

PARTICLE SIZE

Instrument Solutions



Particle Size

There are numerous techniques by which to determine the quantity vs. equivalent size distribution of a collection of particles. Selecting the right technique is critical in obtaining reliable data. No single technique is appropriate for all materials or applications. For this reason, Micromeritics offers you six different particle size analyzer choices, each employing different analytical techniques, to fit your application.

Dynamic Light Scattering and Zeta Potential

Dynamic Light Scattering (DLS), also known as Photon Correlation Spectroscopy (PCS), is a well-established particle size distribution technique for submicron particles and macro molecules. The speed at which particles are diffusing due to random (Brownian) motion is measured. Detecting the rate at which the scattered light intensity of these diffusing particles fluctuates enables the determination of particle size. For a homogeneous suspension, DLS provides accurate and statistically representative results in minutes.

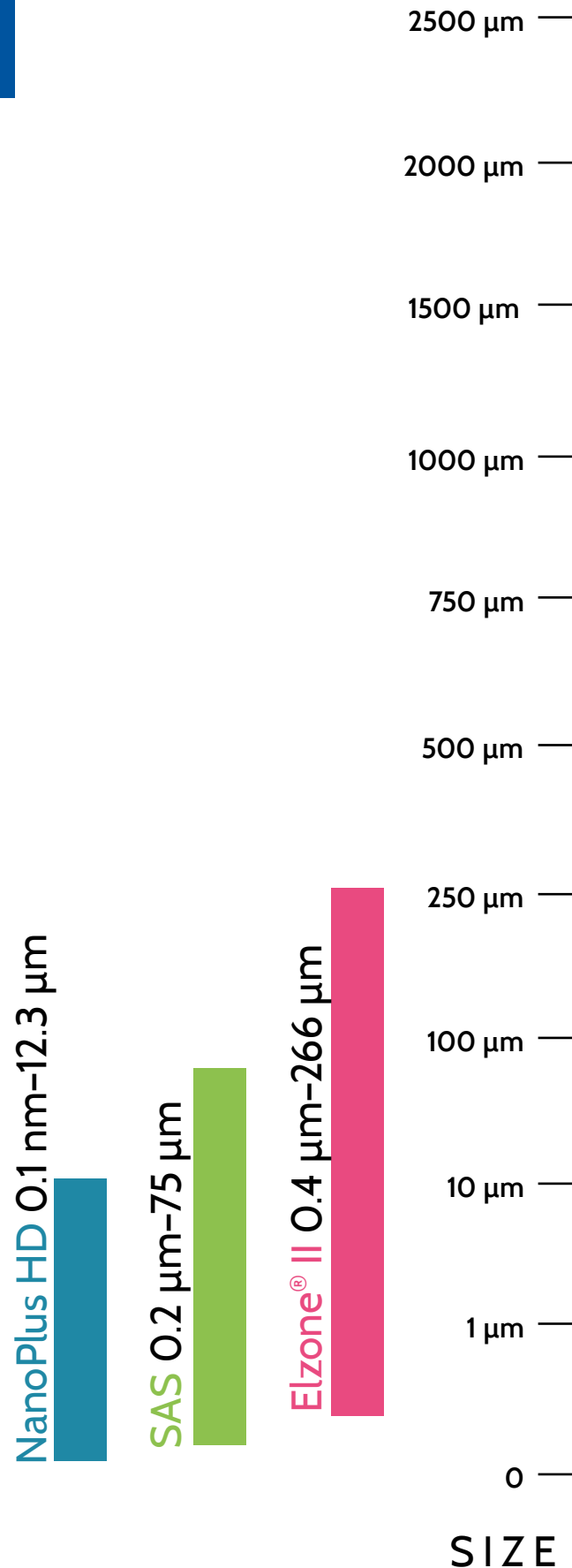
Based on the Electrophoretic Light Scattering (ELS) technique, zeta potential is determined by electrophoretic mobility measurement in a particle suspension or molecular solution. Detecting the Doppler shift when an electric field is applied enables mobility measurement. Zeta potential is a key indicator of the stability of colloidal dispersions, which is an essential factor for surface modification and product transportation.

