Dispersion Technology Inc.

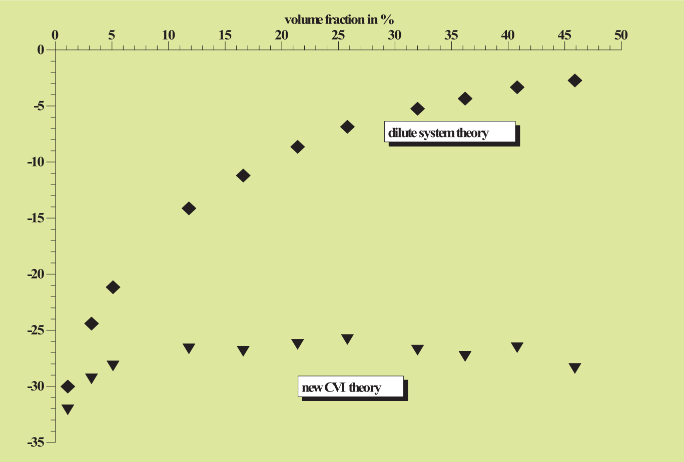
Characterization of Concentrated Dispersions and Emulsions, Liquids and Porous materials

Zeta Potential Probe:
Model DT-300 and Model DT-310 (titration included)

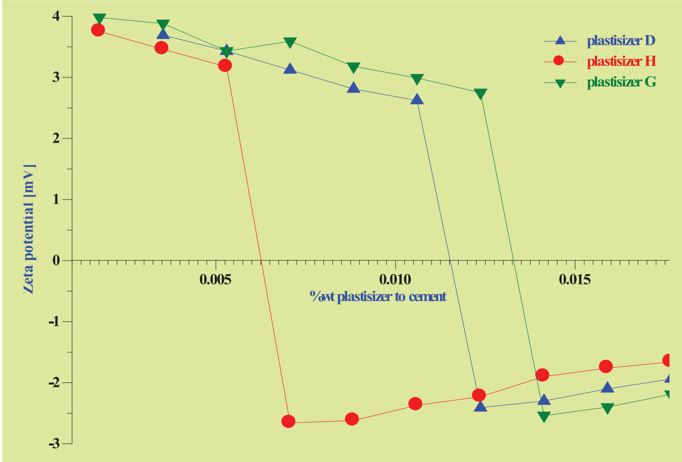
Models DT-300 and **DT-310** have a unique **Electroacoustic sensor**, which is built as a probe (see on the right) for measuring ***ζ-potential*** in concentrates without dilution. The same probe can be used for monitoring sedimentation kinetics.

There is a piezo-crystal inside of the probe that generates sound pulse of certain frequency. These pulses propagate throgh the sample via the gold central electrode. Ultrasound moves particles relative to the liquid, which displaces Double Layers and generates an electric field. This field, in turn, changes the electric potential of the gold electrode. The electric potential of the steel cylinder remains zero because it is outside of the electric field. The Electronics measures AC current flowing between the gold and steel. This Colloid Vibration Current predicted by Debye in 1933 is proportional to electrophoretic mobility, which is in turn proportional to ζ-potential. DTI has verified theory that takes into account both particle-particles hydrodynamic and electrodynamic interactions when calculating ζ-potential from the measured electroacoustic signal.

Equilibrium dilution of rutile dispersion for electroacoustic theory verification in concentrates – ζ-potential must be independent of volume fraction if dilution maintains surface-bulk equilibrium.



Example of ζ-potential surfactant titration: three cement samples at 72% wt with incremental additions of three different superplastisizers.



Available Options:

Conductivity aqueous option for measuring electric conductivity of aqueous systems within a range from 10^{-3} to 10 S/m. This probe functions at MHz range and, consequently, is not affected by electrodes polarization.

Conductivity non-aqueous option for measuring conductivity of various solvents including non-polar liquids within the range from 10^{-11} up to 10^{-4} S/m. This option is identical in function to the DT-700 model. This option requires installation of "non-aqueous option", which is important for protecting instrument sensor from aggressive solvents if they are intended to be used.

External pump for when viscous samples are monitored continuously, which can serve as laboratory prototype for on-line characterization.

Heating control option for temperature titrations.

Nominal Specifications:

Calculated parameters		Sample volume, minimum [ml]	
Zeta potential [mV]	±(0.5%+0.1)	No mixing	0.1
Debye length [nm]	±0.1	Mixing with magnetic mixer	20
		Mixing with peristaltic pump	100
Measured parameters		**Sample requirements**	
Electroacoustic signal [mV(s/g)1/2]	±1%	Volume fraction, % (1)	0.1-50
Temperature [C 0]	0 to 100, ±0.1	Conductivity	none
pH	0.5-13.5, ±0.1	pH	0.5-13
Frequency range [MHz]	1-10	Temperature [C0]	<50
Conductivity [S/m]	10^{-11} to 1, ±1%	Viscosity of media [cP] (2)	<20,000
Measurement time [min]	0.5-2	Viscosity of sample [cP]	<20,000
		Particle size [microns]	0.005-1000
		Zeta potential [mV]	none

(1) Instrument can measure electroacoustic signal well above 50% vl for dispersions and ionic current for pure liquids. However, verification of the theory is possible only for specified range.

(2) The "micro-viscosity" is important for theoretical calculation. It might be different than "macroscopic" viscosity for gels and other structured systems measured with conventional rheometers.

Physical Specifications. Electronic unit: weight 20 kG, Power 100-250 VAC, 50-60 Hz.
Software: embedded Windows HP, MS Ofice optional.

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