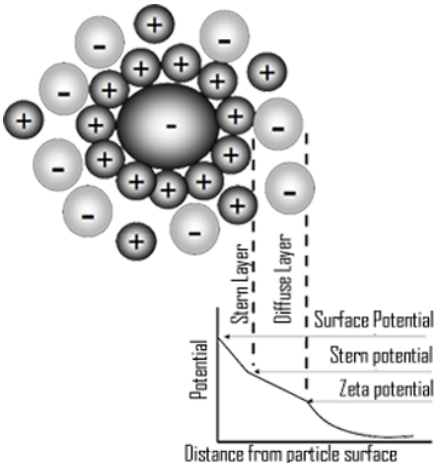
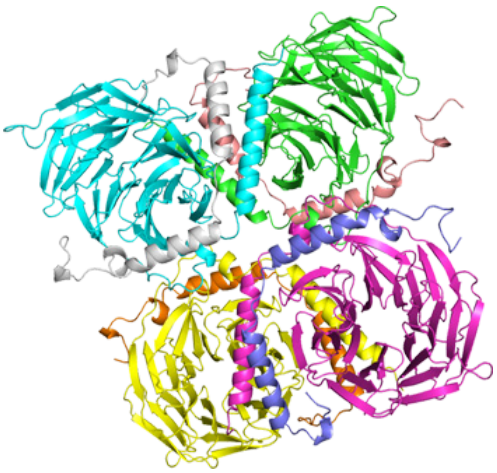
Brookhaven Instruments Corporation

NanoBrook ZetaPALS

Zeta Potential Analyzer



Zeta Potential of Nanoparticles



Zeta Potential of Proteins

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NanoBrook ZetaPALS

Zeta Potential Analyzer using Phase Analysis Light Scattering

ZETA POTENTIAL

- Zeta potential for difficult applications:
    - For proteins, peptides, mAb, RNA, and other biological samples
    - For zeta potential in organic solvents
    - For oily or viscous media
    - For high-salt suspensions
    - For samples near the I.E.P.
- PALS: 1,000 times more sensitive than other techniques
- Disposable cuvettes, no contamination or alignmnent
- Built-in automatic procedures and parameters (SOP)

Brookhaven can handle your difficult applications with high sensitivity

For measurements of very low mobilities, the NanoBrook ZetaPALS is the answer. The only answer! With concepts developed at Bristol University and Brookhaven Instruments, the NanoBrook ZetaPALS determines zeta potential using Phase Analysis Light Scattering: A technique that is up to 1,000 times more sensitive than traditional light scattering methods based on the shifted frequency spectrum.

