

Unmatched Visualization
and Measurement of
Nanoparticles



ViewSizer™ 3000

*Visualize and determine the size distribution of
a wide range of nanoparticle sizes even when
they coexist in the same liquid*

Introduction

Analyzing nanoparticles such as colloids and proteins is inherently challenging. These particles are too small to image with visible light and must be imaged by laborious electron or scanning microscopy. Dynamic light scattering and laser diffraction have been successfully used to determine particle size and size distribution. These techniques are fast and accurate for certain samples, however, as they are ensemble techniques, high resolution distribution information cannot be obtained.

The ultramicroscope and nanoparticle tracking have been used with only partial success since the wide range of sizes present in many samples means that scattering from the largest particle is bright enough to saturate the detector and eliminate any hope of learning about smaller particles. Until now, an instrument for routine high resolution size distribution analysis has been unavailable.

The ViewSizer 3000 exploits innovative hardware and software to overcome these long-standing problems and provide true distribution information for all particle sizes. The instrument visualizes scattered light from individual nanoparticles in suspension. This data is then used to determine particle movement and infer particle size using the Stokes-Einstein relationship.



Furthermore, since the illuminated sample volume is well known, particle number concentration is readily determined. Thus, from a single measurement, two critical pieces of information are determined: particle size distribution and particle concentration even for polydisperse samples.

The screen capture from an analysis on the ViewSizer 3000 (shown above) demonstrates its unmatched ability to visualize highly polydisperse samples. This capability enables unprecedented insights into your nanoparticles, whether they are from pharmaceutical, biological, industrial, aquatic, agricultural or other sources.

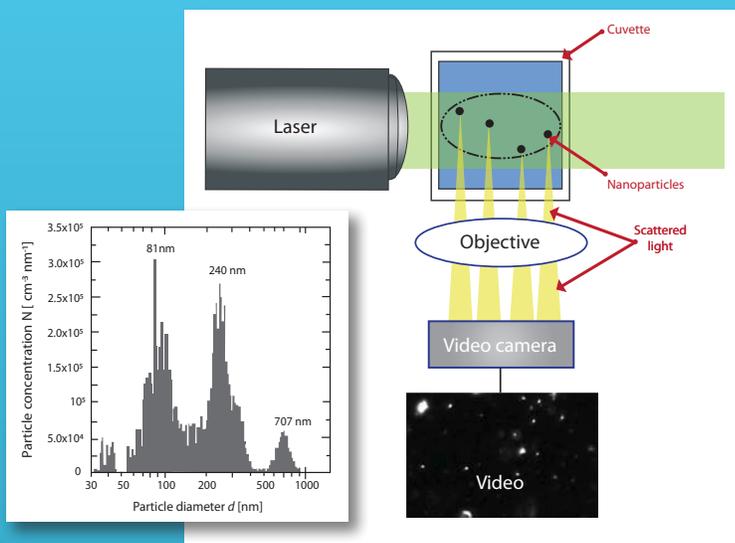
How it works

The instrument characterizes nanoparticles by analyzing their thermal-induced motion (Brownian motion) and larger, micron-sized particles by analyzing gravitational settling. The optical system includes innovative multispectral illumination and detection techniques that enable video recording of scattered light from wide-ranging sizes of individual particles simultaneously.

A schematic of light scattering is shown in the figure to the right. Particles are illuminated and images of scattered light from each particle are magnified by a microscope objective before they are recorded on a video camera.

The obtained video shows each individual nanoparticle. By taking advantage of modern high resolution video cameras and computer graphics processing speed, the motion of each particle is tracked to determine the diffusion coefficient, and, from that, the size of each particle.

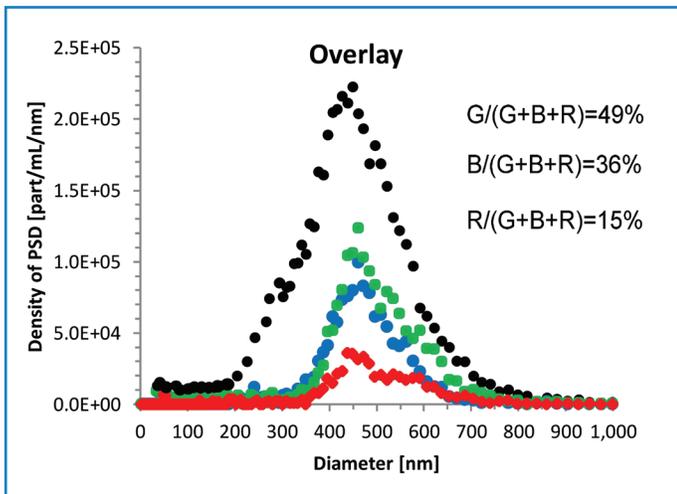
Since data from each particle is obtained, the particle size distribution from a mixture is readily discerned as shown to the right.



A key advancement of this system is its ability to work with the very large dynamic range of scattered light intensity produced by differently-sized nanoparticles coexisting in a polydisperse sample. This technical feat is accomplished by combining clever software with advanced optics and multiple light sources. The ViewSizer 3000 technology from HORIBA Scientific is an elegant and absolute method that does not require calibration standards or knowledge of particle material properties such as refractive index.

- High Resolution Size Distribution
- Nanoparticle Concentration

Determine both
with the ViewSizer 3000



Particle Kinetic Processes

The ViewSizer 3000's unique capability to visualize, measure, and count wide-ranging sizes of nano and micron sized particles in the same sample enables unmatched characterization of common particle kinetic processes including: dissolution of active pharmaceutical ingredients, self-assembly of polymers, crystallization of food and pharmaceutical products, aggregation of proteins and particle agglomeration.

