Particle Analysis at the Touch of a Button

Anton Paar

Litesizer
series

Particle systems can be complex …

The size and stability of nanoparticles and microparticles are crucial to their function, as well as to their processing and transport properties.

Anton Paar, a leading developer and manufacturer of high-performance analytical instruments, has combined its physics and engineering expertise with modern software creativity to create intuitive particle analyzers that are a joy to use:

The Litesizer particle analyzers measure particle size, zeta potential, and molecular mass by light scattering technology such as transmittance and refractive index with ingeniously simple software.

Litesizer 100

With the Litesizer 100 you can determine the particle size and transmittance on a wide variety of samples. It gives you rapid and accurate insight into your particle systems, and provides the tools for optimizing them by revealing how they change with time, pH, temperature and concentration.

Litesizer 500

The Litesizer 500 does all of the above, but also measures zeta potential, molecular mass and refractive index. The unique omega-shaped cuvette for zeta potential combined with patented cmPALS technology (European Patent 2 735 870) guarantees fast, stable and reproducible zeta potential measurements, even on sensitive and turbid samples. In addition, the Litesizer 500 offers a choice of scattering angle, which gives you the optimal measurement conditions whether the sample is concentrated or dilute.

… but **measuring them doesn't have to be**

The **Litesizer particle analyzers** will free up your time to concentrate on what your particles are doing, rather than trying to figure out how to use the instrument.

See everything on one page

All input parameters, measurements and analyses are presented on a single page.

Keep track of your samples

The Litesizer software provides customizable reports that can be generated in a few seconds and passed on for signing, either electronically or by hand. In addition, a pharma option is included, with data security functions, user management and audit trails, making it fully compliant with the US FDA's 21 CFR Part 11.

Save time

Short start-up times, a one-page workflow, intelligent measurement series, automatic measurement modes, and the fastest zeta potential measurements: The Litesizer saves you time.

See what your particles are doing

A series of measurements lets you see how your particles change with time, temperature, pH or concentration. Results are clearly displayed in different colors so that trends can be identified, while all important values and parameters are logically tabulated below.

Technical highlights

Optical bench

The optical bench is the strong heart of the Litesizer series. Highly sensitive measurement optics enable the accurate detection of even low-intensity signals, while the robust casing reduces the effects of vibrations and ensures that measurements remain unaffected by dust or temperature fluctuations.

Patented ELS technology: cmPALS

The Litesizer 500 uses cmPALS, a novel patented PALS technology (European Patent 2 735 870) that defines a new state of the art in ELS optics. The result: zeta potential measurements with the highest accuracy and shortest measurement time.

The Omega cuvette

The zeta-potential cell, which can be used with the Litesizer 500, has an inverted Ω-shaped capillary tube. This facilitates a homogeneous electric field within the measuring channel, guaranteeing stable and reproducible results.

Continuous transmittance measurements

Continuously measuring sample transmittance allows the Litesizer series to automatically adjust parameters like focus position, measurement angle, and measurement duration.

Unprecedented size resolution with DLS

The Litesizer particle analyzers can precisely resolve bimodal and even trimodal particle mixtures.

One instrument – three detection angles

Choose from back-, side- and forward scattering, or let the Litesizer 500 select the best angle for your sample.

Refractive Index

The solvent refractive index can now be determined for the exact wavelength and temperature of your measurement with the Litesizer 500. This ensures maximum accuracy for particle size and zeta potential results under all experimental conditions.

General specifications:

Temp. control range	0 °C to 90 °C
Light source	Semiconductor laser / 40 mW, 658 nm
Operating temp.	10 °C to 35 °C
Humidity	35 % to 80 % non-condensing
Dimensions (WxDxH)	460 mm x 485 mm x 135 mm
Weight	approx. 18 kg (40 lbs)

Measurement principles

Particle size measured by DLS

Particles suspended in a liquid are constantly undergoing random motion, and the size of the particles directly affects their speed. Smaller particles move faster than larger ones. In dynamic light scattering (DLS), light passes through the sample, and the scattered light is detected and recorded at a certain angle. The time dependence of the scattered intensity reveals how fast the particles are moving. From this information, it is possible to calculate the average size of the particles as well as the size distribution.