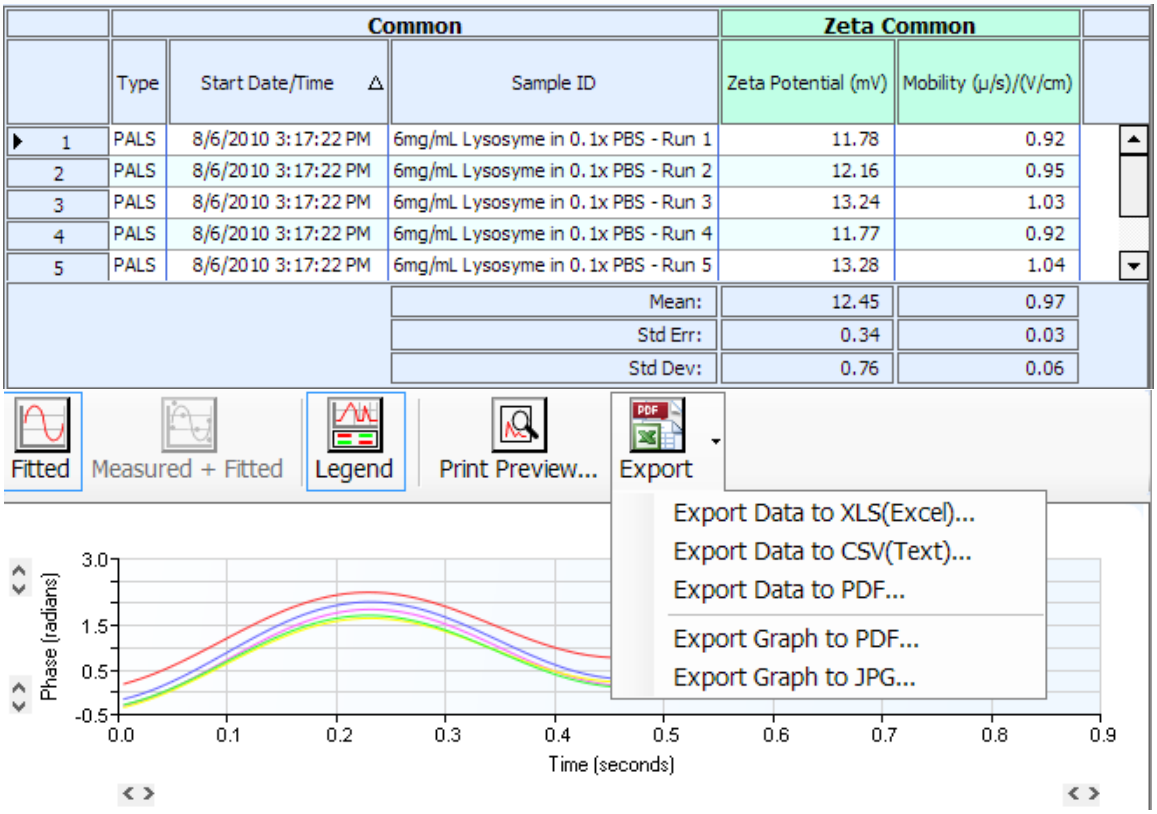
Electrostatic repulsion of colloidal particles is often the key to understanding the stability of any dispersion. A simple, easy measurement of the electrophoretic mobility, *even in nonpolar liquids,* yields valuable information. Measurements made in water and other polar liquids are easy and fast with the NanoBrook ZetaPlus. Such measurements cover the range of typically ± (6 to 100) mV, corresponding to mobilities of ± (0.5 to 8) x 10^{-8} m^2 /V·s. The NanoBrook ZetaPALS covers this full range, of course, and extends it by a factor of 1000 in sensitivity!

Principles of Operation

The NanoBrook ZetaPALS 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. During a phase shift measurement, 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.

Clear and Simple Presentation

The figure below shows the results of an actual experiment with a NanoBrook ZetaPALS instrument. The important parameters and results are seen at a glance. The excellent agreement of the five runs in this experiment is obvious with low standard error and superb overlay of curves. 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.



Multiple Sample Types

The table below shows a variety of difficult to measure samples, all of which were easily measured with the NanoBrook ZetaPALS. Some were measured in high salt concentration, some in low dielectric constant non-polar solvents, and one in a viscous liquid.

Electrophoretic Mobilities Determined with NanoBrook ZetaPALS (units 10^{-8} $m^2/v \cdot s$)

Sample	PALS Result	Literature Value	Comments
NIST 1980	2.51 ± 0.11	2.53 ± 0.12	Electrophoretic mobility standard
Blood Cells	-1.081 ± 0.015	-1.08 ± 0.02	Dispersed in physiological saline
Fe_2O_3	-0.013 ± 0.0015	N/A	Dispersed in dodecane
TiO_2	0.255 ± 0.010	N/A	Dispersed in toluene - not dried
TiO_2	0.155 ± 0.011	N/A	Dispersed in toluene - dried
TiO_2	-0.503 ± 0.015	N/A	Dispersed in ethanol
Casein	-0.025 ± 0.002	N/A	Dispersed in PEG - viscious
SiO_2	-0.73 ± 0.04	N/A	Dispersed in 2.0 M KCl - High salt

NanoBrook ZetaPALS

Zeta Potential Analyzer

Specifications

Sample Type	Most proteins, nanoparticle and colloidal-sized materials, suspended in any non-absorbing liquid, with relative permittivity (dielectric constant) > 1.5 and viscosity < 30 cP.
Size range suitable for zeta measurement	1nm to 100 µm, sample dependent
Mobility Range	10^{-11} to 10^{-7} $m^2/V*s$
Zeta potential range	-500 mV to 500 mV, sample dependent
Sample Cells	210 µL, 450 µL, 1250 µL
Maximum sample concentration	40% v/v, sample dependent
Signal Processing	Electrophoretic & Phase Analysis Light Scattering, ELS & PALS
Maximum sample conductivity	220 mS/cm, covering saline and PBS solutions for proteins
Precision	± 3%, depending on salt concentration
Temperature control range	-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.
Scattering Angle	15°
Data Presentation	Doppler Frequency Shift or Phase, electrophoretic mobility, zeta potential using Smoluchowski, Hückel, or Henry
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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