Listing and specification of **processing** equipment at ISC Konstanz

30.05.2016

Processing equipment

apparatus	applications	properties
 inline wet-bench (RENA)	- wafer cleaning - isotexture - P-glass etch - edge isolation - single side isotexture - single side polishing - emitter etch back	- 3 tracks - format: 80 x 120 mm^2 to 210 x 210 mm^2 - up to 2.5m/s - temperature control: 3°C-98°C - 150l fluid storage
 batch wet-bench (RENA)	- alkaline texture - KOH + RENA monoTEX texture - HF/O_3 wafer cleaning - KOH/H_2O_2-cleaning - HF/HCl-cleaning - HF/O_3 emitter etch back	- semi-automatic - wafer-format: 125 mm^2 or 156 mm^2 - 50 wafers per batch
 indus batch wet-bench (RENA)	- alkaline etching - industrial cleaning - piranha cleaning - drying	- format: 50 x 50 mm^2 to 210 x 210 mm^2 - alkaline bath with heating - HCl bath - HF bath - different deionised water cascades for rinsing - piranha bath - oven for drying
 diffusion furnace (centrotherm)	- $POCl_3$ diffusion - BBr_3 diffusion - LP POCl diffusion (single or half pitch loading) - LP BBr_3 diffusion (single or half pitch loading)	- format: 50 x 50 mm^2 to 210 x 210 mm^2 - up to 200 wafers (400 wafers back to back)
 PECVD furnace (centrotherm)	- PECVD - LPCVD - thermal and wet oxidation - sintering tube	- standard industrial system - wafer format: any size up to 210 x 210 mm^2 - PECVD gases: SiH_4, NH_3, N_2, H_2, N_2O, SF_6, free line for e.g. doping gas - PECVD graphite boats for up to 196 wafers - LPCVD gases: DCS, NH_3, N_2, H_2 - sintering of contacts under ArH-atmosphere

Processing equipment

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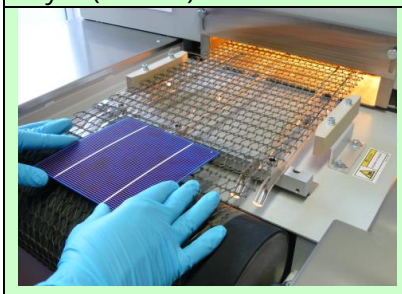
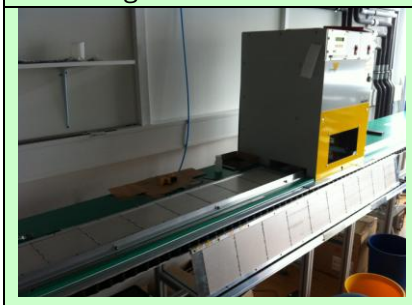
 screen printer (Baccini)	- metallization of front and rear	- semiautomatic screen printer - format: 50 x 50 mm^2 to 210 x 210 mm^2 - optical adjustment with four cameras - printing process in less than 10s - edge & fiducial alignment
 Screen printer (Micro-Tec)	- Front side metallization	- Semiautomatic screen printer - Wafer format: 125 x 125 or 156 x 156 mm^2 - Alignment with two freely adjustable cameras - Highly precise fiducial alignment for dual print, double print, print on print or print on laser structure - Printing under N_2 atmosphere possible - Pressure controlled squeegee head for homogeneous print results
 dryer (Baccini)	- drying of metalized samples	- semi automatic operation - paternoster drying furnace - format: 50 x 50 mm^2 to 156 x 156 mm^2 - 4 heating zones - 250 places - one drying cycle: ca. 10 minutes - temperature up to 230°C
 belt-furnace (centrotherm)	- firing of metalized samples	- metal belt furnace - format: 50 x 50 mm^2 to 210 x 210 mm^2 - 7 m long - 6 heating zones - up to 1000°C - approx. 1.5 min per process (with std. parameters)
 laser (Rofin)	- numbering - cutting - edge isolation - fine lines opening on dielectric layers (application for selective emitter)	- ND: YV04 green laser for class 1 operation - easy touch pad software, automatic door security - wave length: 532nm - frequency: 15-200 kHz - power: 18W - fine lines of 50µm width

Processing equipment

apparatus	applications	properties
 Laser (Rofin)	- Ablation of dielectrics - Large area Ablation for ZEBRA	- Nd:YAG laser with SHG module for 532nm - dual rotary table for fast processing - 156x156mm^2 wafer - frequency: 6-50kHz - pulse width: 120 ns @ 10 kHz - power: 100W - rectangular spot with 300x600µm - 8-point automatic wafer alignment
 Laser (Rofin)	- numbering - cutting - edge isolation - cell repair (isolate shunts)	- diode pumped fiber laser (Yb) with 1064 nm - single cell processing (50x50 – 156x156 mm^2) - frequency: 20-100 kHz - pulse width: 100 ns @ 20 kHz - power: 14 W - spot size: 40-60 µm
 Laser edge isolation	- laser edge isolation - semi automatic - industrial application	diode pumped Nd:YAG laser with 1064 nm - semi automatic cell processing (125x125 – 156x156 mm^2) - frequency: 6-65 kHz - power: 100 W - spot size: 60 µm - 400 wafer/hr (semi-automatic) - 1440 wafer/hr (in automisation)
 stringer	- Soldering of ribbons to the solar cells. - Stringing of solar cells	- Three step process with manageable properties - Heat up, soldering, cool down temperatures and time lapse tuneable - Cell holders on/off selectable - Infrared heating - Designed for 6” cells with 2 and 3 busbars - String length variable
 Laminator	- Module lamination	- lamination of mini-modules (1 cell) up to 60 cell modules: glass-foil and glass-glass - classical lamella laminator with pins - lamella pressure adaptable vial control of vacuum level in upper chamber - top lamella up to 80 °C - hot plate up to 180 °C - free design of lamination recipe - log of temperature + pressure profile possible

Processing equipment

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 climatic chamber	- Environmental testing of solar module samples - Damp heat testing - Humidity freeze testing - Thermo-cycling	- Chamber size for up to 160 one-cell mini modules or 30 two-cell modules - Climatic testing recipe with option to program temperature and humidity ramps - Full humidity control (up to 100% humidity) and temperature control (-40 degrees Celsius up to 90 degrees Celsius) - Access from outside to testing chamber allows for example measurement of contact resistances or application of current to modules during test
several fume hoods 	- preparation of samples	- with or without gas-washer
 Muffle furnace	- Curing of ECA - General high T processes	- Up to 3000°C - Definition of heat ramp - Definition of time at plateau - Metals in chamber allowed
spinner	- thin surface coatings	
 process gases	- 12 process gases	- N_2, H_2, O_2 (technical and high purity) - C_3H_8 - Ar, N_20, SF_6 - SiH_2Cl_2, CH_4, SiH_4, NH_3

Processing equipment

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 chemicals	- >10 different chemicals	- HCl (32%) (hydrochloric acid) - HF (50%) (hydrofluoric acid) - H_2O_2 (30%) (hydrogen peroxide) - NaOH (pellets) (sodium hydroxide) - KOH (potassium hydroxide) - HNO_3 (65%) (nitric acid) - CH_3COOH (99.8%) (acetic acid) - H_2SO_4 (95-97%) (sulphuric acid) - Na_2CO_3 (sodium carbonate) - H_3PO_4 (ortho-phosphorus acid) - 2-propanol (IPA)