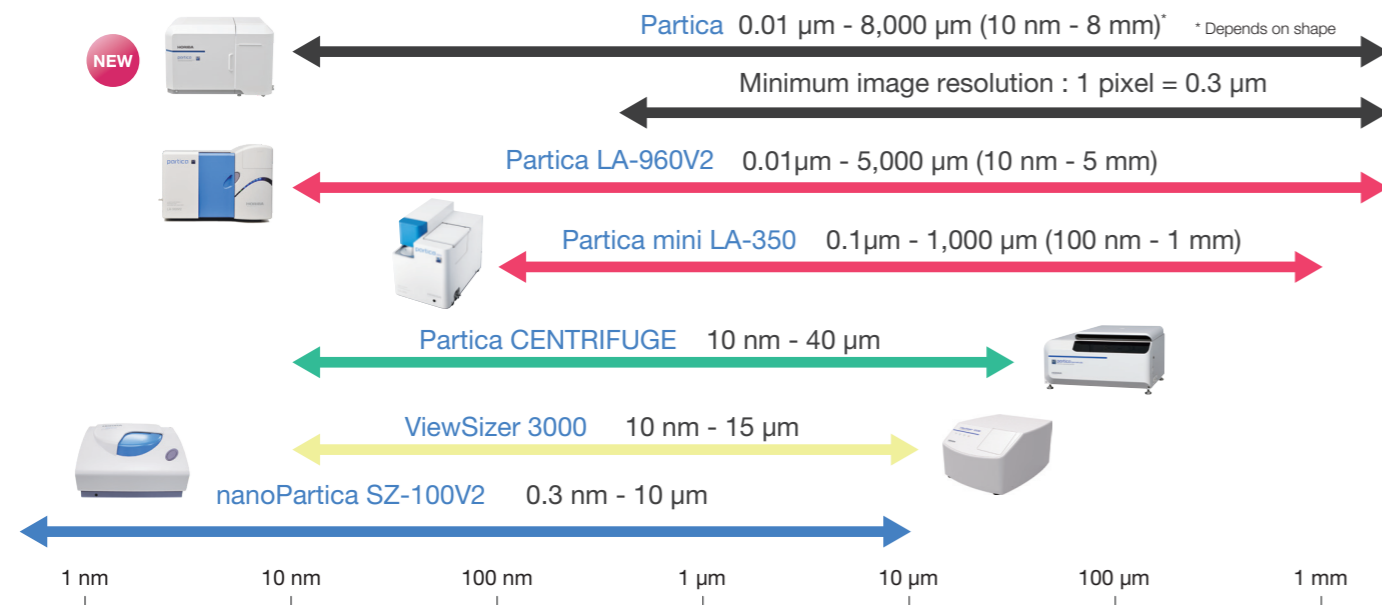


Particle Characterization Product Overview

Search HORIBA's Particle Characterization Product Line



HORIBA Particle Characterization Product Line-up



Laser Diffraction and Dynamic Imaging

Integrated Laser Diffraction/Scattering method and Dynamic Image Analysis for Comprehensive and Efficient Particle Characterization.



Laser Diffraction and Dynamic Imaging Particle Size and Shape Analyzer

Partica

- Combine a wide range of particle size distributions with detailed image analysis, enabling both to be analyzed simultaneously for a variety of sample conditions.
- Detailed particle image analysis with pixel sizes as small as 0.3 μm and over 30 shape parameters.
- A highly scalable particle analysis platform to meet a variety of needs.

Laser Scattering and Diffraction

Very wide range of measurement from 0.01 to 5,000 μm.

Laser Scattering Particle Size Distribution Analyzer

Partica LA-960V2



- High reliability ensured by full inspection at factory test ±0.6% high-precision guarantee for NIST-traceable standard samples and minimized device variation.
- Automatic measurement from sample injection to cleaning in just 60 seconds.

