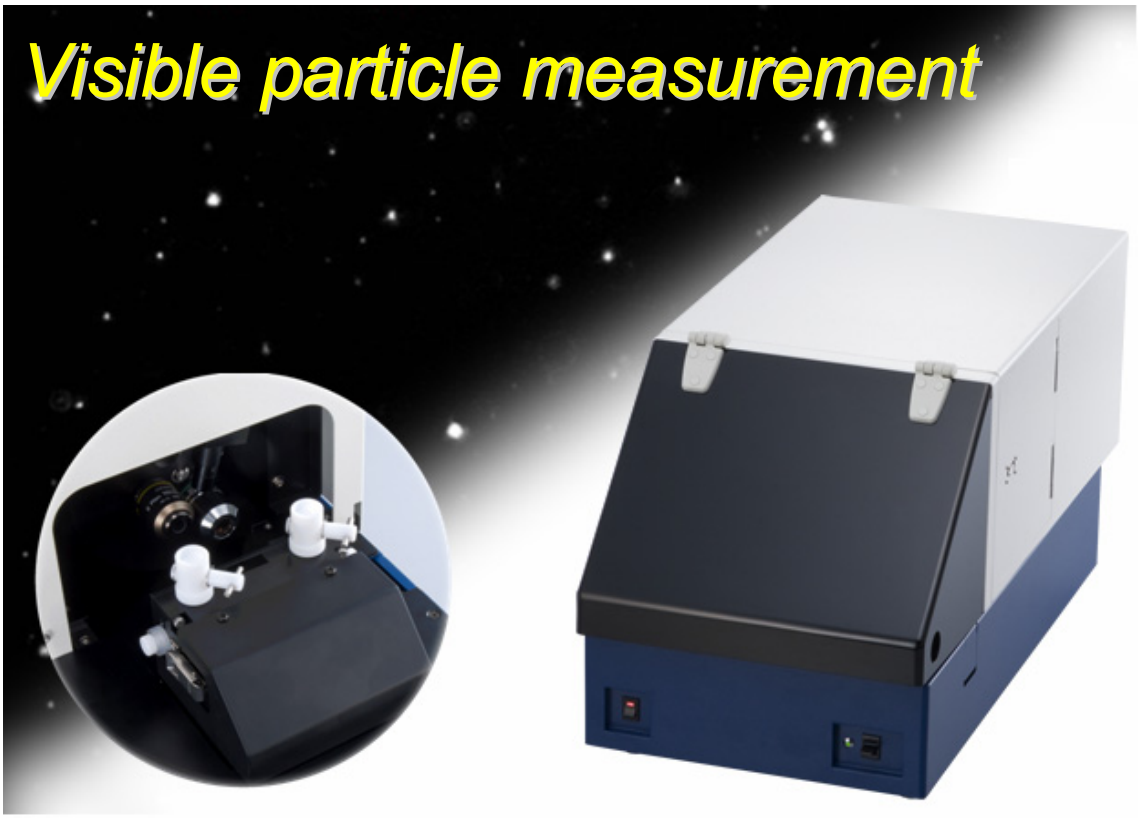
Zeta Potential & Particle Size Analyzer

ZEECOM®

ZC-3000 series

Zeta potential and particle size measurements
with real time observation



Measurement of the charged state on particle-surface changing with solvents

Effective evaluation of the dispersion stability of colloidal solution

Isoelectric point measurement from pH response

Multifaceted evaluation of colloidal particles with zeta potential and particle size measurements

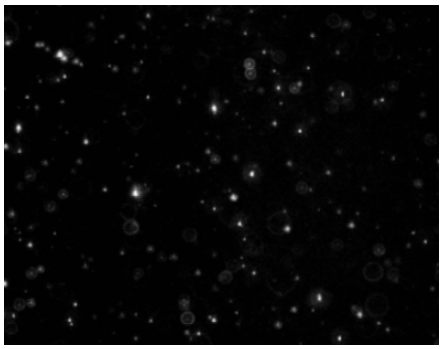
MICROTEC CO.,LTD.

