

Multi c-Si technology here to stay

Multi c-Si technology has continued to lead volume production in recent years, while providing the lowest cost-per-watt metrics, yet is still able to achieve solar cell conversion efficiencies of 20% plus, according to Pierre Verlinden, CTO of PV module manufacturer, Trina Solar, at the inaugural PV CellTech event in Malaysia in March.

Trina achieved a record maximum cell efficiency (21.25%) for a multi c-Si solar cell in November 2015, adding to a string of records the company made that year and in 2014.

The technology still has a bright future despite some key challenges, Verlinden said. The development and implementation of multi c-Si wafers with significantly reduced dislocations in the substrate would improve conversion efficiency to 21.44%. Reducing iron contamination and deactivation of boron-oxygen (B-O) defects in the wafer (B-O complex), which impact the cell performance, known as light-induced degradation (LID), would boost conversion efficiencies to 21.83%.

Improving the local back surface field of the cell would take efficiencies to 22.33% and passivated contacts could achieve cell efficiencies of more than 22.5%. Coupled to a major reduction in wafer impurities, the solar industry could achieve 0.5% cell efficiency gains for a few more years before saturation occurs.



Credit: Trina Solar

Trina Solar's CTO believes multi c-Si PV technology has a bright future.

Orders

JA Solar places US\$18.8 million PERC cell equipment order with Meyer Burger

PV manufacturing equipment supplier Meyer Burger has received a major passivated emitter rear cell (PERC) upgrade order from 'Silicon Module Super League' (SMSL) member JA Solar.

The tool order, valued at over CHF18 million (US\$18.8 million), included Meyer Burger's MAiA 2.1 platform for inline PERC cell plasma processes, SiNA PECVD cell coating systems for anti-reflection and passivation layer coating and its DW288 water-based diamond wire cutting technology for monocrystalline wafers.

The JA Solar order equated to total

annual output of approximately 1.5GW. Tool delivery and commissioning are expected to occur in the second half of 2016.

JA Solar recently reported that expected full-year 2016 shipments would be in the range of 5.2GW to 5.5GW, including 250MW to 300MW of module shipments to its downstream projects. The company is increasing its manufacturing capacity to match expected demand.

SoLayTec receives new ALD tool orders for p-type PERC, n-type IBC and bi-facial solar cells

Atomic layer deposition (ALD) equipment specialist SoLayTec has received a number of new tool orders from a range of customers planning p-type PERC, n-type IBC and

bi-facial solar cell production in 2016.

Four new customers have placed orders for SoLayTec's 'InPassion' ALD system, including a new customer based in Taiwan, with shipments expected to start in Q2 2016. Customers of SoLayTec now reside in China, Japan, Europe and Taiwan.

Roger Görtzen, co-founder of SoLayTec and manager of marketing and sales, said: "After several years of having InPassion ALD systems in mass production at multiple customers in China and Japan, SoLayTec is delighted to announce that in the last couple of weeks three orders were received. These machines will be used for production of high efficient solar cell concepts, like p-type PERC, n-type IBC and bi-facial cells."

German PV equipment firms see strong solar cell orders in 2015 - VDMA

Germany-based trade association VDMA Photovoltaic Equipment has said manufacturing equipment orders received by around 100 members increased by 86% in the fourth quarter of 2015, marking a major rebound in purchase orders.

The strong increase in order intake in Q4 2015 followed a 44% increase in the previous quarter driven by planned large-scale capacity expansions not only in Asia but also from the US.

The export quota for German-based PV suppliers was around 85% in 2015, with Southeast Asia accounting for 59% of the exports in fourth quarter of 2015. However, the US accounted for almost 21% of revenue in 2015 for German suppliers, while Europe (excluding Germany) only accounted for 5% of revenue.



Credit: JA Solar

JA Solar has placed a major order with Meyer Burger for a PERC upgrade.



Credit: Centrotherm

PV manufacturing equipment orders saw a major rebound at the end of 2015, according to VDMA Photovoltaic Equipment.

Equipment revenue in Germany was said to be around 17% of the total in 2015. Around 52% of revenue came from solar cell related orders, while thin-film accounted for around 21% and module assembly equipment accounted for 14% of sales in 2015.

Cell efficiency

Trina Solar sets 23.5% IBC cell conversion efficiency record for screen printed process

Trina Solar has achieved a new world record for a large-area Interdigitated Back Contact (IBC) solar cell.