Centrifugal Sedimentation

Measurement using centrifugal sedimentation provides reliable data even at the farthest edges of the distribution edges. Enables analysis of particle size, foreign substances, and aggregation/dispersal states of advanced materials such as CNTs* and CMP** slurries.



Centrifugal Nanoparticle Analyzer

Partica CENTRIFUGE

- Robust and easy to use. Convenient cuvette cell type.
- Optimal for detecting small amounts of foreign substances or aggregates.
 - Wide range measurement realized by acceleration from low to high rotation.
- Precise particle size distribution measurement for diluted to undiluted samples.
 - Supports both line-start and homogeneous sedimentation methods.

* CNTs : Carbon Nanotubes
** CMP : Chemical Mechanical Polishin

Unique Accessories

High-concentration cell :
Allows measurement closer to the original concentration with low dilution rates, no dilution and variable concentration.

Mini-flow (Circulation system) :
Enables flow measurement with just 35 mL of dispersant. Recommended when using organic solvents as dispersant.

Fraction cell :
Makes measurements with only micrograms of sample. This unique accessory is available in 5, 10 and 15 mL volumes and fully solvent resistant.

Dry measurement unit :
Enables measurement of powders in their dry state. The powder jet combines several unique and patented features to provide the most reproducible dry measurements.

Image analysis unit :
Enables simultaneous and correlated measurement of Particle Size Distribution and Shape Evaluation. (Compatible with Partica)



Fractionator
Easily creates density gradient solution

Comparison of Features and Principles of HORIBA Particle Characterization Product Line-up

Principle	Size resolution	Measurement time	Nano particle <100nm	Non-spherical	Number count	Sample Types	Other Features
Laser Diffraction and Dynamic Imaging partica	+++	+++	++	+++	+	Suspensions, high-concentration slurry, paste, emulsion, ink, bubbles, dry powder, granulated powder	High repeatability, correlation with earlier models, guaranteed accuracy, image analysis, autosampler, capabilities of various customizations
Laser Scattering and Diffraction Partica LA-960V2	++	+++	+	++	+	Suspensions, high-concentration slurry, paste, emulsion, ink, bubbles, dry powder, granulated powder	High reproducibility, correlation with earlier models, guaranteed accuracy, image observation, autosampler
Centrifugal Sedimentation Partica CENTRIFUGE	+++	++	++	-	-	Suspensions, high-concentration slurry, battery materials, ceramics, ink, advanced materials, fibrous materials	High-concentration samples, small amount sample, fibrous particles (e.g. CNT*) <small>*CNT : Carbon Nanotube</small>
Particle Tracking ViewSizer 3000	+++	+	++	-	+++	Suspensions, liposome, exosome, bubbles, protein	Small amount sample, temperature control, fluorescently labeled particles only
Dynamic Light Scattering nanoPartica SZ-100V2	+	++	+++	-	+	Suspensions, high-concentration slurry, emulsion, ink, bubbles, gel	Temperature control, small amount sample, zeta potential, gel network size

Legend +++ : Excellent match / ++ : Applicable / + : Limited / - : Not applicable

Particle Tracking Analysis

The instrument characterizes nanoparticles by analyzing their thermal-induced motion (Brownian motion) and larger, micron-sized particles by analyzing gravitational settling.

- Improved optical design and algorithms allows better known scattering volume and therefore better concentration data, even for polydisperse samples.
- No cross contamination with cuvettes.
- Analysis of larger particles by sedimentation (technique) possible with vertical design, allowing broader size range.

Simultaneous Multispectral Nanoparticle Tracking Analysis

ViewSizer 3000



Dynamic Light Scattering

HORIBA's highest standard for nano particle characterization. Clearly and easily analyzes nano particle size distribution and dispersibility. One device, three functions: particle size distribution, zeta potential, and molecular weight with high sensitivity and precision.

- Dual optical system equipped. Measures from dilute to high-concentration samples, with high sensitivity for single nanometer particles.
- Measures zeta potential of liquid/solid surfaces. Useful as an indicator of dispersion stability.
- New indicator for gel material evaluation. Enables network size analysis of gel samples.

