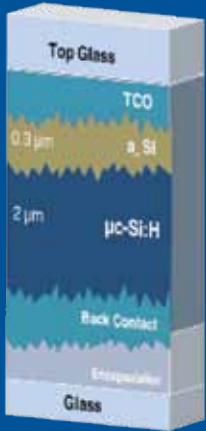


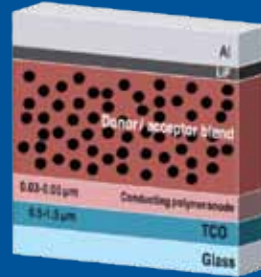
Typical Applications

Micro crystalline Si, Tandem



- α -Si, μ c-Si, TCO Thickness
- Crystallinity of μ c-Si by Raman
- μ c-Si, α -Si Resistivity
- TCO Sheet Resistance
- Haze control
- Lifetime by μ PCD

Organic Solar Cell



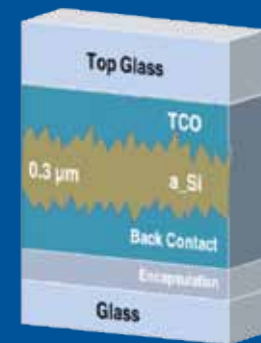
- Active Layer, Pedot & TCO thickness measurement
- Blend concentration

CIGS



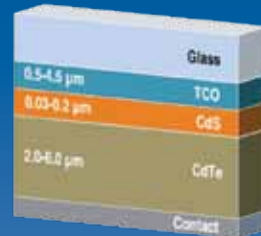
- CIGS, CdS, TCO & Dielectric thickness measurement
- TCO sheet resistance
- CIGS crystallinity and composition measurement
- LifeTime by μ PCD
- Sheet Resistance of CIGS by JPV
- LBIC, IQE
- PhotoLuminescence and Electroluminescence

α -Si



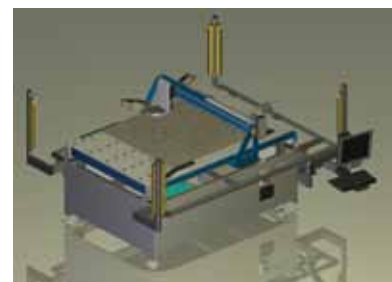
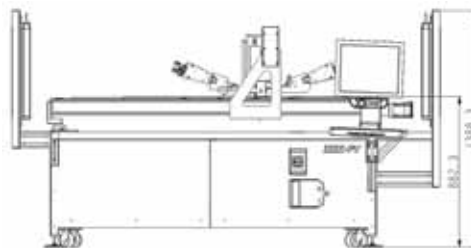
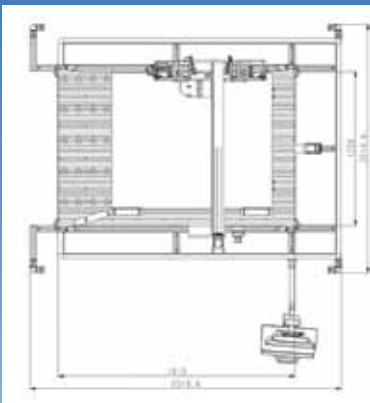
- α -Si, TCO Thickness measurement
- α -Si Resistivity
- TCO Sheet Resistance

CdTe



- CdTe, CdS and TCO thickness measurement
- TCO sheet resistance
- CdTe Lifetime by μ PCD

Dimensions (in mm)





Thin Film Metrology Station

PT-5

Dedicated to Photovoltaic Panels

SOPRALAB 55 avenue de l'Europe - 92400 COURBEVOIE - France
Phone: +33 1 46 49 67 00 Fax: +33 1 42 42 29 34 Contact: sales@sopralab.com
www.sopralab.com



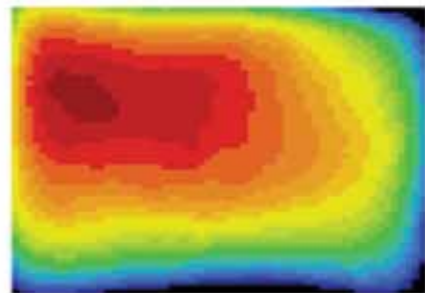
A Unique Analysis Platform for Thin Film PV

- Thin Film Thickness by Spectroscopic Ellipsometry (SE) or Reflectometry
- Optical Properties by SE (N&k, Band Gap, Composition)
- Sheet Resistance by Eddy Current , 4 Point Probe, or Junction Photo Voltage
- Haze Control by Diffused Reflection Scanner (texturization)
- Lifetime by μ PCD (determination of impurities)
- Crystallinity of μ Si by Raman
(amorphous/crystallinity composition ratios)
- Photoluminescence & Electroluminescence
(Non uniformities, defects, Shunt Resistance)
- Other Electrical & Optical techniques
(IQE, EQE, SPV)



Features

- Panel size: 1,1 × 1,3 m panels up to GEN10
- Single Point and/or large area Mapping scanner
- Single layer or multilayer measured in one acquisition
- Manual or Automatic Loading
- Compatible with Conveyor Line Integration
- In-Line ; At Line; Off-Line
- Modular Software (PVECI compliant)
- Simultaneous measurement of thickness and Sheet Resistance of TCO Layers



7.4989 Ohm_sq



8.4224 Ohm_sq

Textured ZnO Sheet resistance: 7.8 Ohm/sq



Ellipsometer & Eddy Current Head at the same point

Best Tact Time on Market !