Independently confirmed by the Japan Electrical Safety & Environment Technology Laboratories (JET), Trina Solar set the conversion efficiency record at 23.5%, using 156x156mm n-type monocrystalline silicon (c-Si) wafers and a screen-printed process.

Pierre Verlinden, vice-president and chief scientist of Trina Solar, said: "To the best of our knowledge, this is the first time that a mono-crystalline silicon IBC solar cell with an area of 238.6 cm² exhibits a total-area conversion efficiency of 23.5%."

However, Japan-based Kaneka Corporation is set to present a paper at the 43rd IEEE Photovoltaic Specialists Conference in June, highlighting it has achieved a large-area heterojunction technology-based (HJBC) solar cell with a cell conversion efficiency of 24.5% and a cell of 24.9% that was independently confirmed at AIST.

Imec and Crystal Solar claim milestone in commercialisation of 'Direct Gas to Wafer'

Nano-electronics research center imec and kerfless epitaxial wafer start-up, Crystal Solar, have demonstrated a homojunction solar cell with a record 22.5% conversion efficiency, claimed to pave the way to low-cost solar wafer commercialization.

The potentially disruptive wafer technology was used to fabricate a standard monocrystalline 156x156mm² cell on 160um to 180um thick grown n-type wafer with built-in rear p+ emitter.

Imec's n-PERT process included a selective front surface field realized by laser doping, advanced emitter surface passivation by Al₂O₃ and Ni/Cu plated contacts, generating a record high Voc of 700mV, demonstrating the high quality of the 'Direct Gas to Wafer' technology and built-in junction.

The cell efficiency was certified by FhG ISE CalLab. Jozef Szlufcik, PV department director at imec said: "Using these kerfless wafers will be disruptive for the complete solar cell manufacturing value chain."

Copper plated solar cell-to-module reliability tests by imec and BESI exceed expectations

Work carried out by nano-electronic research centre imec and equipment supplier BESI and wholly-owned subsidiary, Meco Equipment Engineers, has shown PV modules featuring copper plated solar cells are highly reliable and outperform IEC61215 life test criteria with only 1% degradation.

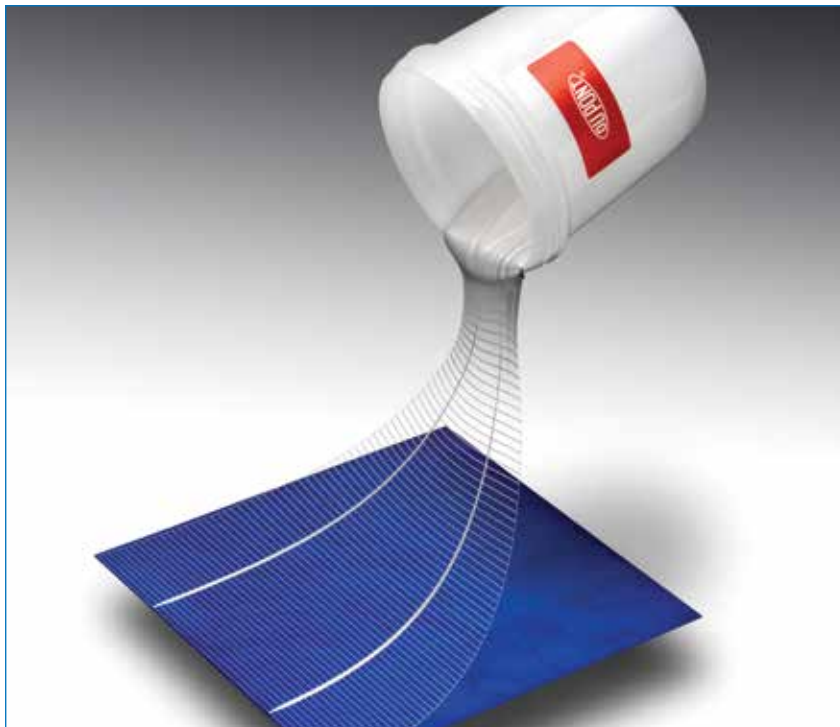
The minimal power loss came after a monocrystalline 60-cells Ni/Cu/Ag plated solar module passed 600 thermal cycles (-40°C to +85°C), three times the IEC61215 specification. Specifically, the module consists of 60 front-side laser ablated and Ni-Cu-Ag plated p-type monocrystalline solar cells, using Meco's 'Direct Plating Line' system and annealed in an inline belt furnace.

