



Brookhaven Instruments

Highest Quality Instrumentation for Colloid Science, Particle technology, Laser Light Scattering

BI-DCP is the instrument of choice for detailed and absolute size distribution information

- high resolution: peaks as close as 20 % apart resolved
- size range: 0.01 to 30 microns; speed: 600 to 15000 rpm
 - LIST and HOST method applicable in one instrument
 - Advanced data presentation: menu driven software
 - no complicated gradient necessary
 - Based on principles of photo sedimentation in a disc centrifuge, the BI-DCP offers these exceptional features:
 - Rugged and reliable: suitable for use in plant or lab.



BI-XDC is the ideal instrument for QC, QA, research and product formulation

Combining gravitational and centrifugal sedimentation means fast, accurate size distribution across the "one micron" transition.

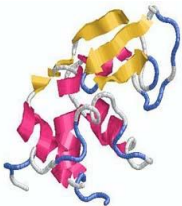
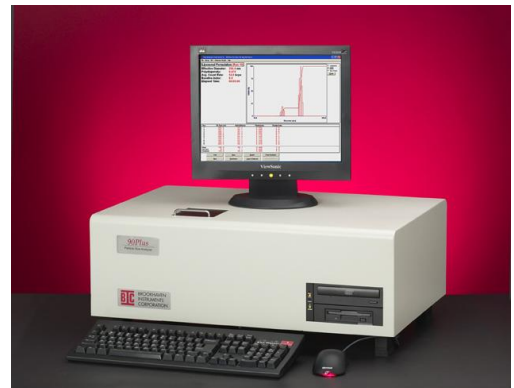
- Scanning X-ray head for speed (8 minutes)
- X-ray detection for high accuracy, no optical corrections needed, quantitative measurements
- Reproducible digitally controlled disk speed
- Merging centrifuge and gravity mode covers a broad size range from 0.01 to 100 microns.



90Plus is the instrument to choose for rapid and reproducible measurements

The BI-90Plus uses scattered light to measure the size of submicron particles suspended in a liquid.

- Size range: 1 nm to 6 microns, sample dependent
 - Fast: fully automated, distributions in 2 min
- Sample QC: gives an index of your sample quality
 - Light source: ultra-stable 35 mW laser at 637 nm wavelength
- Correlator: TurboCorr, multitaу, research grade with 510 channels, covering the equivalent of 10⁷ linearly-spaced channels, 100 % efficiency, real-time operation over the entire delay-time range.
 - integrated industrial computer board



BI-90PDP and APD: Molecular Weight options for the 90Plus

The combination of the APD for detection with the Debye-Plot-method enables the determination of molecular weight with the DLS-system.

- 90PFC - 40µL Flowcell; includes integrated software
- APD detection is about 10 times more sensitive than PMT.



NanoDLS: Nanoparticle sizer from µL-quantities – from 0.5 nm radius upwards

- software selection: batch or continuous operation
- 2.5 µL cell volume; 5.1 µL system; recoverable
- measurement in batch or flow mode to 0.5 mL/min
- Change of mode without changing connection
- light source: ultra-stable 637 nm, 35 mW laser
- electronic laser power regulation by software
- Correlator: TurboCorr, multitaу, 522 channels
- biochemically compatible materials
- three different software options incl. ParSEC



FOQELS is sophisticated and powerful enough to be used by R&D to study particle concentrations effects

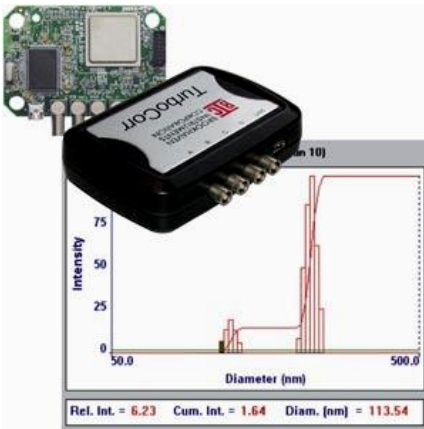
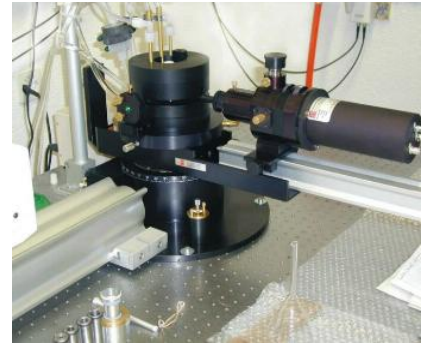
This particle size analyzer allows on-line measurements to be made over a much wider range of concentrations than standard Dynamic Light Scattering (DLS) systems

- ▶ fiber optics: easy applications of DLS to process control
- ▶ concentrated samples: measurement possible from 0.001 to 40 vol% sample
- ▶ probe: inherently rugged glass fiber probe can be used in many hostile environments
- ▶ sensing point: can be located at considerable distances from the control electronics

BI-200SM Goniometer in combination with the BI-TurboCorr digital high-speed correlator is the most advanced system available

Micelles, microemulsions, vesicles, polymers and other colloidal systems are easily characterized by this system.

