Highlight

Building a Low-Carbon Society

Photograph: Oerlikon Solar KAI (PECVD)

Solving environmental problems such as global warming, climate change, and energy resource depletion is an urgent task for humankind. Under our principle of "tackling environmental problems with technology," the TEL Group is taking an even greater leadership role in addressing environmental problems in order to create a society of dreams.

The TEL Group and its PV Cell Production Equipment Business

Renewable energy is gaining attention within society due to expectations that it can contribute significantly to preventing global warming because it emits no or fewer greenhouse gases than current mainstream energy sources and can be used almost perpetually. PV power generation using solar energy may be said to be representative of this renewable energy. However, further technological innovation and cost reductions are necessary to overcome the current challenges, including increasing the efficiency of converting solar energy to electricity, overcoming the shortage of materials for producing the necessary equipment and overall cost improvements.

Utilizing our production technology cultivated through our experience and expertise with semiconductor and FPD production equipment, the TEL Group made a full-scale entry into the PV cell production equipment business in 2008. In February of that year, we set up a joint venture company with Sharp Corporation (Sharp) to begin joint development of plasma CVD[1] systems for use in thin film silicon PV cells. In February 2009, we also entered an exclusive sales representative agreement with Oerlikon Solar Ltd. (Headquarters: Switzerland) for end-to-end thin-film silicon PV cell production lines and equipment in Asia and Oceania. The TEL Group is also undertaking independent development of technology in relation to chemical and organic PV cells and CVD equipment for use in production processes.

Based on our belief that we must employ technology to tackle environmental issues, we are striving to strengthen our PV cell production equipment business to make it the third pillar of our Group following our semiconductor manufacturing equipment and FPD production equipment businesses and consequently increase our contribution to society.

1 CVD (Chemical Vapor Deposition): a method for creating thin films on wafers. Vapor containing the constituent elements of the desired thin film is poured over the wafer and chemical reactions initiated on the wafer surface, creating the thin film.

Tokyo Electron's PV Cell Production Equipment Business Expansion

SHARP	**Joint Development with Sharp** • Plasma CVD systems for use in thin-film silicon PV cells • Tokyo Electron: Joint development, manufacturing, and sales
oerlikon solar	**Collaboration with Oerlikon Solar** • End-to-end production line for thin-film silicon PV cells • Tokyo Electron: Sales representatives in Asia and Oceania
TOKYO ELECTRON	**Independent development by Tokyo Electron**

Installation of a PV power system on the roof of the new Tokyo Electron Taiwan Ltd. (TET) premises

A PV power system was installed on the roof of the new TET premises, which were completed in October 2009. Several types of PV power panels were installed and information about the relationship between the amount of solar radiation to which each panel is exposed and the amount of electricity it generates is monitored, compared, and evaluated. Currently, the amount of electricity generated is no more than 11 kW, but we intend to utilize feedback from these panels to further advance the Group's technology and enhance product development and production.

The PV power system on the roof of the new TET premises

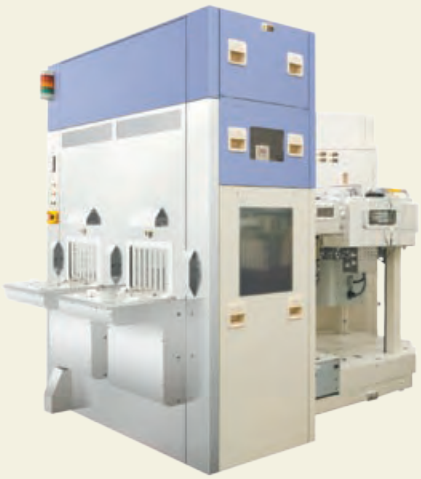
PV cell factory begins operations at Sharp Corporation's "Green Front Sakai"

In February 2008, the TEL Group established a joint venture company with Sharp Corporation (Sharp) to undertake cooperative development of plasma CVD systems for use in thin film silicon PV cells. The equipment developed through this partnership has been delivered to the PV cell factory at Sharp's "Green Front Sakai" manufacturing complex in Sakai City, Osaka Prefecture, and factory operations began on March 29, 2010. This Sharp factory produces thin film silicon PV cells using large glass substrates measuring 1,000 mm x 1,400 mm. The thin film silicon PV cells comprise silicon thinly deposited on these glass substrates. This is a high energy-saving structure, which allows a significant reduction in the amount of silicon used to approximately 100th of that used in the production of crystal PV cells.

Sales launch of the Probus-SiC™ batch system, which forms SiC epitaxial films on SiC substrates for use in next-generation power semiconductor applications

The voltage of electricity generated at power stations is too high to be generally used, thus it needs to be lowered through voltage conversion at a substation or by a transformer before the electrical power can be utilized. Moreover, as new technologies are being developed to support expanding power utilization, such as PV power generation, battery storage as well as smart grids,[2] minimizing power conversion loss is becoming an increasingly important issue. Currently, mainly silicon power semiconductors are used for this purpose, but we now know that using SiC (silicon carbide) instead reduces the loss tremendously and can be used efficiently.

Applying its accumulated semiconductor production technology for developing new tool to support the possibility of SiC power semiconductors, the TEL Group has now launched sales of the "Probus-SiC," a device for forming SiC epitaxial films[3] on SiC substrates. The core technology used for this equipment is the result of industry-university collaborative research conducted by Kyoto University, Rohm Co., Ltd., and the TEL Group. Using this tool enables highly productive formation of high-quality epitaxial films and can contribute to the realization of SiC power semiconductors.



2 Smart grid: a power grid with the function of automatically adjusting the supply and demand of electrical power to optimize the supply of electricity
3 Epitaxial film: film that has the same crystalline structure as the underlying crystal substrate

Improved power conversion is expected to reduce CO_2 emissions

SiC is gaining attention as a new material to follow Silicon, which is currently used in semiconductors. Compared with Silicon, SiC is expected to increase the efficiency of electrical power conversion—whether by inverters or converters—and greatly reduce electricity losses, thereby leading to a reduction in CO_2 emissions. SiC can also accelerate switching speed, which helps the development of small devices with good performance.

SiC can be used effectively in hybrid and electrical cars, for example. Currently, these vehicles are equipped with inverter-cooling devices, which could be made unnecessary by using SiC, as this material can work in a high-temperature environment. This in turn enables extension of driving distance by reducing the weight and size of the vehicle. In addition, the use of SiC for wind and hydroelectric power generation, smart grids, and other measures enables the reduction of electrical power losses.

The current issue is that the prices of SiC substrates are much higher than for silicon substrates of the same size, but our continuing research and development and cost reduction efforts will lead to the growth of the SiC market, thus contributing to low-conversion-loss electrical power usage and a reduction in CO_2 emissions.

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