Competence Centre Thin-Film- and Nanotechnology for Photovoltaics Berlin

The 30 x 30 cm² R&D baseline for high efficiency a-Si/µc-Si thin-film modules at PVcomB

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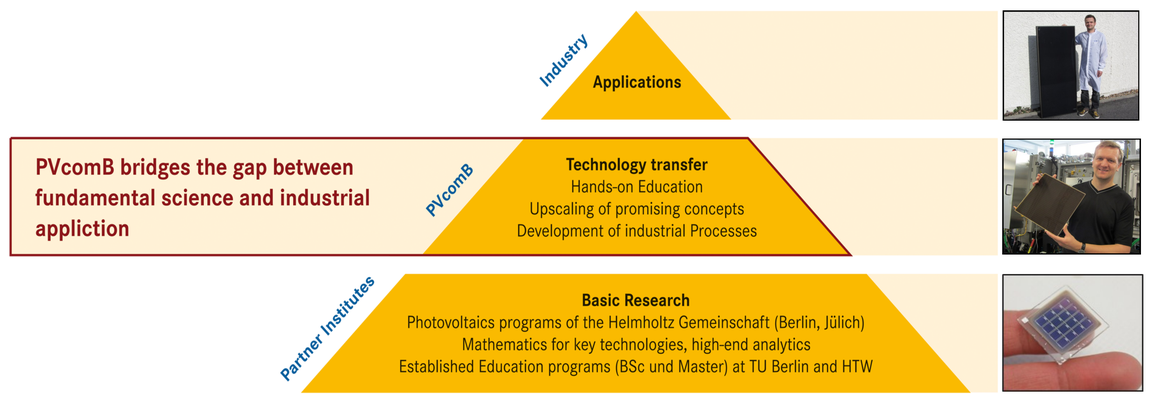
Our Mission

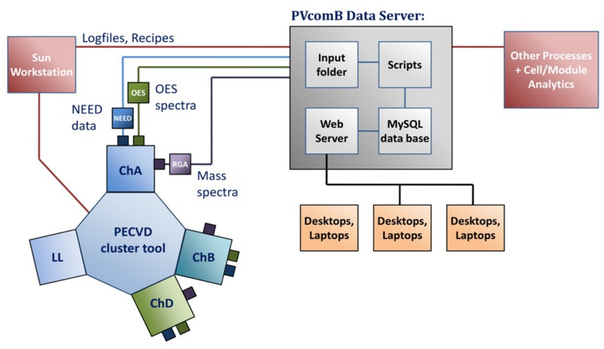
- Technology transfer from innovative lab sized solar cell concepts to industrially produced modules and vice versa.
- Two R&D reference lines **(a-Si/µc-Si) (this presentation**) and **CIGS** (see **3CV.1.35**) for 30 x 30 cm² glass modules.
- Whole process chain from glass washing to module encapsulation.
- Advanced tools for *in situ* and *ex situ* process analytics and high level device characterization.



