



Solar Cells by August BSB (Dreamstime.com)



Industrial diffusion furnace at SERIS



Cassette of silicon wafers at SERIS



Chemical processing of silicon wafers at SERIS



Industrial screen printer at SERIS



Solar Energy Research Institute of Singapore (SERIS)

About SERIS

The Solar Energy Research Institute of Singapore (SERIS) is Singapore's national institute for applied solar energy research. It commenced operations on 1 April 2008. The institute is jointly sponsored by the Singapore Economic Development Board (EDB) and the National University of Singapore (NUS). SERIS has the stature of a research institute at NUS and is located on the main university campus.

SERIS conducts industry-oriented research and development as well as use-inspired basic research in the field of solar energy conversion. SERIS is globally active but focuses on technologies and services for tropical regions, in particular for Singapore and South-East Asia.

Mission

The mission of SERIS is to conduct research and development for a sustainable energy supply based on solar resources. The institute focuses on the development of materials, components, processes and systems for photovoltaic (PV) electricity generation and energy efficient buildings.

Main R&D areas

- Silicon photovoltaics
- Nano-structured solar cells
- Solar and energy efficient buildings

PV module testing and certification unit

- PV module performance analysis
- PV module certification (jointly with VDE-ISE Pte Ltd)

R&D and industry-related support and services

Silicon photovoltaics

Solar cells made from silicon (wafers and thin-film) dominate the PV market. To further reduce the cost of PV electricity, continuous improvements with respect to efficiency and/or manufacturing cost of PV cells and modules are required.

To contribute to this effort, SERIS operates R&D pilot lines for both silicon wafer and silicon thin-film solar cells.

The silicon wafer pilot line is capable of processing industry-size wafers using industrial processing equipment. The silicon thin-film pilot line is capable of processing glass substrates with a size of up to 400 mm x 300 mm (A3 size). Solar cells based on amorphous, microcrystalline and polycrystalline silicon films can be fabricated. The heart of this line is a cluster tool with five processing chambers.

SERIS operates a class 10,000 cleanroom (1,100 m²). Approximately 150 m² of cleanroom space is reserved for industry for test-bedding of novel PV production equipment on our pilot lines, with excellent access, high ceiling (8 m), and high floor loading capability.

Nano-structured solar cells

SERIS focuses on very low cost, highly flexible devices for roll-to-roll manufacture. This includes in particular: bulk hetero-junction organic cells and bulk hetero-junction organic/inorganic hybrid devices.



SERIS is sponsored by the National University of Singapore (NUS) and the Singapore Economic Development Board (EDB).

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PV characterisation and calibration

SERIS operates a PV characterisation and calibration laboratory. The laboratory is capable of analysing both wafer based and thin-film based PV materials and solar cells. Services offered include sample testing and characterisation, failure analysis, technical consulting as well as joint development of characterisation equipment.

PV module testing and certification

This laboratory offers full and partial performance testing of PV modules, as well as single component tests, according to the standards of the International Electrotechnical Commission (IEC). Certification of PV modules occurs via a collaboration between SERIS and the Singapore company VDE-ISE Pte Ltd. The laboratory also offers evaluation, advanced aging and stress testing of novel materials and components that can be used in the manufacture of PV modules.

PV system technology

The PV systems technology group focuses on yield assessment of solar photovoltaic systems. One of the services offered is the prediction of the mean annual energy output in kWh of a planned PV system. The focus is on PV systems in Southeast Asia and the Asia-Pacific region.

Solar and energy efficient buildings

One of the main goals of the solar and energy efficient buildings

cluster is to contribute to the adoption of solar and energy efficient buildings in Singapore and the tropics. The main emphasis is on optimising proven or near-market technologies through analytical monitoring, performance modeling and simulation, as well as the design of new materials and components.

The main R&D areas are façade technologies, building integrated photovoltaics, and solar powered air-conditioning.

Currently the research focus includes systems for advanced daylighting and building integrated photovoltaics (e.g. at Singapore's first zero-energy building) and dehumidification systems for air-conditioning.

The cluster's current facilities range from in-house optical and thermal laboratories to mobile systems and offsite laboratories such as the daylight test chambers of the zero-energy building and the Digital Space Lab at NUS' Department of Architecture.

CAREERS FOR RESEARCHERS AND STUDENTS @ SERIS

SERIS offers a wide range of positions for researchers, technical professionals and students. We are interested in applications from: Physicists, Material scientists, Engineers (electrical, mechanical, civil, chemical), Industrial designers, IT experts, Architects, Lab technicians etc.

Power output measurements of PV modules



Climate chamber at SERIS



Zero Energy Building (ZEB), Singapore



PV installation in Singapore

