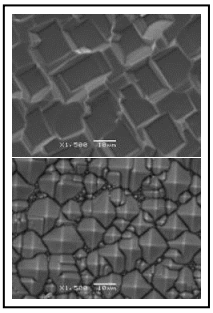
Technology for standard and advanced solar cell processing

Chemical etching/cleaning steps

- Saw damage etching (KOH)
- Alkaline texturing
- Acidic texturing
- RCA based cleaning steps
- Dry etching chemistry



High temperature processes (clean room ISO class 2-3)

- Phosphorus diffusion (POCl3)
- Boron diffusion (BBr3)
- Dry and wet thermal oxidation
- LP CVD of Si3N4
- PE CVD of SiNx, SiOx, AlOx
- Rapid Thermal Processes (SHS1000)

Thick film technology

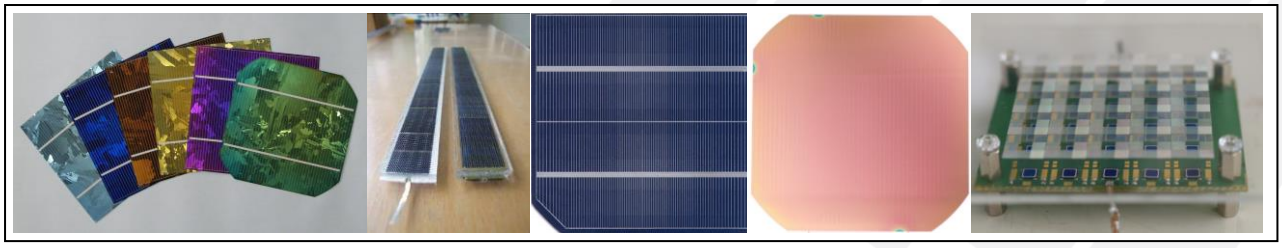
- Screen-printing (Baccini)
- Metallic paste sintering (IR belt furnace)

Edge isolation / cell cutting

- Green and/or IR laser
- Mechanical grinding
- Diamond wheel saw

Other equipment for R&Dspecial cell structure tests and customer design solar cells

- Photolithography - limitation for 4” wafers
- Magnetron sputtering (Ti, Al, Cu, TiOx, AlOx, SiOx, SiNx) - limitation for 4” and 5” wafers
- Acidic and alkaline electroplating (Cu, Sn, Ag, Ni)



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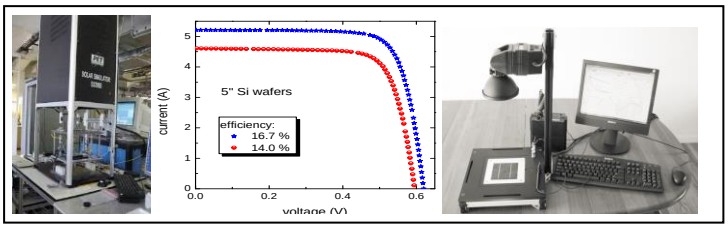
Diagnostic tools for Si wafer and solar cell characterization

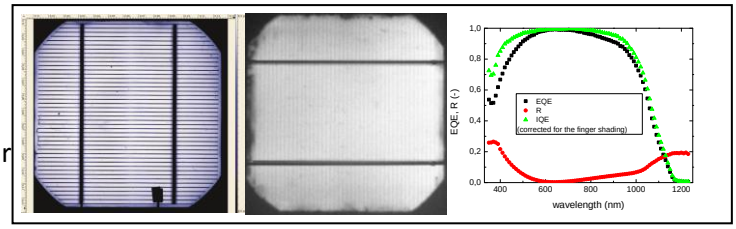
Electro-optical characterization

- Illuminated I-V curve measurement (solar simulator SS200B)
- Suns-Voc measurement – evaluation of Voc, pseudo FF a pseudo Eff (Sinton)



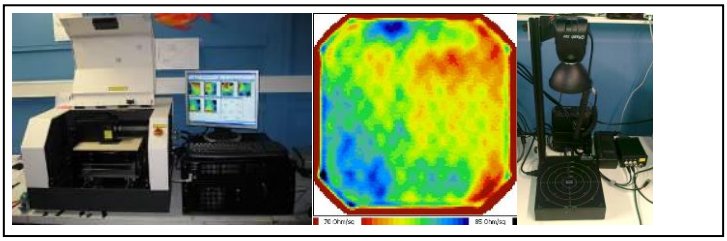
Opto-electronic characterization of solar cells

- Light Beam Induced Current (UV, VIS, IR)
- Electroluminescence mapping
- Quantum efficiency measurement
- Dynamic testing (evaluation of effective carrier lifetime and reverse breakdown voltage)



