cleanroom

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