Deposition of tandem stack

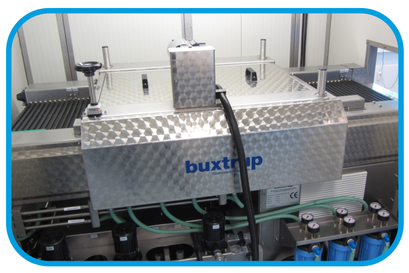
AKT 1600

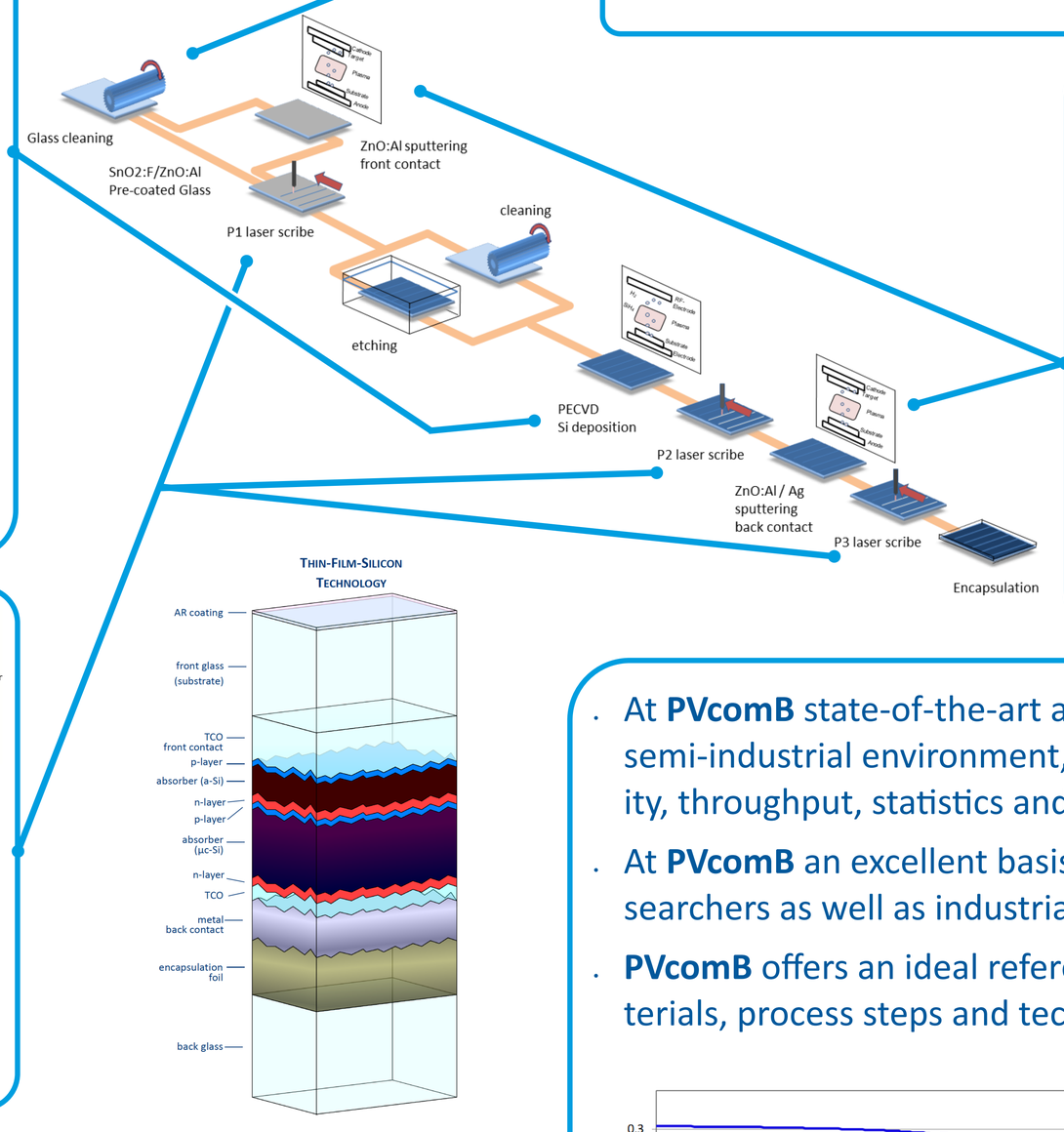
- 3 chamber PECVD cluster tool from Applied Materials for 30 x 30 cm² module size
- *In situ* diagnostics: OES, RGA, NEED
- Automated processing: up to 8 tandems/day



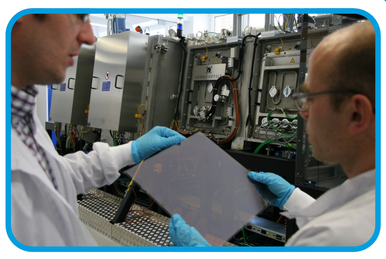
Substrate cleaning

- Commercial low iron glass used as substrates
- Two step cleaning procedure
  1. ultra-sonic bath with alkali solution
  2. clean in multistage inline glass washer (brushes and de-ionised water)





