

# PHOTON International

## The Photovoltaic Magazine

**8/2008** August 2008

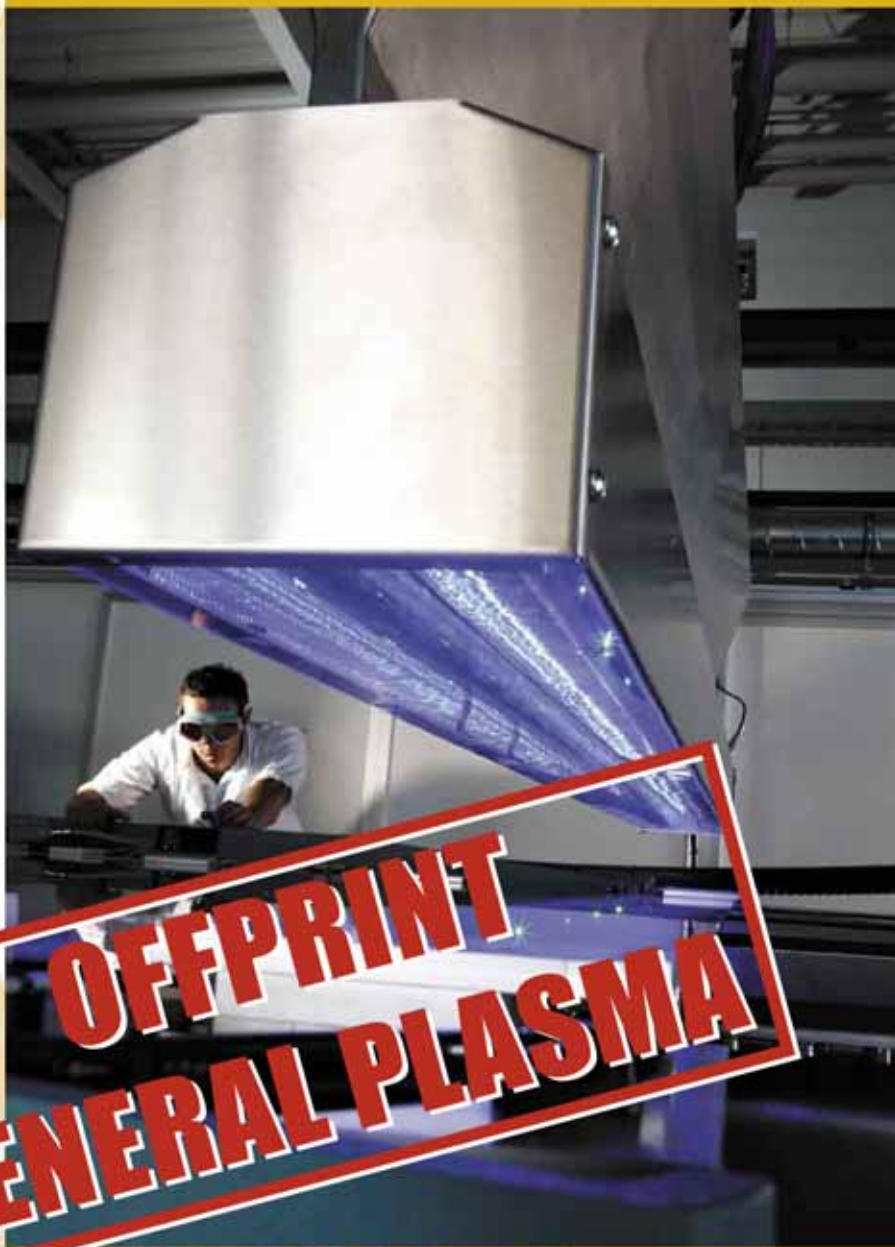
**Valencia special**  
New products presented at  
the EU PVSEC conference

**Oerlikon vs.  
Applied**  
Fight for thin-film  
equipment market  
share goes to court

**Spanish tragedy**  
World's most promising  
market close to the end

**Eastern European  
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Bulgaria emerges with  
uncapped and attractive  
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**Japanese revival?**  
One-time solar leader  
planning new PV subsidy  
program