Diverse information and reliable data by microscopic observation

In ZEECOM, electrophoresing particles are automatically tracked by the combination of microscopic electrophoresis and advanced image processing. The zeta potential values of individual particles are automatically calculated from their mobility.

The ZEECOM measurement process is not so-called "black box" but observable at any time on a monitor.

In addition, ZC-3000 can measure the particle size by automatic tracking of the particle Brownian motion (by optional function).



Application Fields

Characterization of particles / Dispersion stability evaluation of colloidal systems

Environment

Water treatment, waterworks, flocculation agents, dispersants, flocculation control, microorganisms, planktons, asbestos, bubbles, soil, beneficiation technology, and etc.

Nano-materials

Functional material development、recording materials, pigments, ceramics, catalytic agents, polymers, carbon black, carbon nanotubes, inkjet inks, aqueous/non-aqueous solvent paints, fuel cells, coating materials (for automobile parts / electronic parts), paper manufacturing, surface active agents, and etc.

Life Science

Erythrocyte, biological cells, protein, DDS, liposome, vesicle, drug discovery, and etc.

Zeta Potential Measurements

Automatic Measurement Modes

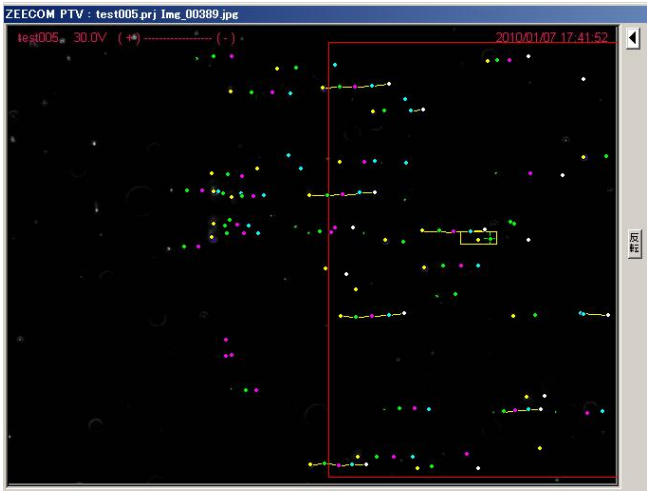
Four different measurements can be selected from automatic measurement modes:

1. Zeta potential & Histogram

Standard measurement method: the zeta potential of particles on the stationary level is calculated on the set measurement conditions. The measurement result is displayed in the histogram.

2. Flow speed distribution in the sample cell

Flow velocity (FV) at each position in the cell is measured and the FV distribution is graphed. You can check the nonuniformity of electroosmotic flow so that measurement can be performed at any position depending on the shift from the stationary level.



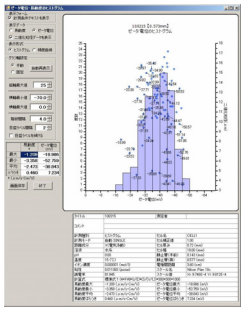
Automatic tracking of particles

3. pH responsiveness measurement (Isoelectric point measurement)

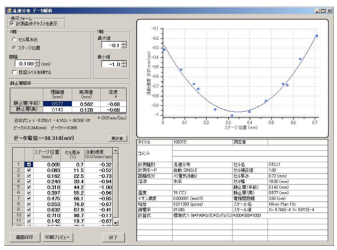
By inputting the pH of dispersion medium, isoelectric point and pH responsiveness can be analyzed from the change in zeta potential.

4. Settling / Rising velocity measurement

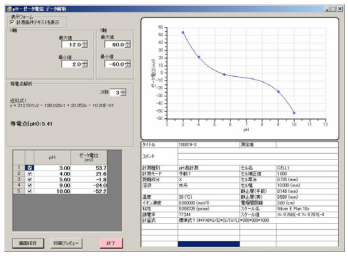
In settling/rising velocity measurements, the particle tracking direction is defined as the Y-axis (vertical) direction. The settling velocity of aggregates or coarse particles and the rising velocity of bubbles or hollow particles can be measured.