In these and other cases, the complete process can be monitored in real-time and important rate constants can be determined. Furthermore, process parameters such as agitation, temperature and concentration can be adjusted during the analysis. Insights from kinetic experiments on the ViewSizer 3000 assist with the identification of ideal process conditions and effective formulations.

Count and Concentration

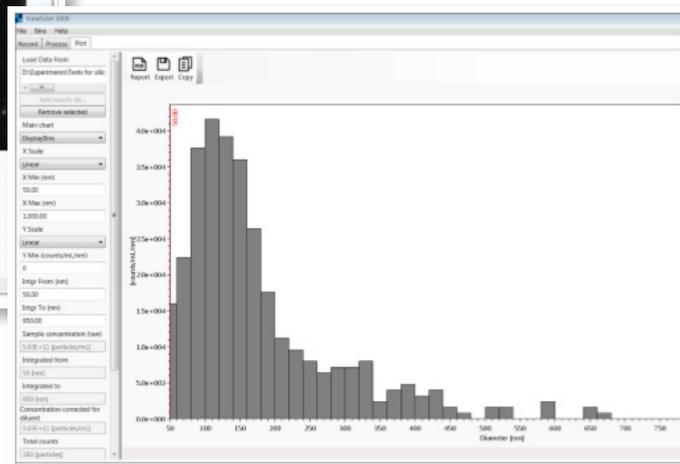
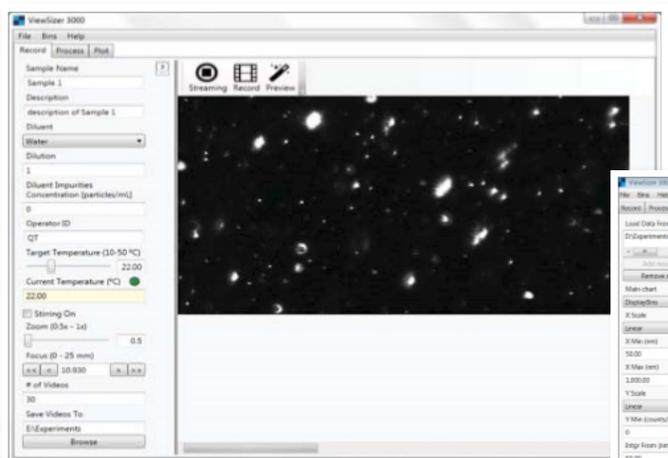
The ViewSizer software was developed with the user in mind. Data collection can start with just a few clicks of the mouse and the final results are available in a number of formats to accommodate every user. All data can be exported for further analysis or preparation of publication quality graphs. The user interface includes real-time visualization of all particles in the sample - a valuable aspect of each analysis performed on the ViewSizer 3000.

Advanced Software

For process yield and many other applications, it is useful to know particle concentration. Since the illuminated sample volume is known along with the number of particles imaged, particle concentration is readily determined.

Fluorescent Particle Analysis

The ViewSizer's proprietary multispectral illumination and detection enables unique capabilities in the field of fluorescent particle analysis. Now for the first time, customers can enumerate different constituents in the same sample under the same size distribution. The overlapped PSDs seen above show how the ViewSizer can determine the concentration of each of the three constituents and their percentages of the total mixture. Imagine the possibilities – it's like flow cytometry for nanoparticles.



Specifications

Range of Particle Sizes Measured*	10 nm to 15 µm
Typical Sample Volume	350 µL to 1.25 mL
Typical Sample Concentration*	5x10 ⁶ to 2x10 ⁸ particles/mL
Sample Temperature Range (Controlled)	10 °C to 50 °C, ± 0.1 °C
Dimensions	55 cm W x 66 cm D x 35 cm H
Weight	27 kg
Operational Environment	15 °C to 30 °C with < 85% RH

* Sample dependent

Key Features

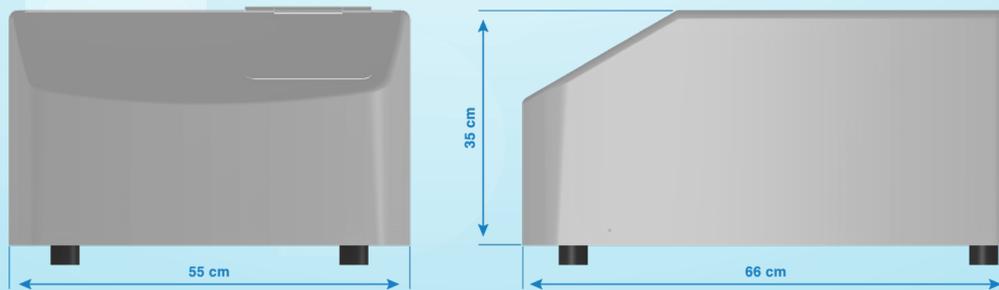
The ViewSizer 3000 offers the following:

- Visualization of particles and particle processes.
- Accurate and reproducible measurements of particle number concentration and particle size distribution, even for highly polydisperse samples.
- Quantification of particle kinetic processes; such as particle crystallization, aggregation, self-assembly, swelling, dissolution, and shrinkage rates.

Applications Include

- Batteries
- Catalysts
- Chemical & mechanical polishing
- Colloid stability
- Cosmetics
- Ecotoxicology
- Energy
- Environmental sciences
- Water quality
- Limnology
- Nanoparticles
- Exosomes, microvesicles, and other biological particles
- Oceanography
- Particle counting
- Particle number concentration
- Particle size distribution even for polydisperse samples
- Metal powders
- Pharmaceuticals
- Pigments and inks
- Polymers
- Protein aggregation
- Semiconductors
- Viruses and virus like particles (VLP's)

External Dimensions



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