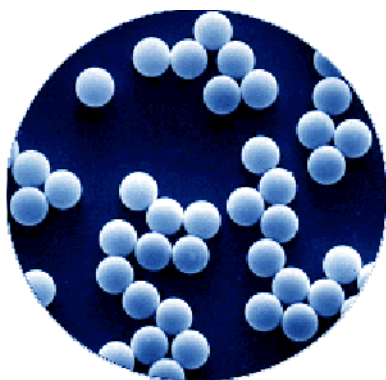
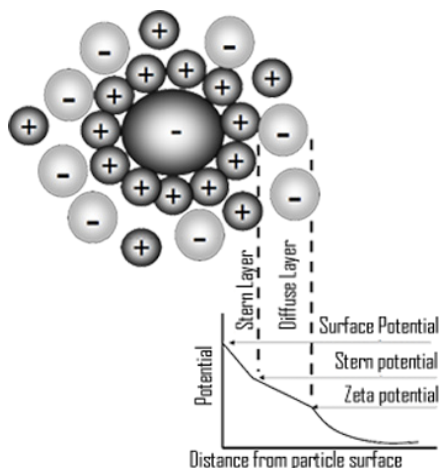


NanoBrook 90Plus PALS

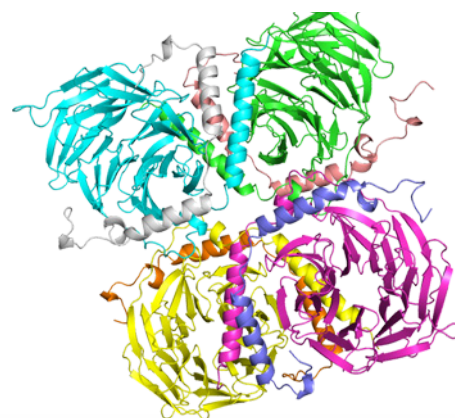
Particle Size & Zeta Potential using Phase Analysis Light Scattering



Nanoparticle Sizing



Zeta Potential of
Nanoparticles



Zeta Potential
of Proteins

NanoBrook 90Plus PALS

Particle Sizer and Zeta Potential Analyzer

Brookhaven's NanoBrook 90Plus PALS instrument combines our NanoBrook 90Plus and NanoBrook ZetaPALS instruments into one versatile package for routine sizing and zeta potential analysis. It employs Dynamic Light Scattering (DLS) for particles/molecules size and Phase Analysis Light Scattering (PALS) for particle/molecular surface charge evaluation. This package not only allows rapid measurements of the effective size and zeta potential of samples, but also provides further information on multimodal size distributions. Based on the proven technologies of Brookhaven, the NanoBrook 90Plus PALS guarantees excellent mobility measurement performance in low to high salt aqueous suspensions and non-polar liquids.



SIZING

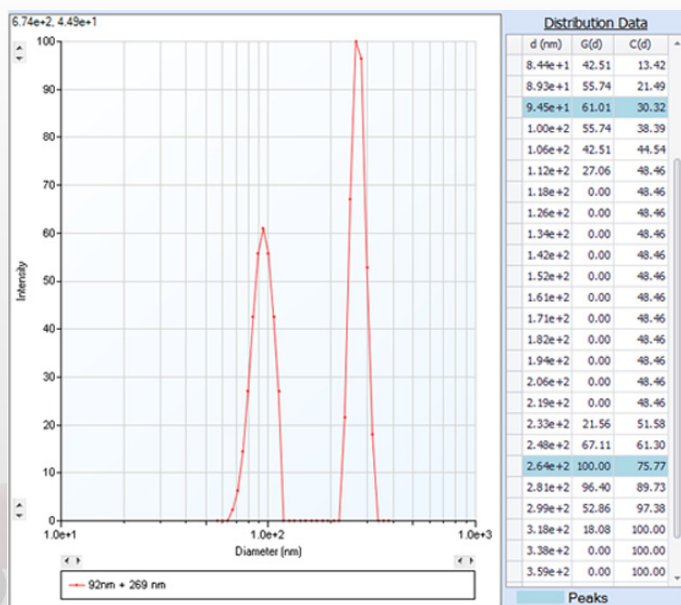
- Rapid and accurate nanoparticle size distributions
- Multimodal & unimodal size distribution software
- ISO 13321 and ISO 22412 compliant results
- Range: 0.3 nm to 6 μm
- High power 40 mW temperature-controlled semiconductor laser
- Dynamic light scattering at 90° & 15°
- Compact bench top unit, USB driven
- Molecular weight determination (relative and absolute through Debye plot)

The NanoBrook 90Plus PALS particle size analyzer offers results in a variety of formats. For routine determinations, an average diameter (Effective Diameter) and a measure of the distribution width (Polydispersity) are sufficient for many applications. The second choice is to fit these values to a lognormal distribution, allowing the user to visualize the size distribution and to interpolate cumulative and differential results.