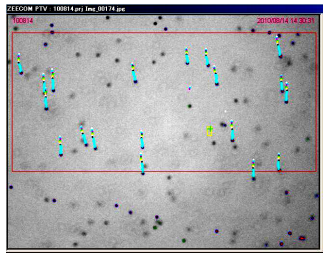
Zeta potential histogram



Flow velocity distribution in the sample cell



pH responsiveness (Isoelectric point)



Settling / Rising velocity measurement

Real-time measurement / Archive measurement

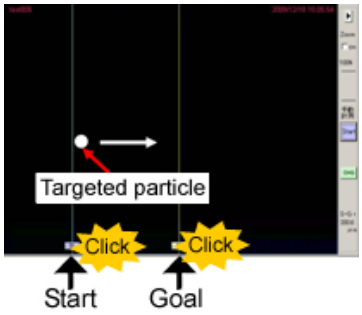
In the real-time measurement, you can observe and measure the sample in the measurement cell simultaneously. The image files are saved every one second. Based on image archive, archive measurements can be performed in the different measurement conditions.

You can also double-check the measurement result of specific particle by archive measurement which enables you to judge the existence of impurity and provides you enhanced measurement accuracy.

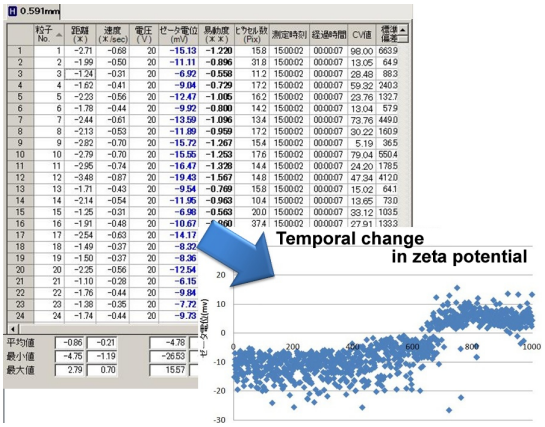
■ Besides automatic measurement mode, manual measurement mode can be selected.
Manual measurement is suitable for:

- Particles with heady flickering due to irregular shape.
- Particle size is widely distributed in the sample so that the data for each particle size need to be acquired.

Electrophoresis motion can be measured manually. →



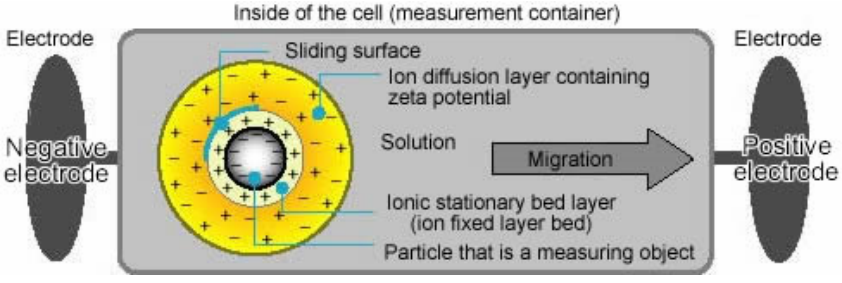
■ The temporal change of zeta potential can be analyzed by using the data of individual particles.



Data of each particle can be analyzed in more detail in a spreadsheet.

What is zeta potential?

Zeta potential is defined as the magnitude of charge at the 'sliding surface' in the 'ion diffusion layer' around a colloidal particle.

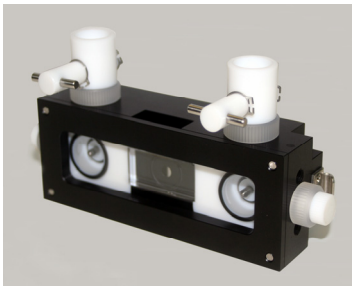


Colloidal particle dispersed in a solution is positively or negatively charged. In order to keep the particles electrically neutral in the solution, ions with opposite polarities build up around the particles and form 'ionic stationary bed layer'.

