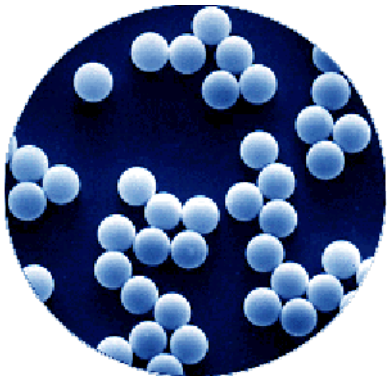
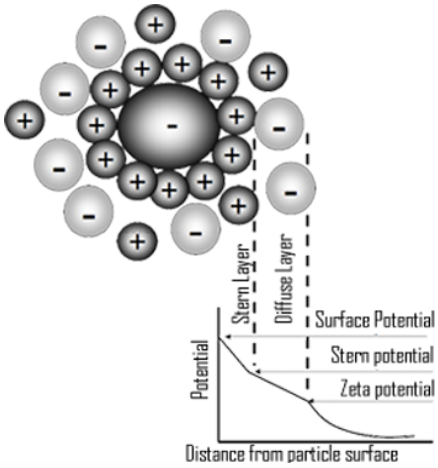
Brookhaven Instruments Corporation

NanoBrook 90Plus Zeta

Particle Size & Zeta Potential Analyzer



Nanoparticle Sizing



Zeta Potential of Nanoparticles

NOVA INSTRUMENTS

NanoBrook 90Plus Zeta

Particle Sizer and Zeta Potential Analyzer

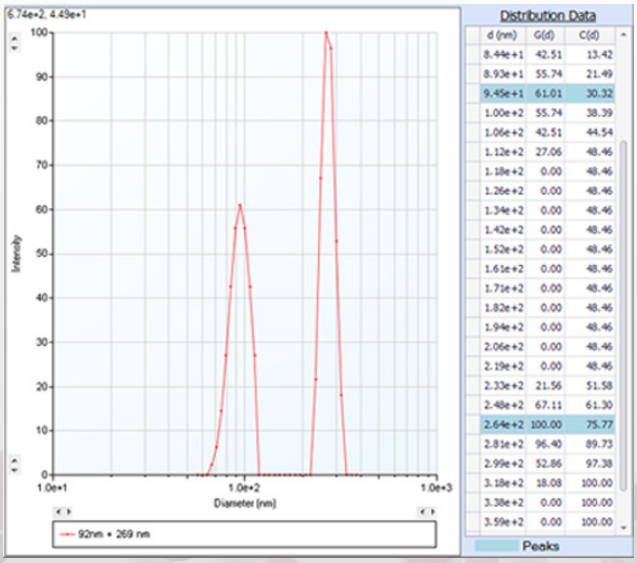
Brookhaven's NanoBrook 90Plus Zeta instrument combines our NanoBrook 90Plus and NanoBrook ZetaPlus instruments into one versatile package for routine sizing and zeta potential analysis. It employs Dynamic Light Scattering (DLS) for particles/molecules size and Electrophoretic Light Scattering (ELS) for particles/molecules 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 multimode distribution in size and surface charge in polydisperse samples. Based on the proven technologies of Brookhaven, the NanoBrook 90Plus Zeta guarantees excellent mobility measurement performance in aqueous suspensions and low salt environments.

SIZING

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

ZETA POTENTIAL

- Zeta potential in low salt aqueous solutions/ suspensions
- Easy-fill disposable sample cells
- No cell alignment or calibration
- Zeta potential at 15°
- Temperature control, -5 °C to 110 °C
- Can resolve multimodals
- SOPs for ease of use



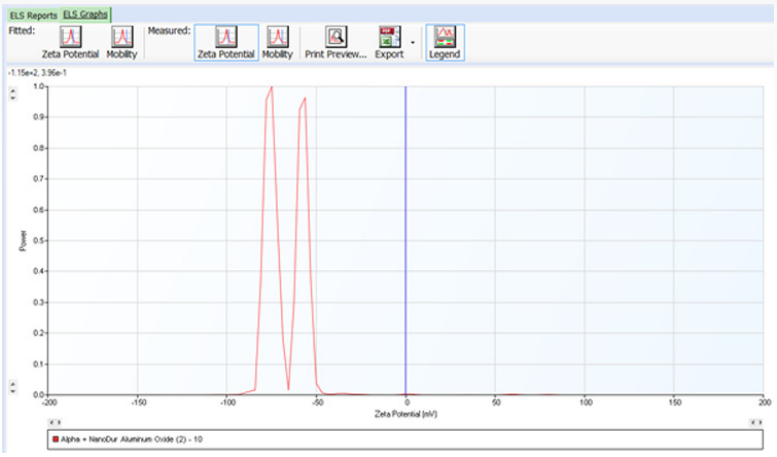
The NanoBrook 90Plus Zeta particle size analyzer offers results in a variety of formats. For routine determinations an average diameter (Effective Diameter) and a measure of the distribution width (Polydispersity) are sufficient for many applications. The second choice is to fit these values to a lognormal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

The figure on the left 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 using ELS