- ▶ Multiangle Measurements: submicron size information
 - ▶ Zimm Plots: molecular weight, radius of gyration, second virial coefficient.
- ▶ Simple Alignment: easier to learn, adjust and maintain
 - ▶ Versatile: can be used with a variety of lasers



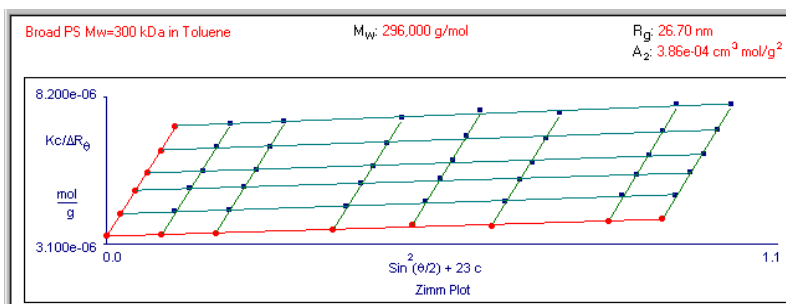
The new BI-TurboCorr correlator setting new standards is designed for a wide range of uses and for the goniometer

When coupled to a goniometer system, it is ideal for analyzing size distributions and for studying diffusion phenomena and other time dependent physical processes. It is also suitable for the absolute determination of polymer molecular weights.

- ▶ Mode: works in auto-correlation and cross-correlation
- ▶ Channels: up to 510 channels, software selectable
- ▶ linear or constant ratio spacing or individual time points recalled from user files
- ▶ Sampling times: 25 nsec to 40 ms
- ▶ Delay Range: 25 ns to 1310 s
- ▶ Count rate history
- ▶ 100 % efficient, real time operation over entire range

BI-MwA Molecular Weight Analyzer

- ▶ Multi-Channel-laserlight-scattering detector for GPC/SEC or as stand-alone unit (Zimm-Plot-analysis)
 - ▶ principle: multi angle laser light scattering,
 - ▶ PEEK flowcell with 100 μ L volume
- ▶ extremely large measurement range: depending on molecules and dn/dc values from 700 Da to 10^7 Da
- ▶ 16 analogue input channels with 24 bit resolution;
 - ▶ optional: Windows Software for GPC regulation
 - ▶ available with temperature control
- ▶ optional with analogue light scattering detector output



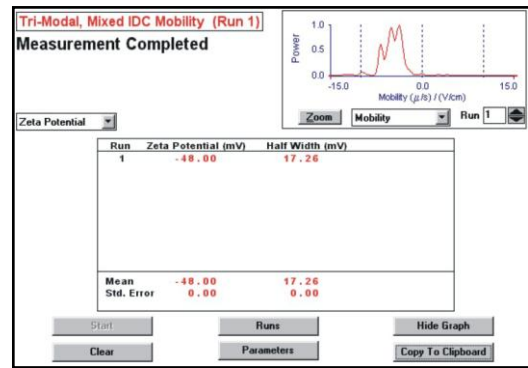
The MwA determines:
 M_n , M_w , M_z , R_g , A_2
 through detection of laser light scattering from seven angles from 35° to 145°

ZimmPlot molecular weight determination using the BI-MwA

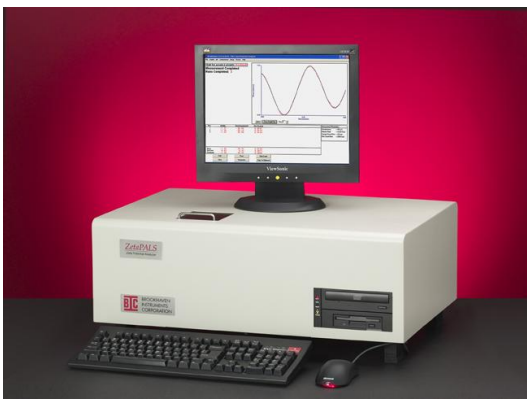
ZetaPlus is the simplest, most accurate particle electrophoresis system available

measures complete Zeta potential/mobility distributions with dip-in electrode in seconds, including multimodals

- laser light scattering, homodyne interference
- light source: solid state diode laser 35 mW
- resolution: analysis of the spectral frequency-shift relating to a 250 Hz carrier-frequency; secures highest possible resolution and aids the separation of multimodal dispersions
- recording and on-screen presentation in real time
 - measurement within 15° angle minimises the broadening of the peaks



ZetaPALS: expanded system for non-polar liquids, organic material, high salt concentration, high viscosity liquids, close to the isoelectric point