Your benefit:

The Litesizer particle analyzers give you accurate and precise size measurements. You can also easily measure the effect of time, pH, temperature and concentration on the particle size. The Litesizer provides highly developed measurement algorithms which allow you to resolve several different particle sizes in a single suspension.

Particle size specifications	
Particle Analyzers	Litesizer 500, Litesizer 100
Measuring range	0.3 nm to 10 µm*
Sensitivity	0.1 mg/mL (lysozyme)
Max. sample concentration	50 % w/v (sample-dependent)
Accuracy	Better than ±2 % on NIST traceable standards
Repeatability	Better than ±2 % on NIST traceable standards
Min. sample volume	12 µL
Measurement angles	175° (Litesizer 100) 15°, 90°, 175° (Litesizer 500)

* under laboratory conditions

Molecular mass measured by SLS

The intensity of the scattered light is directly related to molecular mass. If the scattering intensity is measured at several different concentrations, then a Debye plot can be generated, the intercept of which provides the molecular weight.

Your benefit:

Static light scattering (SLS) measurements with the Litesizer 500 are simple, fast and non-invasive. They also give you the second virial coefficient, which reflects protein solubility.

Molecular mass specifications	
Particle Analyzer	Litesizer 500
Measuring range	980 Da to 20 MDa
Sensitivity	0.1 mg/mL (lysozyme)
Repeatability	±5 %
Measurement angle	90°

Zeta potential measured by ELS

In electrophoretic light scattering (ELS) the speed of the particles is measured in the presence of an electric field. The faster the particles move, the higher the zeta potential of the particles. In general, a greater-magnitude zeta potential means that the particles will repel each other more strongly, giving a more stable suspension.

Your benefit:

The Litesizer 500 uses a patented (European Patent 2 735 870) technology called cmPALS. This is a significant advance on existing PALS technology because it allows the modulator to make large movements. This means you can use shorter measurements and apply lower electric fields, reducing the effects of electrode fouling and deterioration.

Zeta potential specifications	
Particle Analyzer	Litesizer 500
Measuring range	> ±1000 mV
Size range	3.8 nm to 100 µm
Sensitivity	0.1 mg/mL (lysozyme)
Repeatability	± 3 %
Max. sample concentration	70 % w/v (sample-dependent)
Sample volume	50 µL*
Max. sample conductivity	200 mS/cm
Measurement angle	15°
pH range	2 to 12

* sample viscosity dependent

Transmittance

Transmittance is measured by detecting the fraction of light that passes through the sample. The Litesizer particle analyzers continuously measure the transmittance for every sample. The value is reported in real time and is displayed during operation.

Your benefit:

You obtain instant insight into the suitability of the sample for light-scattering measurements. In addition, this measurement allows the Litesizer to select the best parameters for your sample (focus position, measuring angle, measurement duration).

Transmittance specifications	
Particle Analyzers	Litesizer 500, Litesizer 100
Measuring time	10 s
Min. sample volume	15 µL

Accessories

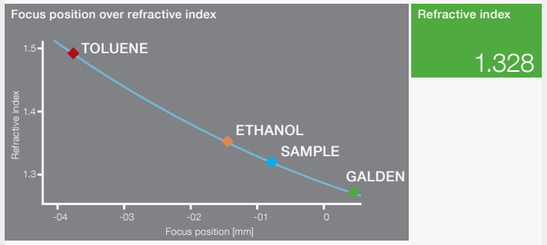
Refractive Index

Performing DLS and ELS on particles in solution requires prior knowledge of the solvent's refractive index. With the Litesizer 500 you won't need to gather these indices from external sources anymore: Anton Paar's particle analyzers can now measure the solvent's refractive index for the exact wavelength and temperature of your experiment.

The Litesizer 500 is the only DLS-based instrument on the market that enables the user to perform a simple, straightforward measurement of the solvent's refractive index. This ensures maximum accuracy of particle size and zeta potential results under all experimental conditions. The results are given directly by the software and do not require any complex data processing.

Your benefit:

The Litesizer 500 is able to determine the solvent refractive index within ±0.5 %, as defined by ISO 22412:2017 concerning the accuracy of the refractive index required for DLS. All settings can be easily accessed via the dedicated Litesizer software Kalliope. This guarantees easy operation and highly reliable results.



