Quantachrome
INSTRUMENTS

zeta potential analyzer

zetaREADER®

www.quantachrome.com

zeta potential analyzer

zetaREADER®

Microelectrophoresis Unit

Small volume unit

Video camera mounted internally

Measurement cell

Sample introduction pump (stepper motor driven)

Titrator pump (stepper motor driven)

pH meter (probe)

Magnetic stirrer plate

Wide Particle Size Range

The ZetaReader is a compact and easy-to-use, rapid zeta potential (ZP) analyzer that uses a sophisticated electrophoresis cell and high-resolution digital video camera for real-time measurements. Unlike most other ZP analyzers, the ZetaReader can make the measurement on a remarkably wide range of particle sizes, from 20nm to 500microns.

It is available with a one- or optionally a three-channel titrator for studying ZP as a function of pH for example. Samples are introduced directly from sample jars and bottles without the need for manual filling of cuvettes.

What is Zeta Potential?

Zeta potential is a measure of electrical charge associated with the surface of a particle in a fluid. It has practical significance for those working with suspensions of powders in aqueous or non-aqueous media. The relative instability of a suspension, i.e. the tendency of the solid particles to flocculate (aggregate) - or not - is a function of zeta potential (ZP). The behavior of particles coming together (when ZP is low, typically -30mV to +30mV) is considered to be desirable in the field of water treatment where much of the suspended matter might be otherwise be too small to filter out.

Conversely, an oral pharmaceutical preparation should maintain its dispersed colloidal state, that is it should exhibit a high zeta potential (-45 to -70 mV for example), to ensure proper dosing of the active compound. Zeta potential is an important material property in many other areas of science and technology too, including, but not limited to, fine ceramics, geology and mining, food and beverages, biosciences, chemicals and polymers, cosmetics, inks and paper pulp.

See what you are measuring!

Polymer w/5-8µm particles

The direct imaging technique used allows zeta potentials of both individual particles and flocs to be measured in the same suspension, plus optional image analysis. The measurements are effected without beam splitters, light intensity attenuators or compensation optics. Density and optical properties of the particles are not needed.

Visit *www.quantachrome.com* for more detailed instrument specifications and downloadable brochures.

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Measuring principle:	**Electrophoretic mobility (velocity)**
Measurement system:	High resolution, color video camera
Zeta Potential (ZP) range:	-200mV to +200 mV
Adjustable cell voltage:	✓
Specific conductivity:	10 to 25,000 µS-V/cm.
Particle size range for ZP (bright field):	1 to 500 micron
Particle size range for ZP (dark field):	> 20nm
Sample temperature range:	2º - 60ºC
Liquid medium:	Aqueous, non-aqueous
Sample concentration range:	~25 – 400 mg/liter
Suspension volume:	25ml minimum
Small sample mode:	40µL
Titrator:	✓
Minimum titrant volume:	1 drop
pH meter:	✓
Magnetic stirrer plate:	✓
Control module included:	✓
20" widescreen monitor included:	✓

How is ZP measured?

To measure zeta potential, particles – suspended in a liquid - are pumped to the measurement cell. A controlled voltage is applied between two electrodes mounted in the cell. The resulting electric field causes the particles to move towards the electrode of polarity opposite to the one in the charged layer surrounding the particles. Because the particles move in a viscous fluid, their motion is opposed by drag forces and attain a constant velocity. This directly observed velocity is used to calculate electrophoretic mobility, hence zeta potential, since the particle velocity is directly proportional to the magnitude of the charge, i.e. potential.

The measured zeta potential is not an intrinsic property of the particle, but rather a description of the charge around the particle in the liquid born suspension. Not only do surface structural ions have an effect, but so will ions adsorbed from the liquid. The effect of pH easily illustrates this.

A pH below seven represents a condition in which hydrogen anions (albeit associated with a water molecule and called a hydroxonium cation) outnumber hydroxyl ions. These protons will tend to be adsorbed to a surface that naturally has a negatively charged surface (one rich in anions) resulting in a less negatively charged surface/liquid interface.

At very low pH values, the very high concentration of protons can cause an excess of positive charge to build at the solid/liquid interface resulting in a net positive zeta potential. Conversely, a high pH causes negatively charged ions to concentrate at this interface, "titrating" to excess an originally surface positive charge (rich in cations), causing a net negative zeta potential. The local condition that leads to a net zero charge is called the isoelectric point. An important value in colloidal science, it is easily determined on the zetaReader using the built-in titrator and pH meter.

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Contact your local representative or call 1.800.989.2476 (in USA/Canada) to request pricing information.

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- Surface Area Measurement
- Pore Size Distribution
- Chemisorption Studies
- Water Sorption Behavior
- Mercury Porosimetry
- True Solid Density
- Tapped Density
- Zeta Potential

These properties are essential qualities of battery and fuel cell materials, heterogeneous catalysts, pharmaceuticals, ceramics, carbons, zeolites, advanced mesoporous and microporous materials, pigments and foodstuffs, indeed any solid whose performance relies on some interaction with its surroundings through its surface. Quantachrome offers a wide range of fully automated gas, vapor and water sorption analyzers, gas displacement pycnometers, flow chemisorption analyzers and intrusion porosimeters suitable for both research and development, and industrial quality control.

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CE

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