Nanoparticle Analyzer nanoPartica

nanoPartica SZ-100V2



Other related products

BET Flowing Gas Adsorption & Desorption

Specific surface area is related to performance properties such as catalytic activity and dissolution rate. Rapidly obtain specific surface data with the flowing gas BET technique and the SA-9650.

BET Surface Area Analyzer SA-9650 series



X-ray Fluorescence / Raman

Automatically recognizes multiple particles from microscope images, obtains elemental (XRF) / chemical (Raman) information, particle size information, and particle coordinate positions.

X-ray Analytical Microscope XGT-9000 series



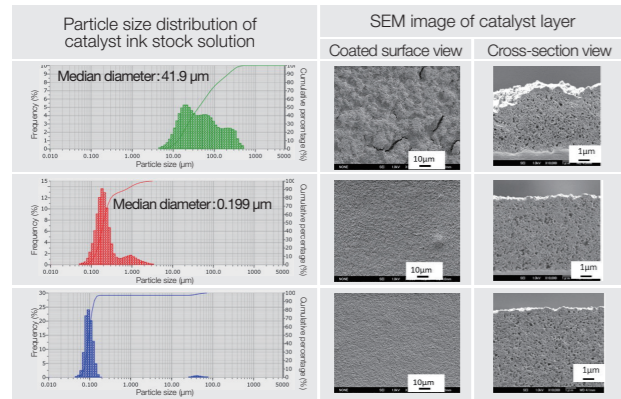
Raman Microscope XploRA™ series



Catalyst Ink

Particle size measurement of non-diluted sample

The particle size of the catalyst ink determines the surface area and porosity of the catalyst, which influence its efficiency and detachability, and diffusivity of gas. Knowing the particle size distribution of catalyst ink before coating can predict the battery performance, and prevent the fault occurrence of electrodes, and finally enable shortening of the manufacturing process of the fuel cell.

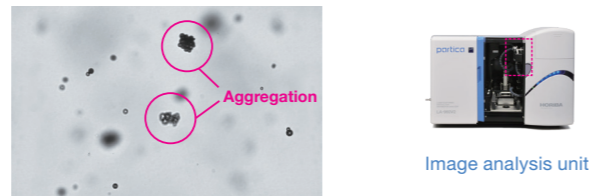


• Data courtesy of Institute of Science Tokyo Hirai& Sasabe Lab, FC-Cubic

Aggregation

Detection and Analysis of aggregation by Imaging

The imaging unit visualizes the particles in the wet circulation system. It is very small and built into the main unit, and can acquire particle images information without changing the usability.



Labor-saving Options

Supports automation and labor-saving for multi-sample measurement using autosamplers or robotic arms. Please feel free to contact us.



Quick and high precision analysis. Furthermore, a variety of accessories meet various measurement needs.



Laser Scattering Particle Size Distribution Analyzer
Partica LA-960V2



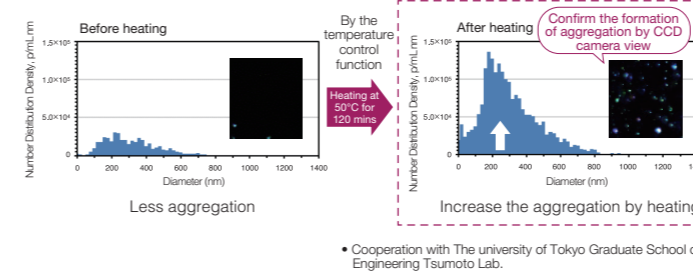
High Concentration Cell

Protein

Evaluation of Aggregation Changes due to Heating

Three simultaneous wavelength light sources enable a wide measurement range in the same sample. Measure all of your particles, not just a narrow size range.

■ Measurement example of protein aggregation



ViewSizer 3000 enables easy quantitative evaluation of protein aggregation. Incubation at high temperature (50°C) revealed increased formation of aggregates, especially in the SVP (sub-visible particle) region.