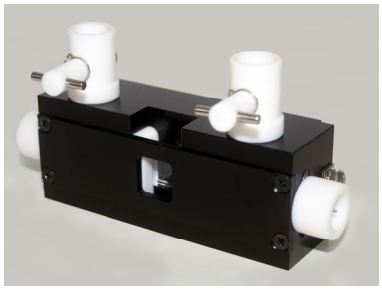
Outside of it, there is an 'ion diffusion layer' in which ions with same and opposite polarities coexist.
Since ions slide from the outside of the ionic stationary bed layer, this boundary is called 'sliding surface'.

When the zeta potential value of positively or negatively charged colloidal particles is large, the dispersion stability of the sample is good. On the other hand, when the zeta potential is close to zero, the particles have tendency to aggregate and the state of the particle system is unstable.
Zeta potential provides you a guideline for the dispersion stability, aggregability, sedimentation property of small particles. Also, the charged state of surface functional group in a dispersion medium can be evaluated.

ZEECOM sample measurement cells



Standard cell



20 mm cell
for non-aqueous solution

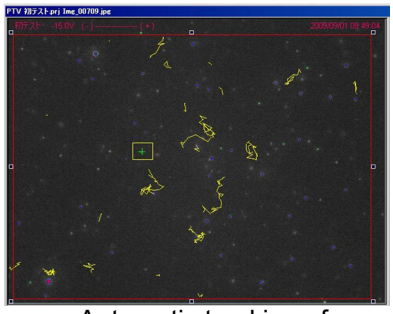
Temperature controlled cell
for aqueous solution

Particle size distribution measurements by Brownian motion (option)

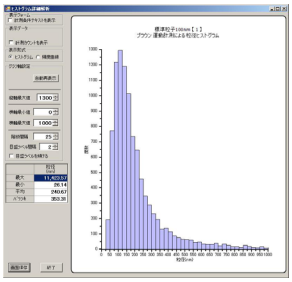
Brownian motion is a random kinetic phenomenon which is caused by the irregular collision of solvent molecules being in thermal motion in a colloidal solution. For large size of particles, they need more energy for the particle movement. The larger surface area they have, the more molecular collisions occur in various directions. Since the effects of the molecular collisions cancel each other, the Brownian motion becomes small for large size of particles.

In this way, the particle size and the particle movement due to Brownian motion are related with each other. By applying the Einstein-Stokes equation, the particle size can be calculated from the travel distance of a particle.

In ZC-3000, the random movement of particles is tracked by the image analysis. Then the particle size and its distribution are automatically calculated from the travel distance of a particle and various parameters (such as solution temperature and absolute viscosity).



Automatic tracking of
Brownian motion of particles



Frequency curve analysis of
particle size distribution

Specifications (ZEECOM / ZC-3000)

Measurement method	Microscopic electrophoresis (zeta potential)
Zeta potential measurement range	-200~200 mV
Mobility	-20~20 cm^2/sec·V
Measurable particle size (*)	0.02 μm ~ 100 μm (for zeta potential measurement)
	0.05 μm ~ 100 μm (for particle size measurement)
Supply voltage	0~350 V DC *Applicable voltage to electrodes (compatible with external power supply)
Light sources	LED / Laser diode
Source position (Irradiation method)	Scattered / transmitted light method
Camera	CCD black-and-white video camera
Objective lens	x10 objective lens (option: additional lens with another magnification)
Video output	Video signal NTSC
Cell stage	Digital display in 0.001 mm increments *Accuracy 0.01 mm
Measurement cell	Standard measurement cell for aqueous solution (option: cell for non-aqueous solution)
Size / Weight	300 (W) × 600 (D) × 332 (H) 25 kg
Power supply	100 V 1 A 50/60 Hz

(*) Measurable particle size may change depending on the sample.

MCIK
엠·씨·아이·케이
MATERIAL CHARACTERIZATION INSTRUMENTS, KOREA

MICRO **Microtec Co., Ltd.**

2-16-5 Takidai, Funabashi-shi, Chiba, 274-0074
TEL:+81-47-466-8186 FAX:+81-47-466-8190
URL: http://nition.com/en/
Email: microtec@nition.com