**OFFPRINT  
GENERAL PLASMA**

**Lasers for thin films**

First market survey on scribing equipment for modules



Stand: Hall 3, B28

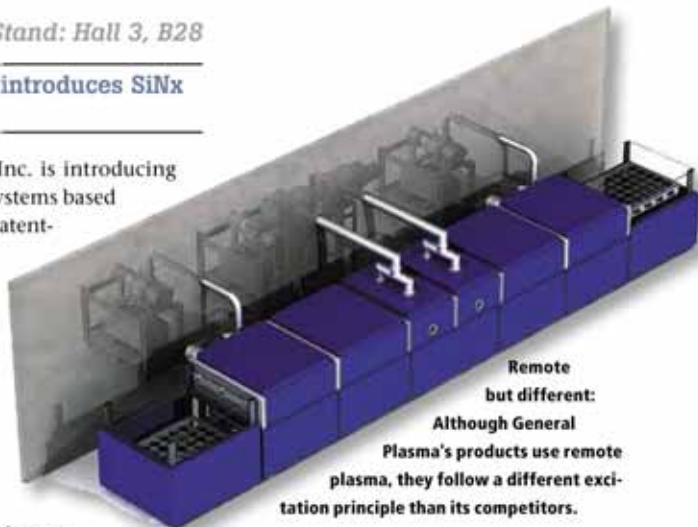
### General Plasma introduces SiNx deposition tools

■ General Plasma Inc. is introducing a range of PECVD systems based on the company's patented Plasma Beam Source technology to deposit the silicon nitride layer for anti-reflection coating on silicon wafers. The US-headquartered vacuum coating expert's four inline PECVD reactors with variable throughputs are marketed under the brand name MAXUM.

General Plasma's technology of choice, PECVD, is used by most SiNx deposition equipment manufacturers – the only other alternative is sputtering devices offered by Applied Materials Inc. The PECVD furnaces are characterized as direct or remote depending on whether the substrate is in contact with one of the plasma generating electrodes or not. According to Mark George, the director of technology at General Plasma, the MAXUM range offers a remote plasma device, a technology that is also being offered by German market leader Roth & Rau AG and OTB Solar from the Netherlands.

Like Roth & Rau, General Plasma also places the substrates on a carrier for transport, but the employed technique to excite the plasma is completely different. The American company's Plasma Beam Source has an internal magnetron cathode inside of a discharge cavity that is separated from the deposition chamber. A non-condensable reactive gas such as hydrogen is introduced into the discharge cavity to excite the plasma. The strong magnetic field then confines the resulting plasma beam and directs it onto the substrate. The precursor gases, silane and ammonia, are delivered into the reaction chamber. According to General Plasma, the presence of reactive gases outside the discharge cavity eliminates the possibility of electrode contamination, which is typical with parallel-plate direct plasma technology. Nevertheless, such undesired deposition also takes place in Roth & Rau's microwave excitation principle, for example, where the quartz tubes receive substantial coatings, so that they have to be replaced after a certain number of hours of operation.

In our market survey on SiNx deposition machines, the devices from OTB had the best uniformities (+/-2.5 percent)



Extend your lifetime...

**General Plasma has 2ms!**



### ADVANCED SILICON NITRIDE COATING TECHNOLOGY

- 2ms carrier lifetime
- +/-3% uniformity over 1+ meter
- Refractive index control 1.85-2.25
- High deposition rate
  - >60nm-m/min per source
- Long production runs
  - no exposed electrodes
- Efficient Silane use (>15%)

### BREAKING NEWS FROM THE 23RD EU PVSEC!!!

Introducing THE MAXUM SILICON NITRIDE PRODUCTION SYSTEMS



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among all PECVD systems (see PI 3/2008, p. 120) With thickness variations of up to +/-3 percent along a one meter length (the OTB value refers to the wafer size), the MAXUM systems are in the upper range with regard to this parameter. Apart from uniformity, one of the most important characteristics of the silicon-nitride film is the refractive index value, which can be altered by changing the reactive gas flows to the process chamber. To achieve refractive index values between 2.2 and 1.95, the MAXUM furnaces use the same amount of reactant gases, whereas with most other PECVD furnaces the ratio of ammonia to silane is above four. Hence, these new reactors are said to consume 15 percent less silane.

Although General Plasma claims a high deposition rate of 1 nm per second for its equipment, other devices in our survey displayed even higher maximum deposition rates. When this deposition rate is transformed into production capacity, the smallest device in the range, the MAXUM 600L, can accommodate 15 wafers in a carrier and it takes 90 seconds to get the characteristic blue color onto the wafer. This equates to a throughput of 600 wafers per hour. The other models, with suffixes 600H, 1000L and 1000H, have respective hourly processing capacities of 900, 1,400 and 2,100 wafers. However, the company has only provided the price for the MAXUM 600L, which costs \$2 million. The systems are available for worldwide sales. skc

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