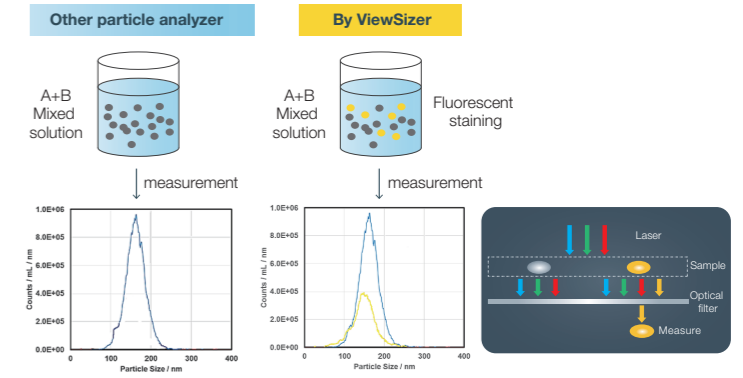
Simultaneous Multispectral Nanoparticle Tracking Analysis
ViewSizer 3000

Exosome

Fluorescent Label Analysis

Using an optical filter, incident light wavelength can be blocked for analysis of only fluorescent particles.

■ Measurement example of Exosome



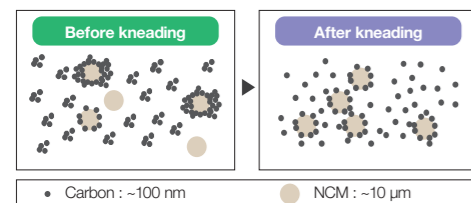
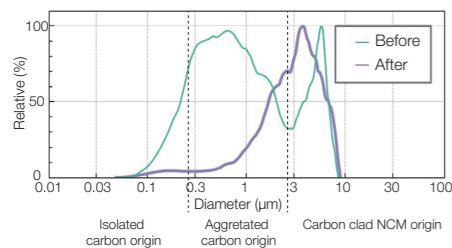
It's possible to measure only A+B as an overall particle, not just A, not just B. **Fluorescent particle / all particle = 44%**

By fluorescently labeling proteins on the exosome surface, the proportion of fluorescent particles to total particles can be determined.

Lithium-ion Battery Materials

Understanding the Dispersion State of Mixtures

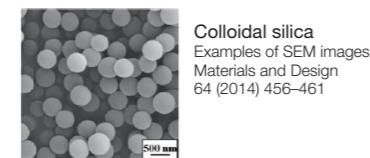
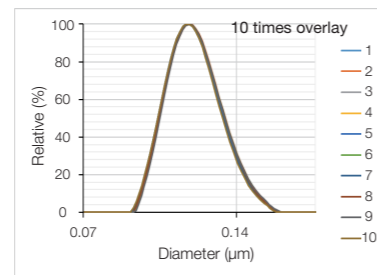
Before and after kneading, measurement results with distinctly different distributions were obtained. This enables us to infer the dispersion state of the battery materials (carbon).



CMP Slurry

High-resolution, High Repeatability Measurement

Ten repeated measurements of silica slurry with different sampling show high repeatability, confirming high-precision quality control.

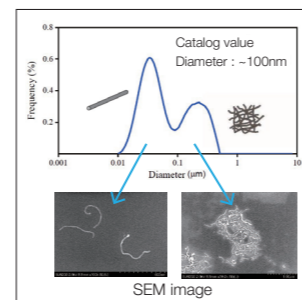


Colloidal silica
Examples of SEM images
Materials and Design
64 (2014) 456-461

Carbon Nanotube

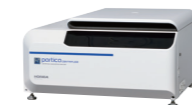
Understanding Aggregation and Dispersal State

A bimodal particle size distribution was obtained, and both isolated and aggregated CNTs were detected, correlating with SEM images.



• This measurement was performed at the HORIBA-AIST Collaborative Research Laboratory

High-value-added materials with high resolution and wide-range measurement.

