From Fundamental Research to Industrial Technology

Photovoltaics laboratory in Neuchâtel introduces high efficiency devices based on the deposition of amorphous and microcrystalline Si.

Following the recent “IMT microcrystalline patent” dispute, it is timely to summarize a few facts about laboratory who originated it. The Photovoltaics Laboratory (PV-Lab) of IMT (Institute of Micro-technology) was founded in 1984 by Prof. Arvind Shah. It has pioneered several new processes for the preparation of thin-film silicon, such as the introduction of Very High Frequency (VHF) plasma deposition. It has, among other major results, demonstrated that microcrystalline silicon can be used effectively as the active layer for the bottom cell in tandem and multi-junction solar cells. The laboratory, headed currently by Prof. Christophe Ballif, and now part of the EPFL, covers a broad spectrum of activities, ranging from fundamental research to industrial technology. It has a focus on the following topics.

1. Processes and device structures for high efficiency thin-film silicon solar cells on glass and plastic substrates
2. Plasma processes for cost effective cell fabrication, including new plasma diagnostic tools and high deposition rate approaches
3. Development of TCO and advanced light trapping structures for thin-film Si solar cells
4. Physical properties and manufacturing of high efficiency hetero-junction crystalline Si solar cells (a-Si/c-Si)
5. Encapsulation processes and reliability of PV-Modules, with emphasis on durability of thin-film Si modules

Past and recent achievements of the lab include record efficiency devices in a wide variety of configurations both in substrate and superstrate configuration.

Links to Industrial Development

The PV-Lab has close links with several Swiss and European research institutes and industries. It has led to the creation of Oerlikon solar in 2003, a leading supplier of production lines for amorphous and tandem solar cell fabrication on glass substrates. It also has common projects with its technology spin-off company VHF technologies (Flexcell), the largest EU manufacturer of flexible solar cells prepared on plastic substrates by roll-to-roll. Recently, it has triggered the creation of the company Roth&Rau Switzerland, and established collaboration for high efficiency crystalline silicon cells. Indotec, a new spin-off of the PV-Lab, is now commercializing high end R&D cluster PECVD systems, based on the expertise of the lab in the design of deposition systems. The PV-Lab has direct projects with more than a dozen companies worldwide, and collaborates in the frame of EU-Projects with several other partners.

Personal and Infrastructure

The laboratory currently employs more than 45 people, with a mix of researchers, postdocs, senior scientists, technicians and engineers. It hosts an impressive technology park including 10 plasma PECVD systems, among them a two chamber cluster 41 x 52 cm² system, 6 systems for the deposition of TCOs and metallic layers and 2 systems for plasma etching. Samples with sizes ranging from a few mm up to > 1,000 cm² can be processed. The lab has recently installed a versatile R&D high precision laser system which allows for full module manufacturing, as well as the testing of a wide variety of laser scribing applications (moving sample or moving laser, wide set of wavelengths available) on samples up to 50 x 60 cm² in size. For crystalline Si solar cells, a full R&D line for hetero-junction preparation is currently being ramped up.

It includes wafer etching and screen printing facilities. An extensive set of measurement systems allows for the characterization of semiconductor and optoelectronic layers, as well as for the performance testing of devices ranging from thin-film sensors to single-junction and multiple-junction solar cells. Finally, back-end line and reliability testing units permit the production and characterization of complete modules, and allows for comparisons before and after damp heat, UV degradation, etc.

Perspectives

Through its infrastructures and organization, the PV-Lab has reached the status of a small technology center. It is now looking for various private-public partnerships to reinforce both the industrial research sector, and the academic part with the nomination of new professors in the field of PV.

Further Information: EPFL STI IMT-NE PV-LAB (http://pvlab.epfl.ch)
General Plasma Inc. (GPI) (www.generalplasma.com) announced that Jerry Martin has joined the company as Vice President. A recognized leader in developing sales and distribution channels throughout the world, Jerry will lead business development efforts as GPI focuses on commercialization and mass production of its patent-protected advanced source and large area PECVD solutions.

“Jerry’s leadership and vast experience in global sales and marketing will be invaluable as we validate new applications of our PECVD and sputter equipment technology,” commented John Madocks, President at GPI. “We are fortunate to have Jerry lead business development efforts as we expand into new market opportunities and look to deliver our revolutionary plasma technology on a large scale basis.”

Spanning a career of more than 30 years in vacuum coating, Jerry brings a multidisciplinary cache of experience to his new role. Most recently employed as Sr. Director, Product Sales with Veeco Solar Equipment, Jerry’s background includes positions in product development, global product management and direct sales, and as the leader of several top-producing sales and marketing teams.

“I’m inspired by the possibilities at GPI,” commented Jerry Martin. “The product profile is unique in its class, the people at GPI are first rate, and the opportunities are abundant. The company is beginning to realize the results of years of intensive research and committed financial backing. We have aggressive plans to deliver our products to those in need of complete PECVD and sputter equipment solutions.”

In addition to his leadership role in planning product roadmaps, Jerry will assist in identifying market opportunities, managing customer relationships and coordinating business development strategy.

Further Information: General Plasma Inc. (www.generalplasma.com)