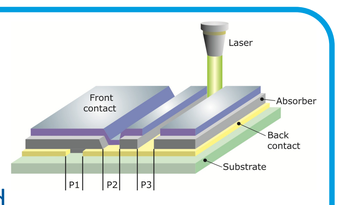
Deposition of Front (TCO) and Back (TCO/metal) contacts



A600V7

- Inline sputter tool from Leybold Optics Dresden for 30 x 30 cm² module size
- 2 planar & 2 rotatable magnetron positions
- Sixfold carrier magazine/2 substrates per carrier: high throughput & high reproducibility

Laserscribing



- Joint laser lab of HTW and PVcomB.
- High performance laserscribing tool from Rofin Baasel Lasertech
- Laser sources with pulses at µs (1063 nm), ns (532 nm) and ps (1064, 532 & 355 nm) timescale.

see **3.CV.1.6/3.CV.1.34/3.CV.1.42**

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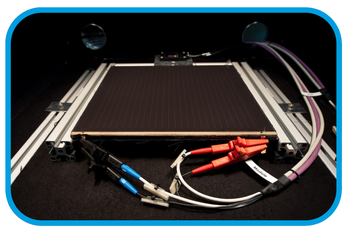
Advanced analytics for device and process optimization

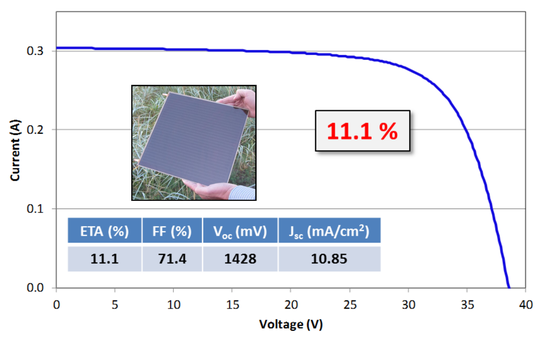


Wide range of state-of-the-art analytics e.g.

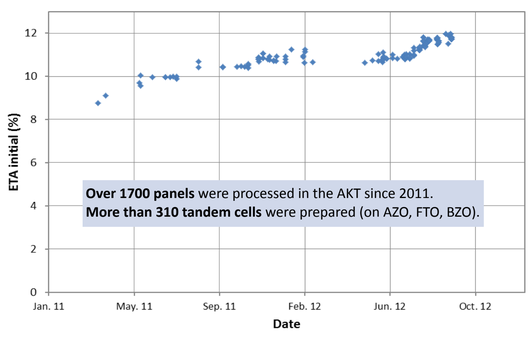
- AAA dual-source WACOM solar simulator
- AAA dual-source h.a.l.m. flasher
- Dual-source EQE with bias-light adapted to a-Si/µc-Si
- UV-VIS spectrometry, lock-in thermography (DLIT, ILIT), EL, XRF, ARS, LBIC, Raman, Hall, …

- 1D/2D/3D device modelling e.g. of light management phenomena

- At **PVcomB** state-of-the-art a-Si/µc-Si TF modules are developed in a semi-industrial environment, addressing issues such as process stability, throughput, statistics and reliability.
- At **PVcomB** an excellent basis for cooperation with fundamental researchers as well as industrial partners has been created.
- **PVcomB** offers an ideal reference for the implementation of new materials, process steps and technologies.



IV characteristics of an a-Si/µc-Si tandem module prepared at the PVcomB baseline.
(aperture area of 27 x 28 cm², 27 cell stripes, glass/glass laminate, DC sputtered ("industrial") ZnO:Al front TCO, no AR coating)



Development of initial conversion cell efficiency of PVcomB's a-Si/µc-Si tandem baseline (best median values).
(Front TCO: SnO:F until Juli 2012, then ZnO:Al (by DC sputtering))

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HZB Helmholtz Zentrum Berlin

GEFÖRDERT VOM Bundesministerium für Bildung und Forschung

SPITZENFORSCHUNG & INNOVATION IN DEN NEUEN LÄNDERN

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