LTB LASERTECHNIK BERLIN

LIGHT. PRECISION. ANALYTICS.

PAnalyzer

Fast multi-elemental mapping of solar PV modules with LIBS

Key Features

- Off-line / at-line / in-line metrology
- Large-area sample mapping
- Fully software-controlled
- Quick start-up
- Easy to operate

PAnalyzer photovoltaics

- Quantitative multi-elemental analysis in the low ppm range e.g. Fe, Na, Cu, Zn
- Non-contact measurement
- No sample preparation needed
- Measurement duration < 1s / point

Applications

- Process monitoring
- Quality control
- Industrial applications

The PAnalyzer is a metrology system for qualitative and quantitative multi-elemental analysis of large-area panels by means of laser-induced breakdown spectroscopy (LIBS). As a non-contact measuring system that is easy to operate, the PAnalyzer is designed for off-line / at-line / in-line process monitoring of solar PV modules, glass panels, metallurgical products and ceramics in industrial manufacturing, quality control and R&D.

Equipped with a movable measuring head that is mounted on a XY-stage, the PAnalyzer provides a spatially resolved analysis of the lateral element uniformity (element concentration and element composition) within a short measurement time. Due to the modularity of the single components, the system can excellently be adapted to your needs. The following modules are available as standard:

- Nd:YAG laser, diode pumped
- High-resolution echelle spectrometer with CCD or ICCD camera
- Remote optics (receiver telescope, laser expansion, focusing optics)
- Fibre coupling
- Customized sample holder
- Motorized linear axes
- Video monitoring
- Interlock safety circuit
- Laser class 1 safety housing

The measurement capabilities of the PAnlayzer can be improved by adding a Raman system. Thus, besides the elemental analyzing, the molecular composition of samples can be determined.

Laser-induced breakdown spectroscopy (LIBS) is a type of atomic emission spectroscopy, utilizing laser ablation and the subsequent atomic emission from the generated plasma for elemental analysis. Laser ablation is at present the only analytical method that offers direct sampling from any kind of material (solids, liquids, gases) without sample preparation.

The operating and evaluation software *Sophi* provides full access to all device functions by using the PC-based control panel. All lines of the measured LIBS spectra are automatically analyzed with an integrated large data base and are qualitatively assigned to the corresponding element. For quantitative multi-elemental analysis of unknown samples, calibrations with reference materials are a precondition. The implemented script-based control allows the automatization of recurring measuring and evaluation procedures and provides you maximum flexibility.

Specifications

Measuring method	Laser-induced breakdown spectroscopy (LIBS)	qualitative and quantitative multi-elemental analysis
		non-contact measurement
		no sample preparation necessary
		almost non-destructive
	Typical measurement duration per measurement point [1]	< 1 s
	Limit of detection LOD [2]	< 10 ppm
	Features	sample mapping
		off-line / at-line / in-line metrology
XY-stage [3]	Axes	motorised linear axes
	Positioning accuracy	±1 mm
	Repeatability	100 µm
	Step precision	≤ 100 µm
	Velocity	60 mm / s
Spectrometer	Type	echelle spectrometer (ARYELLE series)
Laser [3]	Type	Nd:YAG
	Wavelength	1,064 nm (optional 532 nm, 355 nm, 266 nm)
	Pulse energy	up to 25 mJ
	Frequency	up to 100 Hz
	Lifetime pump diode	> 1 billion shots
Safety	Housing	laser safety housing, laser class 1
	Interlock safety circuit	door, light curtain, service door
	Signal tower lamp	yes
Sample	Width x depth x height [4]	1,200 mm x 1,600 mm x 4 mm
	Weight	max. 10 kg
Control and analysis	Hardware	PC-based control panel
	Software	operating and evaluation software *Sophi*
		parameterization
		monitoring
		script editor for automation of measurement and analysis
		qualitative and quantitative spectrum analysis
General	Width x depth x height [4]	(2,200 x 1,350 x 2,340) mm
	Weight	700 kg
	Typical power consumption	2 kW
	Operating temperature	+ 10 °C … + 35 °C
	Relative humidity	max. 80 %

[1] depends on hardware and measurement application
[2] depends on element and matrix
[3] other specifications possible
[4] customized adaptations possible

Subject to technical changes.

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