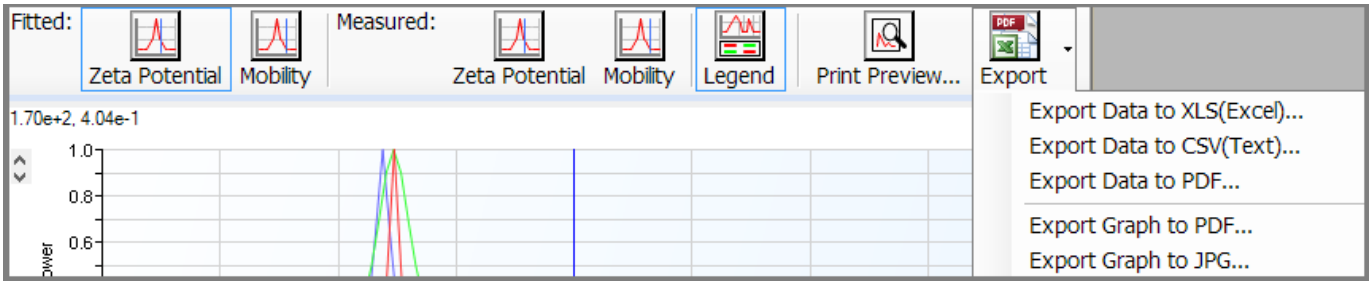
The NanoBrook 90Plus Zeta measures complete electrophoretic mobility distributions in seconds including multimodals.

In the example to the right, the results of analyzing a mixture of alpha and gamma Aluminas in 1 mM KCl at pH10 is displayed. The left peak is identified with the green cursor and shown to have a zeta potential of -75 mV. If the other peak is chosen, the value given is -55 mV. The ability of the NanoBrook 90Plus Zeta to provide this information distinguishes it from other methods which provide only an ensemble average.



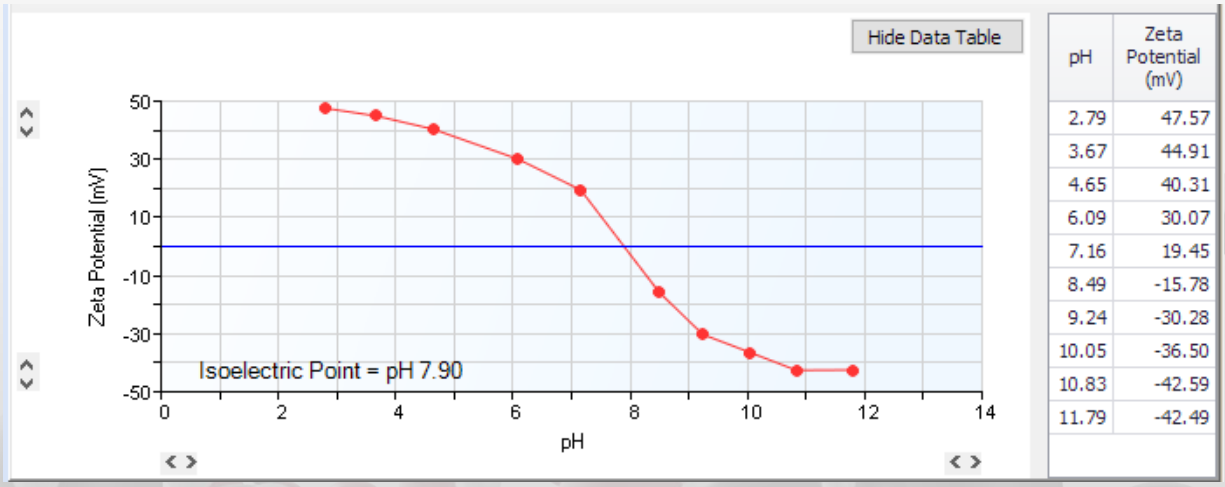
Simple Clear Presentation

With Brookhaven Instruments Particle Solutions Software Suite, the user can easily produce a customized report based on the information desired, 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.



pH	Zeta Potential (mV)
2.79	47.57
3.67	44.91
4.65	40.31
6.09	30.07
7.16	19.45
8.49	-15.78
9.24	-30.28
10.05	-36.50
10.83	-42.59
11.79	-42.49

NanoBrook 90Plus Zeta

Particle Size & Zeta Potential Analyzer

Specifications

Sample Type	Sizing: nanoparticle and colloidal-sized materials, in any non-absorbing liquid. Zeta potential: nanoparticle, polymer and colloidal-sized materials, suspended in any non-absorbing liquid, with relative permittivity (dielectric constant) > 20 and viscosity < 5 cP.
Size Range	Sizing: 0.3 nm to 6 µm diameter, depending on refractive index and concentration Zeta potential: 1nm to 100 µm, sample dependent Molecular Weight: ~9,800 Da to 20 MDa, sample dependent
Mobility Range	10^{-9} to 10^{-7} m^2 /V*s
Zeta potential range	-220 mV to 220 mV, sample dependent
Maximum sample conductivity	Sizing: unlimited Zeta potential: 7.5 mS/cm
Sample Cells	Sizing: 1 to 3 mL disposable plastic, 50 µL disposable, 40 µL quartz flow cell, 10 µL quartz minimum Zeta potential: 210 µL, 450 µL, 1250 µL
Concentration Range	Sizing: 2 ppm to 50 mg/mL, depending on refractive index and concentration Zeta potential: 40% v/v, sample dependent
Signal Processing	Sizing: Dynamic Light Scattering, DLS Zeta potential: Electrophoretic Light Scattering, ELS
Correlator	Brookhaven's TurboCorr, multitau, research grade with 522 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: plus minus 3% 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
Laser	40 mW 640 nm temperature-controlled red semiconductor laser. Alternative wavelengths available.
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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