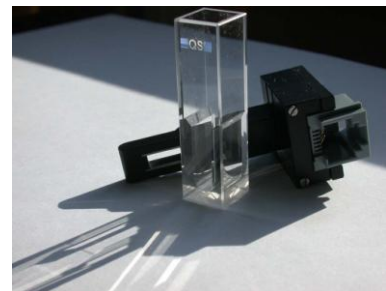


- Full functionality comparable to the ZetaPlus
- principle: Phase Analysis of Laserlight Scattering
- up to 1000 times higher sensitivity than traditional mobility measurements
- BI-ZetaPALS actually measures in full PALS Mode and not only for correction of the otherwise existing osmotic streaming when capillaries are used therefore it comes with special PALS Software
- suitable for extremely low mobilities from approx. 10^{-11} m²/V·s
- Range of conductivity: 0 to 20 S/m
- Particle size range for the measurement of zeta potential depending on sample material from 5 nm to approx. 30 µm

The Brookhaven ZetaPotential Electrodes



- designed to maintain a homogenous field; therefore no electro osmotic effect and no adjustments necessary
- material: Gold or Palladium
- electrodes for aqueous suspensions or organic solvents
- use of affordable disposable plastic cells or quartz cells
- 300 µL low-volume quartz cell



Brookhaven BI-ZTU Titration Unit

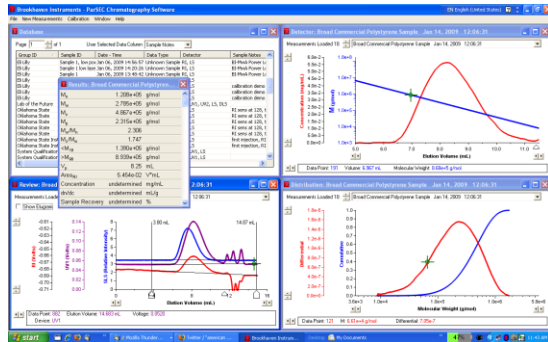
Direct connection to BI-ZELF flow-electrode within the Zeta Potential analyzer (ZetaPALS) sample compartment

- 80 mL reaction tube ensures a large working range
- four dosage pumps enable simultaneous use of strong and weak reacting liquids (f. ex. acids, bases)
 - Transfer of the sample from and to the reacting tube via peristaltic pump, leak proof designed system
 - Sealed, absolutely maintenance-free pH-electrode
 - Software integrated within the 32-bit ZetaPALS system
 - Easy connection and handling due to the use of commercially standardized fittings
 - Delivered including software, extensive accessories and BI-ZELF flow-electrode



The new Brookhaven BioDLS for fully automated size measurements

- extremely small, recoverable cell volume of just 2 μL
 - leading to high cost efficiency
 - high throughput of 36 samples per hour
- automatic processing of up to 768 samples within a run, therefore convenient over night working possible
- processes up to two trays of 12, 48, 96 or 384 wells
 - transfer of sample to and from measurement cell with piston pump system, automatic wash cycle
- minimal handling requirement leads to optimal safety for lab personnel and valuable sample material
- only bio-compatible materials in contact with sample
 - samples can be protected by purging with inert gas
 - independent temperature control of measurement
- cell and sample storage; external TE cooler available
- special, efficient wash cycle, even copes with highly viscous sample materials
 - choice of 35 mW/637 nm or 30 mW/850 nm laser



ParSEC GPC/SEC Chromatography Software

The new solution for chromatography that looks for absolute particle size and molecular weight, efficiently handles MALLS and DLS detectors

- intuitive – comprehensive – flexible
- conventional or universal calibration methods
- multiple detector capabilities: RI – UV – size - viscosimetry – absolute molecular weight
- all expected and necessary functions

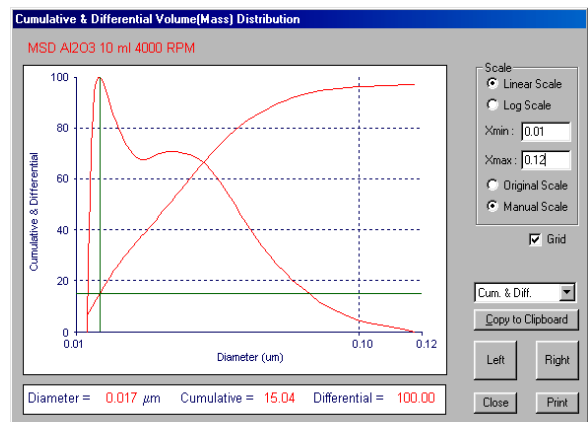
How to choose the correct particle size analyzer

Applications - Criteria - Advantages - Constraints

Measurement range: an important limit is the range around 1 μm
 - dividing line between sedimentation and centrifugal sedimentation
 - border between dynamic light scattering and Fraunhofer diffraction
 - end of the optical microscopy

Weightening: according to interpretation the allocation gets weighted as number, volume, surface or scattering intensity

Information content: next to average size distribution (mean and width) or multi-modality could be of interest



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