

Laser Doping System

by Laser-Chemical Processing (LCP)



The Laser Chemical Doping Technology

The efficiency of solar cells can be increased by locally diffusing dopant underneath the front contacts, so-called selective emitters.

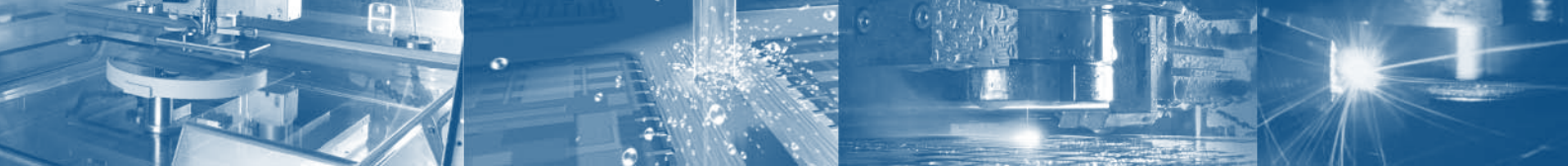
Laser Chemical Doping uses a laser beam to groove, if necessary, the passivation layers and a chemical jet, in which the laser beam is guided, that simultaneously introduces local doping at the surface of the silicon wafers. Thin selective emitters can be produced with a laser-based industrial process.

A manual loading Laser Chemical Doping system is now available from Synova. Targeting development and test laboratories, it offers a unique blend of flexibility and freedom to tailor the Laser Chemical Doping process to one's specific solar cell structure.

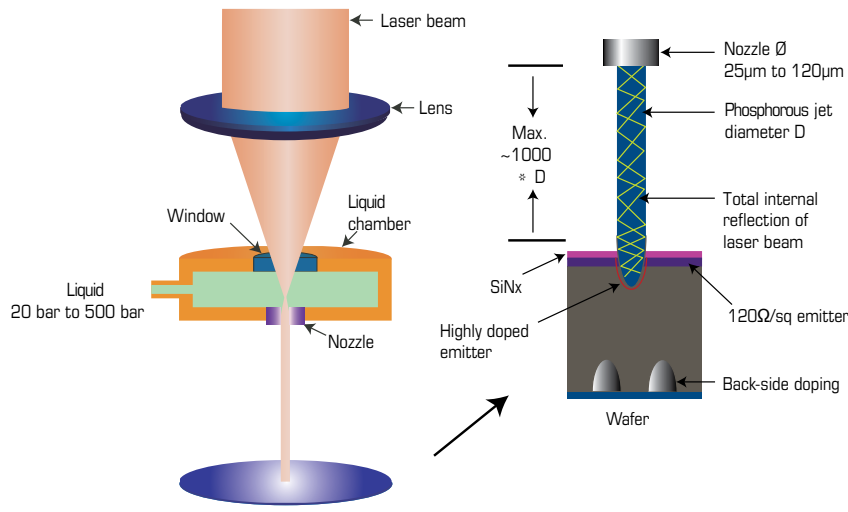
Numerous advantages

The LCP offers radically new solutions for doping of solar cells:

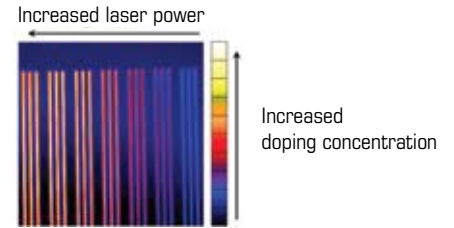
- Up to 20.4% efficiency already demonstrated
- Fast and simple process for selective emitter formation
- AR layer opening and groove doping in one step
- Compatible for P-type back-side doping
- Doping possible before and after SiNx deposition
- Excellent ohmic contacts manufactured
- Contact resistance reduced below 1 mΩcm²
- No need for separate etch, diffusion and anneal
- Selective emitters sufficiently doped for screen-printing and electroplating
- Greatly reduces line widths (down to 20µm) in combination with Ni plating
- Versatile process as other steps can be added (e.g. seeding) as the technology evolves



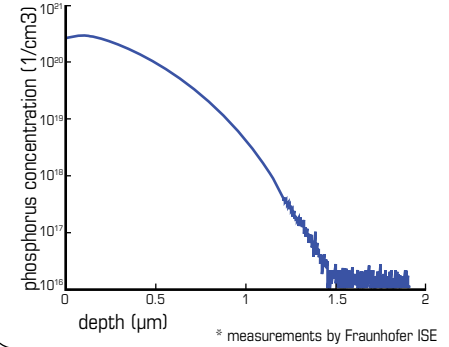
Laser Chemical Processing Principle



SRI measurement of local doping in laser grooves – 85% phosphoric acid



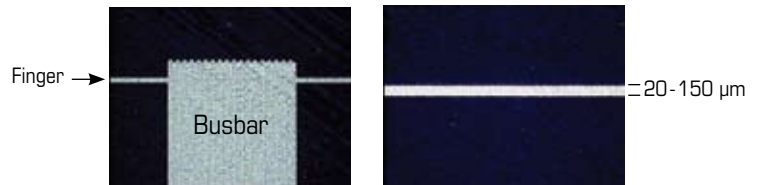
SIMS measurement of a 20.4% solar cell



Applications

- N-Doping of selective emitters
- Back-side P-doping
- Grooving of passivation layers
- Edge-Isolation of solar cells (using DI water)

Locally doped selective phosphorous emitter using the LCP technique. Totally damage-free grooving quality can be achieved by using the Laser MicroJet®.



Example of doping with 85% phosphoric acid.
Doping speed: 200 mm/s - Groove depth: 2-7 µm

Specifications

Dimensions (HxWxD):

1789 x 1055 x 2204 mm (machine)
1607.5 x 707.5 x 800 mm (electrical cabinet)

Weight: 1720 kg

Type: x-y table, assembly on granite table

Working area: 200 x 200 mm

Max speed: 1 m/s

Accuracy: +/- 8 µm on full range, +/- 2µm on 25 mm

Power: Input: AC 230 V +6%/-10%, 1-phase, 50/60 Hz
Peak: 2.5 kVA

Acid Jet: Phosphoric Acid (H3PO4)

Flow rate: Max. 0.05 L/min

Manual loading



Synova LCP development system with electrical cabinet