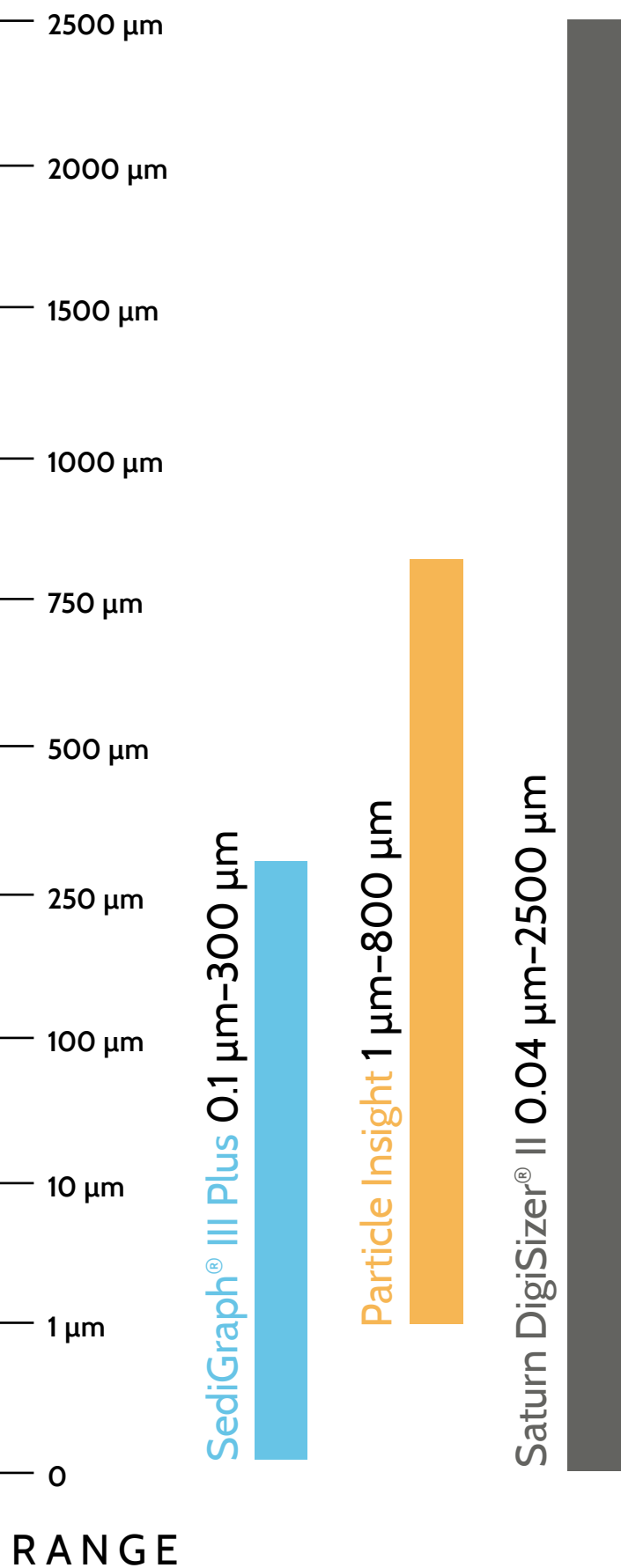
Air Permeability

This technique uses the principle of pressure drop across a packed bed of powder. By varying the sample height, and hence the "porosity" of the bed, average surface area and particle size can be determined as a function of pressure drop and flow rate in accordance with the Carmen equation.

Electrical Sensing Zone

The electrical sensing zone (ESZ) technique, also known as the Coulter principle, analyzes samples particle by particle. Requiring only a small volume of sample for analysis, it provides the highest particle size measurement resolution of the techniques presented here. A homogeneously dispersed suspension of sample material is prepared in an electrolytic solution. A tube with a small orifice of short path length is submerged in the suspension, an electrode being positioned on both sides of the orifice. A pump establishes a flow of electrolyte through the orifice, providing a conductive path between the two electrodes and a small electrical current is established between them. Both electrolyte and particles pass through the orifice. The particles, being non-conductive, impede the electrical current flow as they enter the orifice. This creates an electrical signal proportional to the volume of the particle. Each individual particle is counted and classified according to volume, thus producing a volume frequency distribution. The particles are considered to be spherical and a particle diameter can be determined from volume.