The copper plated cells were interconnected using a standard solder and lamination process. imec's and BESI's Cu-plated cells and modules outperformed the industrial standard for reliability, which requires less than 5% loss relative to initial power after 200 thermal cycles or 1000 hours of damp-heat testing.



SolarWorld is planning to gradually migrate all of its production to PERC and five-busbar technology

Credit: SolarWorld



Credit: DuPont

DuPont has launched a new metallization paste, Solamet PV19B.

PERC

SolarWorld 'gradually' migrating cell production to PERC and five-busbar technology

High-efficiency products will be the key focus of SolarWorld's expanded manufacturing capacity and technology migrations in 2016.

At the core of SolarWorld's high-tech strategy is migrating all solar cell production to PERC technology and moving from three busbars to five in order to boost conversion efficiencies and limit capital expenditures at the same time.

SolarWorld has upgraded between 800MW to 1GW of conventional Al-BSF production lines to PERC, predominantly monocrystalline, since transferring from its pilot line in 2012.

Migration to PERC on a total nameplate capacity of 1.5GW was in progress, SolarWorld said. Further PERC migration to full production status would be "gradual", notwithstanding that increased production utilization in 2015, due to increased shipments and tight capex control, prevented a more aggressive switch.

SolarWorld's bifacial modules produced for testing in US

PV module manufacturer SolarWorld has started producing its first bifacial Bisun modules at its US manufacturing facility in order to test their capability against standard modules using advanced p-type mono-PERC cell architecture.

The testing will take place on a 205kW solar system at the University of Richmond in Virginia, which will be the first commercial installation of the SolarWorld bifacial Bisun modules.

The Bisun technology is able to generate electricity from direct solar radiation on the front side as well as reflected sunlight on the back side, and these modules can generate up to 25% more energy than standard mono-facial modules. Power generation from bifacial modules also depends on the distance they are installed away from the surface below as well as the reflectivity of that surface. Consequently, the modules will be installed on two roofs – one with gravel and another with a white material thermoplastic olefin (TPO) – to vary conditions in the testing.

Trina Solar starts ramping cell and module production in Thailand

Trina Solar has officially started ramping its solar cell and module assembly plant in Rayong, Thailand, meeting every milestone on schedule, from ground-breaking to production.

Trina's first manufacturing facility outside China was initially announced in May 2015 with 700MW of nameplate solar cell capacity using its 'Honey' multicrystalline PERC solar cell technology and 500MW of PV module capacity.

Financing for the new production plant was facilitated by a consortium of banks led by the Siam Commercial Bank Public Company Limited (SCB), one of the top three domestic banks in Thailand, to the tune

of US\$143 million, maturing in June 2020.

Jifan Gao, chairman and CEO of Trina Solar said: "The investment in Thailand fits our strategy of prudent capacity expansion in select overseas markets to deliver industry leading products to customers in the US and Europe in particular."

Metallization

DuPont claims cell efficiency benefits from new metallization paste

Materials specialist DuPont Photovoltaic Solutions has launched a new metallization paste.

The company's new 'Solamet PV19B' is claimed to offer a multitude of benefits, including higher PV cell efficiencies and better throughput speeds.

Chuck Xu, global business director, DuPont Photovoltaic Solutions, said: "We are excited to announce the launch of DuPont Solamet PV19B, which can enable more than 0.1% cell efficiency improvement over other products currently used in the industry. We are committed to optimising solar power output and long-term reliability through material science."

As well as higher cell efficiencies, by virtue of its paste transfer attributes, the new product allowed higher print speeds and thus improved average throughput rates – by as much as 26%.

ASM AE wins solar cell metallization business from Risen Energy

PV screen printing equipment supplier ASM Alternative Energy (ASM AE) has secured a repeat order from China-based PV manufacturer Risen Energy.

ASM AE said the order was for its 'Eclipse' metallization tool as part of a solar cell capacity expansion at Risen Energy's Ningbo, Zhejiang Province, China headquarters.

Brian Lau, ASM AE's vice president of business development, said: "Risen has high expectations for ASM AE's platforms, with exceptional throughput capability and extreme accuracy as priorities. Customers like this only serve to make our team and our products better, and our long partnership with Risen is evidence of ASM AE's ability to consistently deliver on their tough requirements."

Risen Energy placed a 950MW automated module assembly line order with Suzhou Horad New Energy Equipment Co last November and plans to take capacity of solar cells and modules to 2.5GW.