The figure on the right shows an example of a data format suitable for more complicated, multimodal size distributions. Here, a numerical algorithm, including Mie theory, is used. These results are for a mixture of known latex particles. Positions of the measured particle sizes on the accompanying graph are in excellent agreement with the known sizes of 92 and 269 nm.

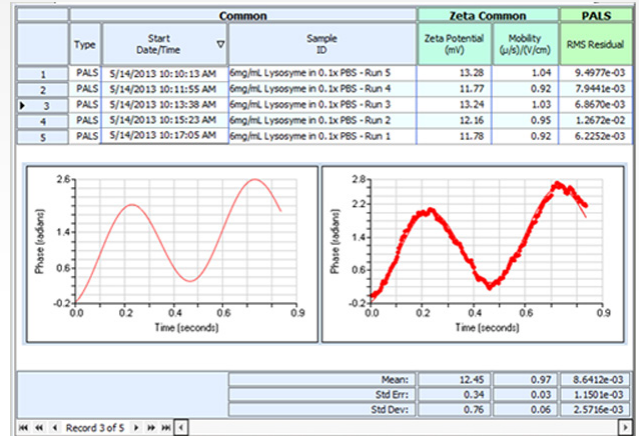
ZETA POTENTIAL

- For proteins, peptides, mAb, RNA, and other biological samples
- For high salt, organic solvents & viscous media
- 1000x more sensitive than other techniques
- Zeta potential at 15°
- Temperature control -5 °C to 110 °C
- Easy-fill, disposable sample cells



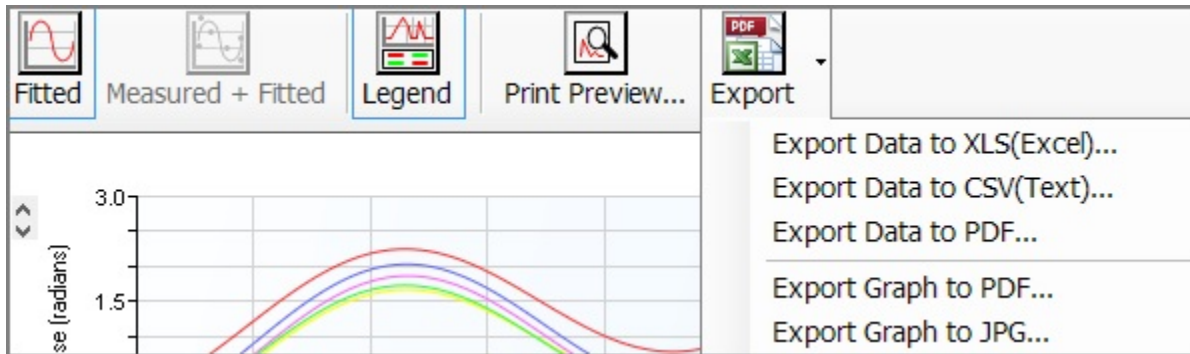
Principles of Operation

The NanoBrook 90Plus PALS utilizes phase analysis light scattering to determine the electrophoretic mobility of charged, colloidal suspensions. Unlike its cousin, Laser Doppler Velocimetry (LDV) (sometimes called Laser Doppler Electrophoresis (LDE)), the PALS technique does not require the application of large fields which may result in thermal problems or denaturation. Because in the measurement of phase shift, the particles need only to move a fraction of their own diameter to yield good results. In salt concentrations up to 3 molar and with electric fields as small as 1 or 2 V/cm enough movement is induced to get excellent results. In addition, the Autotracking feature compensates for thermal drift.



