

# DT-1202



## REAL CONDITIONS

- no sample preparation
- no sample modification: measurement in original media and original concentration

## VERSATILE

- wide range of concentration (0.1 – 50 vol-%)
- wide range of particle size (5 nm – 1000  $\mu\text{m}$ )
- wide range of pH (0.5 – 13.5)
- wide range of conductivity ( $10^{-11}$  – 10 S/m)

## ...AND MUCH MORE

- characterisation of settling or high viscous samples
- on-line measurements in bypass
- fully automatic titration experiments

## PARTICLE SIZE AND ZETA POTENTIAL IN ORIGINAL CONCENTRATION BY ACOUSTIC SPECTROMETRY

ACOUSTIC SPECTROMETRY



## PARTICLE SIZE AND ZETA POTENTIAL IN ORIGINAL CONCENTRATION

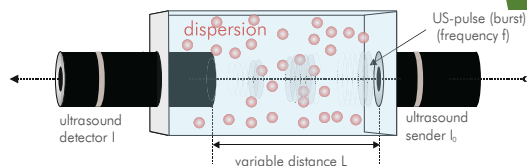
The particle size distribution and zeta potential of liquid dispersions are key parameters for estimating the dispersion quality. Therefore the choice of a suitable measuring method for the determination of those parameters plays an important role for the quality control or research and development. Especially in the field of highly concentrated dispersions a dilution of the sample, for instance, is leading to a significant change of the electrochemical properties, whereby the measured particle size and zeta potential are effected dramatically. For a representative characterisation of such concentrated suspensions or emulsions, a measurement technique is needed, allowing a macroscopic analysis of the dispersions in original state. The acoustic spectrometry provides: the determination of particle size by measurement of the attenuation of ultrasound waves in concentrated dispersions from nano to the upper micrometer range; the zeta potential is calculated from so called Colloid Vibration Current.



## EXPERIMENTAL SETUP

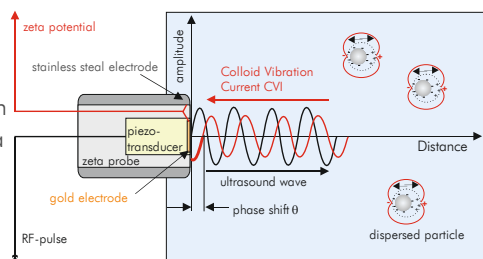
For the characterisation of concentrated suspensions and emulsions in terms of particle size distribution, the unique acoustic sensor measures the ultrasound attenuation at a set of frequencies from 1 to 100 MHz at variable gaps between sender and detector. The particle size distribution is calculated from the frequency dependence of the attenuation, using a suitable mathematical fit procedure.

- HIGH CONCENTRATION
- QUANTITATIVE TITRATION EXPERIMENTES
- NO SAMPLE PREPARATION
- FROM NANO- TO MILLIMETER-RANGE



The electro acoustic sensor generates a sound pulse of certain frequency, which is coupled into the dispersion under investigation. This yields to a relative movement of particles and therefore a displacement of electro-chemical double layers.

The resulting change in electric field is measured as a so called Colloid Vibration Current, from which the zeta potential is calculated directly.



## KEY BENEFITS

## MEASUREMENT IN ORIGINAL CONCENTRATION

The unique measurement technique of DT-1202 enables the detection of sound attenuation by using variable gap widths between ultrasound sender and detector. Therefore the maximum flexibility in terms of dispersion concentrations is provided. Either diluted ( $< 1$  vol%), as well as highly concentrated systems (up to 50 vol%) could be characterised. Due to the innovative pulse-echo method for zeta potential measurement, allowing the usage of the probe as ultrasound sender and signal detector, near-process on-line measurements in the reactor or mixing tank, inside pipelines or by just using commercially available lab beaker glasses are possible.

## FULLY AUTOMATIC AND QUANTITATIVE TITRATION

The optional available titration unit allows fully automatic titration experiments and therefore the measurement of zeta potential and/or particle size as a function of pH values or added amount of additives and surfactants.

## COMPREHENSIVE COLLOID CHEMICAL CHARACTERISATION

Besides the measurement of particle size and zeta potential, many colloidal chemical parameters, like DEBYE length,  $\kappa a$  value, DUKHIN number or surface charge density in case of highly non-polar solvents could be analysed.

## APPLICATION

Paints &amp; Coatings



Glass &amp; Ceramics



Building materials



Graphite &amp; Carbon blacks



Raw materials



Soils &amp; Sediments



## SPECIFICATION

Particle size	5 nm – 1000 $\mu$ m
Particle concentration	0.1 – 50 vol.-%
pH	0.5 – 13.5
Conductivity	$10^{-11}$ – 10 S/m
Viscosity	$< 20000$ mPas
Temperature	$< 50$ $^{\circ}$ C
Sample volume, minimum	0.5 ml (zeta potential), 15 ml (particle size)
Measurement frequency	1 – 100 MHz
Acoustic attenuation	up to 20 dB/cm/MHz
Sound speed	500 – 3000 m/s
Measurement time	0.5 – 10 min
Weight	20 kg (electronic unit), 30 kg (sensor unit)