Refractive index specifications	
Particle Analyzer	Litesizer 500
Measuring range	1.28 to 1.50
Accuracy	±0.5 %
Temperature range	0 °C to 90 °C
Wavelength	658 nm
Min. sample volume	1 mL

Dosing System

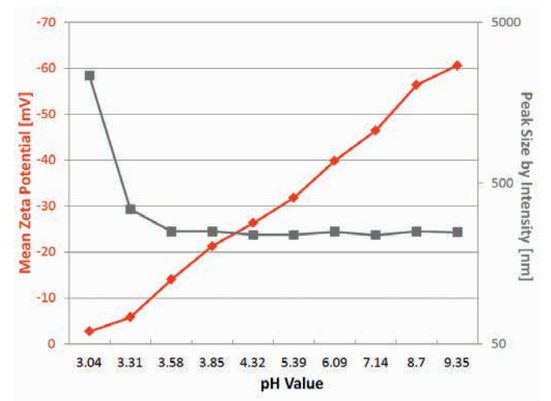
The Dosing System is an optional accessory for the Litesizer 500 that automates the adjustment of the sample's pH and enables the determination of the isoelectric point directly in the measurement cuvette. Fast and accurate characterization of zeta potential and particle size changes in response to pH are now possible.

The tedious process of adjusting the pH manually between every measurement can now be avoided. Furthermore, automating this process not only saves time and effort but, most importantly, also considerably reduces the possibility of human error.

The main benefits of the Dosing System are:

- Better accuracy and reproducibility
- Improved traceability
- Minimized errors in calculations and documentation
- Easy and fully programmable setting

pH ramp-down



Flow module FM-10

The flow module enables the automatic size and zeta potential measurements of dispersed samples under varying pH conditions. It can be installed on the Litesizer 500 instead of the general batch module BM-10, which accommodates cuvettes for single measurements. Of note, the flow module FM-10 can also be used for single measurements in standard cuvettes, thus representing a very versatile solution for a wide variety of applications.

Cuvettes

The Litesizer analyzers are compatible with a number of different cuvette types for measuring size, zeta potential, molecular mass, transmittance, and refractive index of particles dispersed in liquids. The table below lists all the available cuvettes and their major measurement applications.

	Disposable cuvette	Quartz cuvette	Glass cuvette	Quartz low-volume cuvette		Uvette® low-volume cuvette	Omega cuvette	Univette
								
APPLICATION (measuring parameter)								
	- particle size - transmittance	- particle size - molecular mass - transmittance - refractive index	- particle size - molecular mass - transmittance	- particle size - molecular mass - transmittance		- particle size - transmittance	- zeta potential - particle size - transmittance	Univette is a high-quality reusable cuvette designed for zeta potential and particle size measurements with the Litesizer 500. It enables measurement of particles suspended in organic as well as in aqueous solvents. The versatile Univette is also breaking new ground in terms of robustness and measurement under critical conditions: it is resistant to harsh chemicals, fully functional at high temperature and/or high conductivity, and is also able to measure highly concentrated or low-volume samples. **Univette's main features include:** - ELS and DLS measurements in organic or aqueous solvents possible - Resistant to harsh chemicals - Functional even at critical temperatures - Excellent robustness at high conductivity - Ability to measure low-volume samples (50 µL) - Suitable for highly concentrated samples - Reusable **Univette is the most versatile cuvette on the market.**
DETAILS								
	- for aqueous solvents - ideal sample volume: 1 mL (not less than 0.85 mL)	- for aqueous and organic solvents - ideal sample volume: 1 mL (not less than 0.85 mL)	- for aqueous and organic solvents - ideal sample volume: 1 mL (not less than 0.85 mL)	- for aqueous and organic solvents - maximum volume: 45 µL - minimum sample volume: 12 µL (when inserting a supporting plate into the module)		- for aqueous solutions and organic solvents* - minimum sample volume: 50 µL - maximum sample volume: 2 mL	- disposable cell - for aqueous solutions only - minimum sample volume: 650 µL	
Cuvette compatibility with Litesizer 500								
	✓	✓	✓	✓		✓	✓	✓
Cuvette compatibility with Litesizer 100								
	✓	✓	✓	✓		✓	×	×

* Refer to the supplier material data sheet for the list of compatible solvents.

Legend: ✓ compatible × not compatible

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