X-Ray Sedimentation

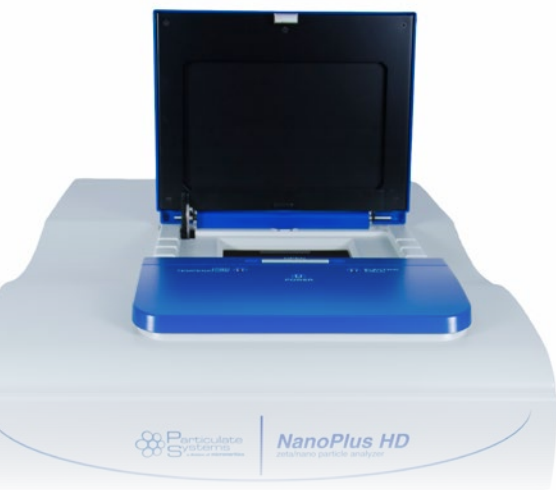
Sedimentation velocity of suspended particles can be obtained by measuring the concentration of particles remaining in suspension with time. This technique measures the distribution of equilibrium velocities of particles settling through a liquid under the influence of gravity. Stokes' law relates these velocities to particle diameters for spherical particles. Non-spherical particles are measured in terms of the diameter of a sphere of the same material that settles at the same velocity in the same suspension liquid.

Dynamic Image Analysis

Particles are suspended homogeneously in a carrier liquid. They pass through a thin flow cell in the optical path. Light is transmitted through the flow cell, thus projecting silhouettes of the particles onto a high-resolution camera sensor. The high frame rate and high resolution of the camera combined with a high-speed host computer enables the characterization of thousands of particles per second in real-time. This technique is ideal for applications where shape, not just diameter, is critical information for predicting raw material performance.

Static Light Scattering

The size of particles can be determined from the manner in which they scatter light. The most common application of this technique is low angle light scattering (LALS) in which an assemblage of particles is illuminated by a source of monochromatic, coherent light. All information about particle size resides in the intensity versus angle characteristics of the scattering pattern; therefore, precise measurement of the light scattering characteristics is fundamental to obtaining good particle size data.



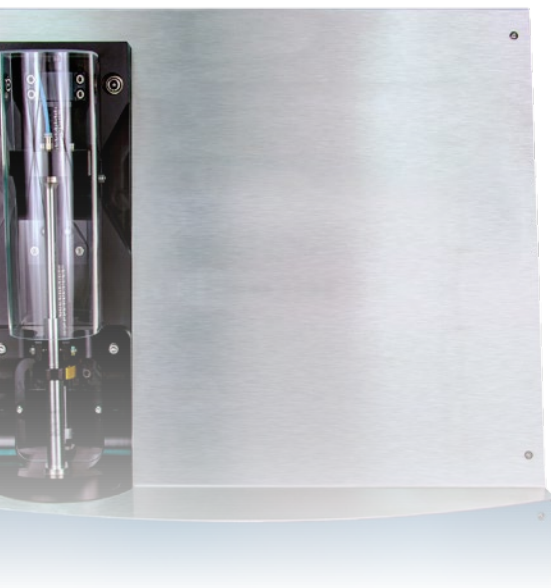
NanoPlus HD

Particle Size Zeta Potential

ASTM: E2490
ISO: 13321, 22412, 13099-2

The NanoPlus HD is a unique instrument that utilizes photon correlation spectroscopy and electrophoretic light scattering techniques to determine particle size and zeta potential. The instrument is compact and easy to use with an extended analysis range, intuitive software, and multiple sample cells to fit the user's application.