Opto-electronic characterization of Si wafers and solar cell structures

- Mapping of minority carrier lifetime and doped layer sheet resistance (WT2000 tool)
- Quasi Steady State Photoconductivity – Sinton (evaluation of implied Voc, dark saturation current density, sheet resistance, …)



Electrical characterization of solar cell structures

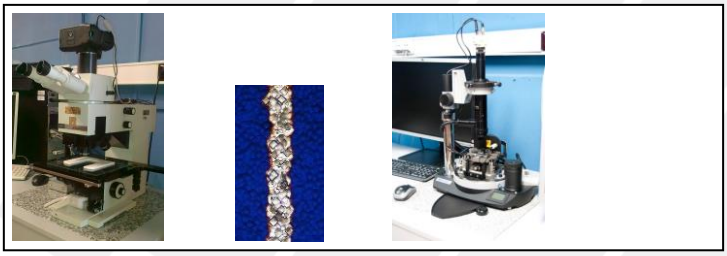
- 4PP – four point probe mapping (Si wafer resistivity and sheet resistance of doped layers)
- Reimer technique and TLM method (sheet, metallic layer and contact resistance evaluation)

Optical characterization of solar cell structures

- Transmittance/reflectance measurement
- He-Ne ellipsometry (for polished samples)
- Spectra-Suite spectrometer
- IR mapping (Fluke Ti32)

Microscopic tools

- Optical microscopy with deep focus option and integrated camera
- AFM - Atomic Force Microscopy with various SPM modes for surface morphology characterisation (NT-MDT)



Degradation setups for solar cells and minimodules

- Light degradation setup (halogen lamps,temperature stabilized cell holder)
- PID – potential induced degradation aftercell encapsulation (laminator for PV minimodules)

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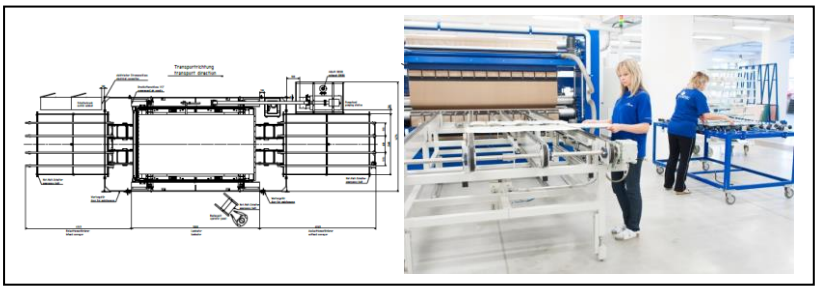
Equipment for standard and advanced PV module production and testing (collaboration with Solartec, CZ)

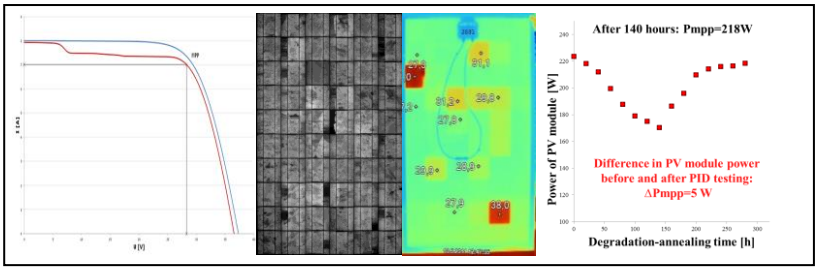
Laminator ICOLAM 38/24

- Max module size 2000 x 4000 mm
- Module thickness up to 40 mm
- Suitable also for glass/glass modules



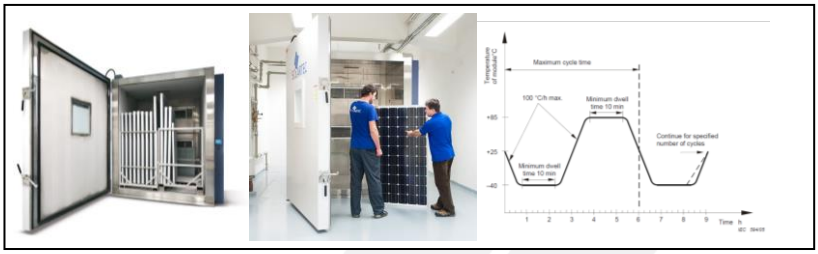
Standard PV module testing (PV lab accredited according to ISO/IEC 17025:2005)

- I-V measurement (flash simulator – h.a.l.m. elektronik, class A/A/A)
- Insulation test
- Electroluminescence
- IR camera
- PID (Potential Induced Degradation)



Advanced PV module testing – climatic chamber (size 1829 x 1829 x 2388 mm)

- Temperature range -70 – 150°C
- Relative humidity 10 – 90%
- Thermal cycling test
- Humidity freeze test
- Damp heat test



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