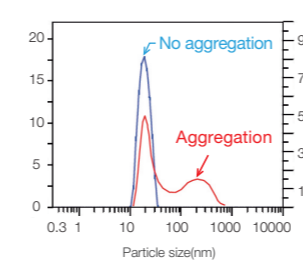


Centrifugal Nanoparticle Analyzer
Partica CENTRIFUGE

Nanofiller

Aggregation Evaluation

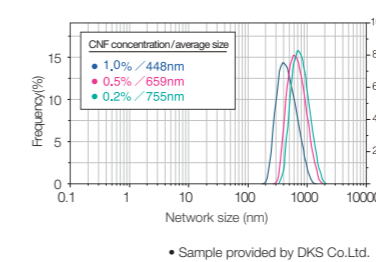
Analyzing nano-sized fillers in non-diluted samples allows differentiation between aggregated and non-aggregated states.



Cellulose Nanofiber Gel

Evaluation of Network Size Inside Gel

As the concentration of cellulose nanofiber (CNF) increases, density rises and network size becomes finer. Measurement results confirmed a correlation between network size and CNF concentration.

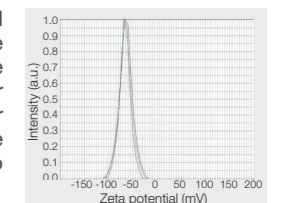


• Sample provided by DKS Co.Ltd.

Fine Bubbles

Zeta Potential

Measuring zeta potential enables evaluation of the long-term stability of fine bubbles. Generally, the larger the absolute value, the higher the dispersibility; values close to zero indicate a tendency to aggregate.



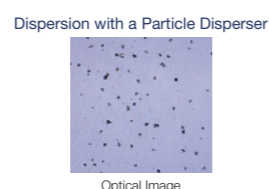
Nanoparticle Analyzer
nanoPartica SZ-100V2

Particle Dispenser

Well-separated particles dispersion makes it possible to conduct particle-by-particle measurement.



Agglomeration and clustering can easily take place with conventional particle dispersion methods. These clusters which are detected as single, large particles can compromise the results of the analysis.



This ensures that the dispersed samples provide precise and dependable results when using particle analysis techniques.

Particle dispenser obtains a well separated and uniform powder dispersion.

Powder dispersion made easy!



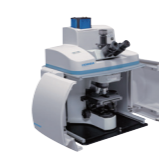
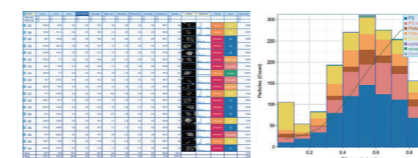
Particle Dispenser

Particle Analysis and Classification ~ Raman

Combining morphological and chemical information is fundamental for accurate results. ParticleFinder benefits from the LabSpec™ 6 integrated classification, univariate or peak fitting tools, or from the power of the optional MVAPlus app for advanced multivariate analysis, automatic extraction of the pure component spectra and classification of the particles.



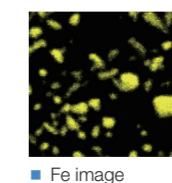
ParticleFinder
Automated Particle Measurement, Identification and Classification using Raman Analysis



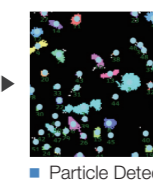
Raman microscope
XploRA™ series

Particle Detection Function ~ XRF

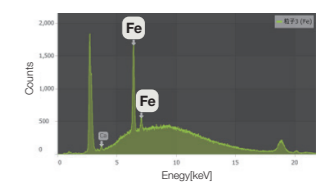
The particle detection function is available from optical images, fluorescence X-ray images, and transmission X-ray images. The particle detection function detects particles automatically and marks their position for multi-point measurement, classification and analysis.



■ Fe image



■ Particle Detection



Search the Fe peak from spectrum



X-ray Analytical Microscope
XGT-9000 series