- Two model configurations: nano particle sizing or a combination of nano particle sizing and zeta potential
- Measures particle size of samples suspended in liquids in the range of 0.1 nm to 12.3 μm with sample suspension concentrations from 0.00001% to 40%
- Measures zeta potential of a sample suspension in the range of -500mV to +500mV with concentrations from 0.001% to 40%
- The NanoPlus AT Auto-Titrator accessory and a wide variety of sample cells are also available



Sub-Sieve AutoSizer (SAS)

Air-Permeability Particle Size

ASTM: B330, C721

The SAS is a modernized and improved version of the Fisher Model 95 Sub-Sieve Sizer. The SAS has drastically improved the well-established air-permeability particle sizing technique. Air-permeability techniques generate average specific surface area data for powder samples. The specific surface area of particles has a significant impact on the physical properties of powders

and has been the focus of much attention from pharmaceutical, paint, toner, and geological applications.

- Measures particle size in a range of 0.2 to 5 μm
- Designed to generate "Fisher number" results identical to that of its predecessor, the Fisher Sub-Sieve Sizer
- Simple set-up and real time data display



Elzone[®] II

Particle Size Particle Count

ASTM: C690, D4438, F577
ISO: 13319

Unlike other measurement techniques, the electrical sensing zone method can size samples that have assorted optical properties, densities, colors, and shapes. The Elzone II can determine the size, number, concentration, and mass of innumerable organic and inorganic materials.

- Sizes and counts both organic and inorganic materials from 0.4 to 266 μm
- Different conductive liquids can be used without needing to enter an extensive set of liquid properties
- Does not require previous knowledge of material properties (density, refractive index)
- Automated features include: start-up, run, and shut-down routines; blockage detection and clearing; flushing/rinsing; and calibration
- A CCD camera provides real-time video display of the aperture to assure a clear path through the detection zone

SediGraph® III Plus

Particle Size

ASTM: B761, C958, C110
ISO: 13317-3

This analyzer combines the proven SediGraph analytical technique with advanced instrumentation features to provide superior repeatability, accuracy, and reproducibility. The SediGraph III directly measures mass by x-ray absorption and determines particle size by direct measurement of settling velocity. Direct measurements require no modeling.

Particle Insight

Particle Size Particle Shape

ISO: 13322-2

Particle shape information about raw materials enables manufacturers to control their process with a much higher level of sensitivity. The Particle Insight is a dynamic image analyzer which is ideal for applications where the particle shape, not just the diameter, is critical raw material information.

- Three size range model options:
1 to 150 μm , 3 to 300 μm ,
and 10 to 800 μm

- Particle size range of 0.1 to 300 μm
- Complete particle accountability
- Features lifetime warranty (7 years) on the x-ray tube
- Optional MasterTech 052 autosampler provides unattended analysis of up to 18 samples



- Real time data display with a unique optics camera with high frame rate and resolution for enabling analysis of tens of thousands of particles in seconds
- Select from 30 size/shape parameters for the best match to the particles being analyzed
- Thumbnail images of all analyzed particles for post run viewing and shape filtering with customizable particle type views
- Recirculating sample module and optics enable statistically valid measurements in a very short amount of time
- Standard system is compatible with both aqueous as well as organic fluids



Saturn DigiSizer® II

High Definition Particle Size

ASTM: B822, C1070, D4464
ISO: 13320

This state-of-the-art laser particle size analyzer utilizes advanced optics, CCD technology, and over three million detector elements to maximize the ability to deliver high sensitivity and a high-resolution measurement of articulations in the scattering pattern. This allows a high degree of size discrimination in the sample population. Higher size

resolution reveals information about the material that goes undetected with other laser particle sizing systems, providing more accurate results in even the most complex sample type.

- CCD technology with high angular resolution of up to 70 degrees provides accurate results within the range of 40 nanometers to 2.5 millimeters
- Fast, detailed results that are repeatable on and reproducible between every Saturn DigiSizer
- Liquid sample handling unit for automatic sampling, diluting, and dispersion. Available in both standard and low volume configurations





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To request a quote or additional product information, visit
micromeritics.com

Contact your local Micromeritics sales representative
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770-662-3636