Less than 10 Minutes for
195 points on a 1.1 × 1.3 m!

Standard Specifications

SPECTROSCOPIC ELLIPSOMETER

- Thickness and Optical properties
- Fast acquisition CCD (250-1700nm).
- Fixed Angle of Incidence.
- Microspot focusing optics (spot size <1mm).
- Rapid Autofocus.

EDDY CURRENT

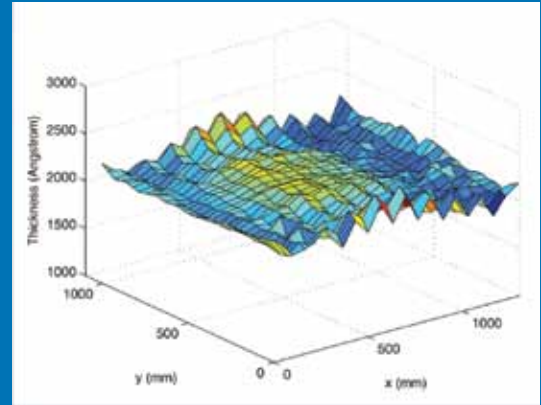
- Non contact sheet Resistance Measurement of TCO
- Induces circulating currents in the sample.
- Measurement of the electrical loss in the material.
- Conductivity of a material has a very direct effect on the eddy current flow.

μPCD

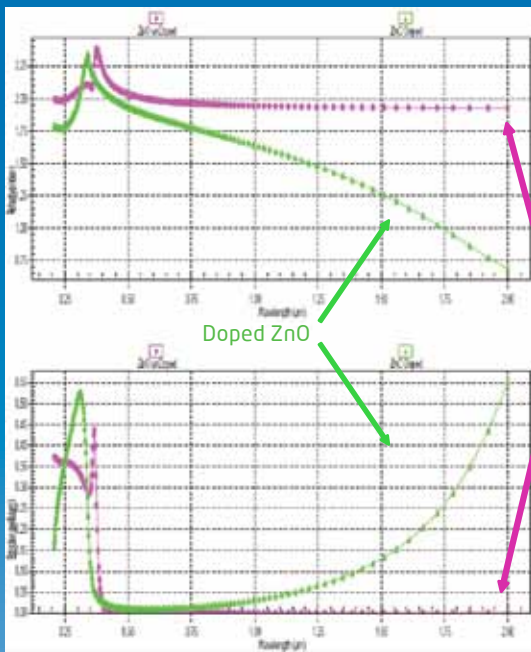
- LifeTime measurement
- In photo conductive decay (PCD) measurement the electron hole pairs are generated by optical excitation.
- The excess carriers change the conductivity, which is monitored by microwave reflectivity as a function of time the transient of conductivity

DIFFUSE REFLECTION SCANNER

- TCO Haze control
- Spot size Resolution < 1mm
- Rapid measurement time

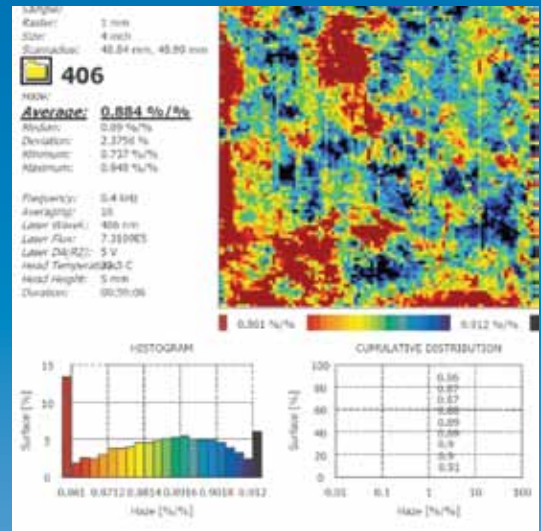


195 points Thickness Mapping of μSi layer



Refractive Indices of doped and Undoped ZnO

Undoped ZnO



Haze Scan at 406nm for textured ZnO

Performance

- Acquisition time:
 - ≤1 sec. with SE + Eddy Current
 - ≈ 400 ms CCD Mode
- Thickness range 0.5 nm to 10 μm
- Measurement Precision: 0.01nm on 120 nm SiO2 on Silicon reference sample
- Optical indexes with 0,001 precision