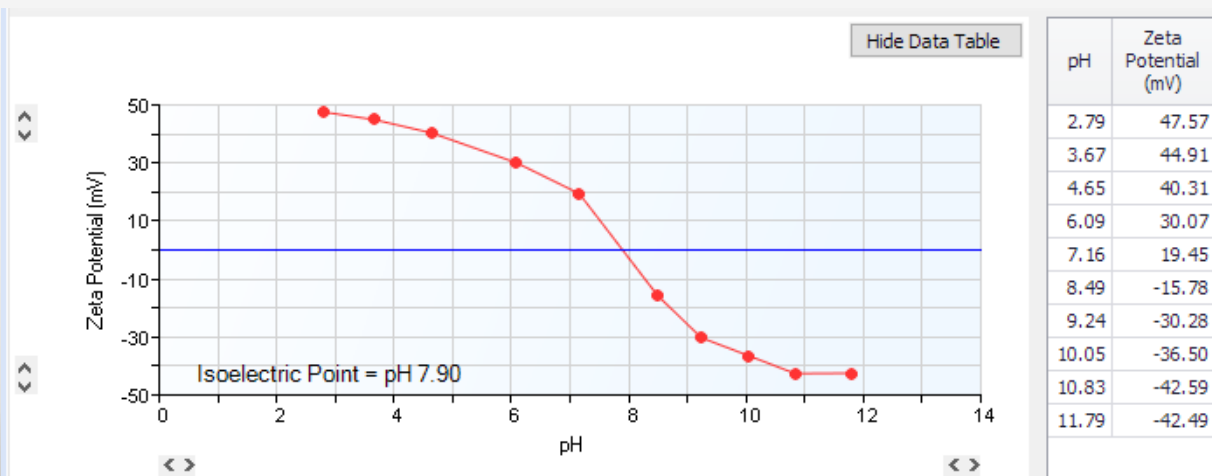
Simple Clear Presentation

The figure above shows the results of an actual experiment with a NanoBrook 90Plus PALS instrument. The important parameters and results are seen at a glance. The excellent agreement of the five runs in this experiment is obvious as is the match of experimental curve (red, bold) and its fitted version (red, thin). With Brookhaven instruments Particle Solutions Software Suite, the user can easily produce a customized report, or select from one of the pre-designed templates. Furthermore, exportation of data to multiple formats (i.e: XLS, CSV, PDF) is both quick and simple.



Derive Extended Information

The user can tabulate or graph any appropriate pair of parameters allowing, for example, the determination of the isoelectric point (IEP) as in the example below.



NanoBrook 90Plus PALS

Particle Size & Zeta Potential using Phase Analysis Light Scattering

Specifications

Sample Type	Sizing: nano particle and colloidal-sized materials, in any non-absorbing liquid. Zeta potential: proteins, nano particle, polymer and colloidal-sized materials, suspended in any non-absorbing liquid, with relative permittivity (dielectric constant) > 1.5 and viscosity < 30 cP.
Size Range	Sizing: 0.3 nm to 10 µm diameter, depending on refractive index and concentration Zeta potential: 1 nm to 100 µm, sample dependent Molecular Weight: 9,800 Da to 20 MDa, sample dependent
Mobility Range	10 ⁻¹¹ to 10 ⁻⁷ m ² /V*s
Zeta potential range	-500 mV to 500 mV, sample dependent
Maximum sample conductivity	Sizing: unlimited Zeta potential: 220 mS/cm
Sample Cells	Sizing: 1 to 4 mL disposable plastic, 50 µL disposable, 40 µL quartz flow cell, 10 µL quartz cell minimum Zeta potential: 1250 µL, 210 µL minimum
Concentration Range	Sizing: 0.1 ppm to 50 mg/mL, depending on refractive index and concentration Zeta potential: 40% w/v, sample dependent
Signal Processing	Sizing: Dynamic Light Scattering, DLS Zeta potential: Electrophoretic & true Phase Analysis Light Scattering, ELS & PALS Molecular Weight: SLS Debye Plot & MHS Parameters (DLS)
Correlator	Brookhaven's TurboCorr, multitaup, research grade with 522 hardware channels, covering the equivalent of 10 ¹⁰ linearly-spaced channels, 100% efficiency, real-time operation over the entire delay-time range
Precision	Sizing: ± 1% typical Zeta potential: ± 3% typical
Accuracy	Sizing: ± 2% on NIST traceable latex standards Zeta potential: 2.53 ± 0.12 µm • cm/V • s for aqueous systems with NIST SRM1980 Molecular Weight: ± 10% typical
Temperature Control	-5 °C to 110 °C, ± 0.1 °C, active control. No external circulator required.
Condensation Control	Purge facility using dry air, nitrogen preferred
Standard Laser	40 mW 640 nm temperature-controlled red semiconductor laser. Alternative wavelengths available.
Detector	Avalanche photodiode detector with highest Quantum Efficiency and low dead time
Scattering Angle	90° & 15°
Data Presentation	Average & width, lognormal fit, and multimodal size distribution for sizing Doppler Frequency Shift, electrophoretic mobility, zeta potential using Smoluchowski, Hückel, or Henry
Compliance	ISO13321 and ISO22412 compliant results for sizing
Power Requirements	100/115/220/240 VAC, 50/60 Hz, 150 Watts
Dimensions	23.3 x 42.7 x 48.1 cm (HWD)
Weight	15 kg
Environmental Characteristics	Temperature 10 °C to 75 °C Humidity 0% to 95%, non-condensing
CE Certificate	Class I laser product, EN 60825-1:2001, CDRH



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