ROFIN at Intersolar 2012: May 2012

Higher Cell Efficiency with Laser Processing

ROFIN releases upgrade for selective emitter processing

In 2010, ROFIN officially introduced the PowerLine L 100 SHG for laser doping on crystalline Si solar cells. The laser source, with a wavelength of 532 nm, provides the desired near-surface absorption in silicon. It comes with top-hat energy distribution, fast and precise scanning system and a beam delivery system perfectly suitable for up to 156 mm cells. More than 50 laser systems have been installed at customers worldwide and help to produce higher efficient solar cells out of the same materials.

Selective emitters promise efficiency gains of about 0.3 – 0.5% compared to standard homogeneous emitters. In the past, there has always been a trade-off between the desired heavy doping of the n-type silicon layer underneath the metallized contact regions and light doping between the contact fingers. Heavy doping achieves low contact resistance and good lateral conductivity whereas, light doping is necessary for limited recombination and good response to blue light. Laser doping uses the phosphosilicate glass (PSG) layer, already grown on top of the emitter during conventional dopant diffusion, as doping source – no additional cost driving dopants are required. With an optimized pulse length regime, the laser process is diffusing the additional Phosphor atoms into the silicon emitter without causing heat affected damage to the bulk silicon. In fact, the texturized silicon surface doesn't even melt in the process.

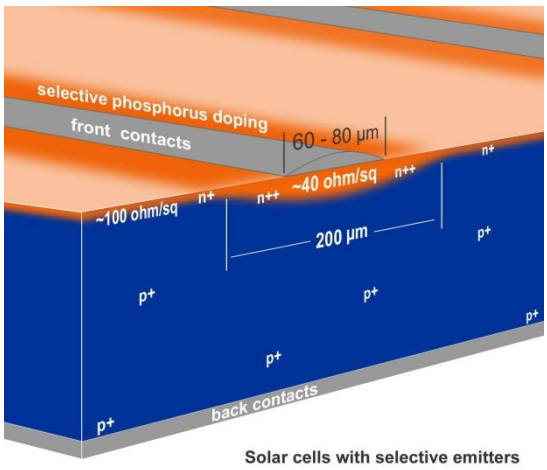

Fig. 1: Solar cells with selective emitters

Originally the doping width of 300micron was designed for a metallized finger width of around 100micron leaving enough room for printer to laser alignment. With advances in process accuracies and fine line printing down to 60 – 80 micron being introduced into industrial mass production, ROFIN is responding with a product upgrade for selective emitter processing. Two new versions with the unique, patent pending rectangular spot design are being offered (as pictured below):

- 250 x 500micron flat top spot area
- 200 x 600micron flat top spot area with Powerline L 80 SHG

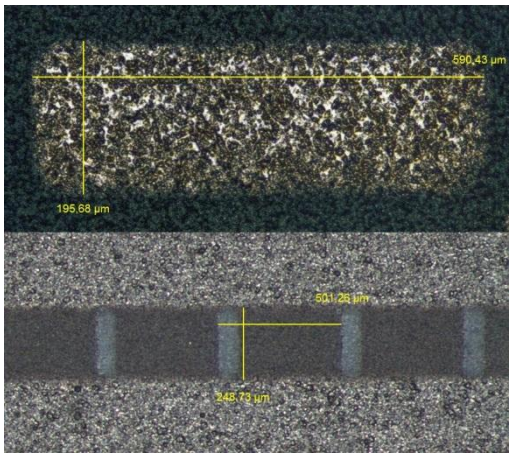

Fig. 2:
Single spot with 200 x 600 micron and laser doping line with 250 x 500 micron spots

Fig. 3: PowerLine L is the optimal laser source for large scale production in solar cell manufacturing

A laser doping line of 200micron under the fingers compared to a 300micron width enlarges the total area with reduced recombination and better blue light response by 1250 mm² (or 5%) and pushes the cell efficiency further up. The calculation is based on an 80 finger 156 mm cell design. The upgrades are available for new laser systems as well as lasers already installed. The 200 micron line width comes with a new laser resonator version and enhanced beam quality, the Powerline L 80 SHG.

Laser Systems for high throughput cell processing

ROFIN and CENTROTHERM have successfully introduced fully integrated laser manufacturing systems for selective emitter and rear side passivation to European and Asian high volume c-Si cell manufacturers over the last 2 years. Detailed results of cell efficiencies in mass production have been presented at various technical conferences.

ROFIN is now broadening the product range for its "*Dual Line c-Si"* ™ machine to other applications as laser fired contact, front side scribing and metal wrap through cell (MWT) drilling. The core of the machine is a high precision granite base to support the laser optics and rapid wafer handling units. Features are a standardized HMI software and a powerful PLC system allowing a throughput range of 1800 – 3600 wafers per hour. The machine can be equipped with a wide range of options:

- Quality control system and sensors
- MES host interface
- Inline, cassette or coin stack handling for all common standards and degrees of automation

Fig. 4: Dual Line System for wafer drilling

COO, Thomas Merk: “The Photovoltaic Energy Industry is one of our strategic key markets. The current main task of our PV customers is to increase the efficiency of their solar cells to levels of higher than 20 %. Rofin has focused its product portfolio exactly according to these requirements. Dedicated production and lab solutions for selective emitter, backside opening, MWT, etc. applications have been launched successfully to the market. With local offices in all relevant regions and with high competitive solutions ROFIN is best positioned to support our PV customers.”

About ROFIN

With more than 35 years of experience in laser technology, ROFIN has successfully focused its strategy on being an innovative leader in the industrial laser market and has consistently demonstrated its determination to deliver the most powerful and innovative manufacturing tools to a wide range of industries. ROFIN’s global outlook, which started very early on, combined with acquisitions of other companies, contributed to ROFIN’s expansion efforts. In the last fiscal year net sales amounted to 598 million US dollars. Since 1996, ROFIN-SINAR Technologies’ shares have traded on the NASDAQ Stock Exchange under the symbol “RSTI”.

Meet ROFIN

SNEC PV Power Expo
May 16 – May 18,2012
Shanghai / CHINA
hall no. W1 / booth no. 220

Intersolar Europe
June 13 – June 15, 2012
Munich / GERMANY
hall no. A5 / booth no. 474.

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