Dispersion Technology Inc.

Characterization of Concentrated Dispersions and Emulsions, Liquids and Porous materials

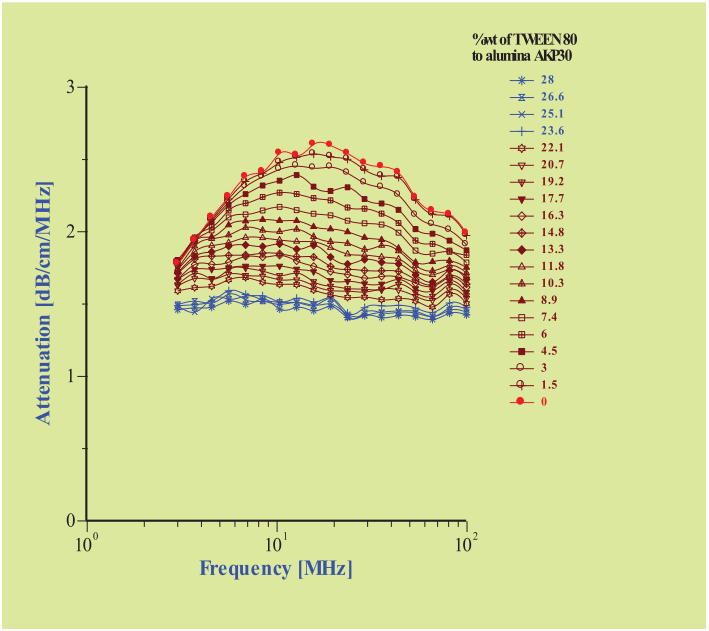
Model DT-100 Acoustic spectrometer: Particle sizing in concentrates.

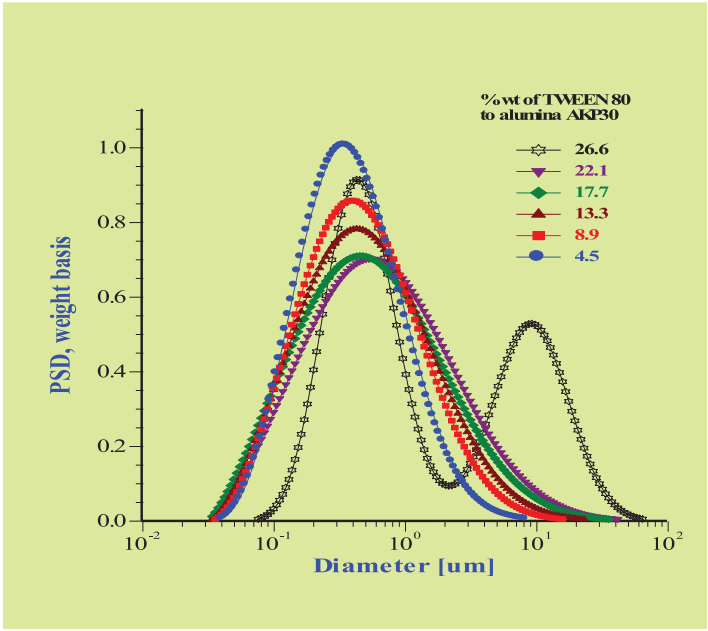
Model DT-100 has a unique Acoustic sensor for characterizing *particle size distribution* by measuring ultrasound attenuation at set of frequencies from 1 to 100 MHz, as well as sound speed. This method can be referred to as ***"ultrasound scattering"***.

Application of ultrasound instead of light allows characterization of concentrated opaque sample as is, with no dilution or other sample preparation.

Calculation of particle size distribution from the measured attenuation spectra takes into account particle-particle interaction, which is imperative in concentrated systems.

The same ultrasonic raw data can be used for calculating compressibility, elastic modulus and longitudinal viscosity of any liquid sample, when Rheological option is installed.





Available Options:

Titrations option with one or two burettes allows conducting complicated experiments involving modification of chemical composition of the liquid medium according to a certain protocol. There are several different types of protocols available: “pH ramp”, “pH stat”, “surfactant titration”, “temperature titration”. Titration “pH ramp” allows scanning of a certain pH range in single or multiple sweeps. Titration “pH stat” monitors amount of a particular reagent that is required for maintaining given pH. Surfactant titration reflects changes in particle size distribution with incrementally increasing surfactant concentration. It is used for determining optimum surfactant dose. Temperature titration requires installation of “heating control option”, which would allow performing T sweeps within a range from room T up to 50 C.

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 electrode 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.

Rheological option allows calculation of high frequency (MHz range) longitudinal rheological parameters such as compressibility, elastic modulus, viscosity, and performs test on Newtonian nature of the liquid sample.

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

Nominal Specifications:			
Calculated parameters		**Sample volume, minimum [ml]**	
Mean size [microns]	0.005-1000	No sedimentation, no mixing	15
Weight fraction	±0.1%	Mixing with magnetic mixer	70
Compressibility E10[1/Pa]	±0.003	Mixing with peristaltic pump	150
Bulk viscosity [cP]	±0.01		
Measured parameters		**Sample requirements**	
Temperature [C 0]	0 to 100, ±0.1	Volume fraction, % (1)	0.1-50
pH	0.5-13.5, ±0.1	Conductivity	none
Frequency range [MHz]	1-100	pH	0.5-13
Ultrasound attenuation [dB/cm/MHz]	0 to 20, ±0.01	Temperature [C0]	<50
Sound speed [m/sec]	500 to 3000, ±0.1	Viscosity of media [cP] (2)	<20,000
Conductivity [S/m]	10^{-11} to 1, ±1%	Viscosity of sample [cP]	<20,000
Measurement time [min]	0.5-10	Particle size [microns]	0.005-1000

(1) Instrument can measure attenuation well above 50% vl, but verification of the theory for computing particle size is not possible above this limit.
(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, sensor unit 30 kG. Power: 100-250 VAC, 50-60 Hz, <300 W. Software: embedded Windows HP, MS Office optional.

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