

BP-D5

Automatic Dynamic Surface Tensiometer (Bubble Pressure Method)



Why dynamic surface tension is required?

“Surface tension properly low, but during the actual coating process, the wetting result was insufficient.” Have you ever faced this dilemma?

For instance, coating agents generally include surfactants to control their wettability to materials by lowering surface tension, and the surfactants can adsorb toward the solution surface gradually, changing the surface tension of the solution over time. Thus, surface tension has to be studied in the function of time if the target solutions include surfactants.

The widely-known Wilhelmy plate method and du Nouy ring method measure surface tension under conditions in which the surfactant adsorbing has equilibrated, called Static Surface Tension. But coating solutions are in constant change, with surfactants continually adsorbing to new surface and bulking up as micelle. In such conditions, the speed at which surface tension drops, via the time function Dynamic Surface Tension, becomes important. The BP-D5 allows measuring Dynamic Surface Tension with its Bubble Pressure technique.

Functions

- Lifetime^{*1} can be changed automatically to draw variations over time in a single process.
- Real time display of the bubble pressure waveform for monitoring of bubble generation.^{*2}
- One-touch adjustment of the probe's immersion depth and starting measurement.

^{*1}: Please refer to the explanation of the Lifetime on the next page under Measurement Principle.

^{*2}: The stability of the bubble generation is important for accurate measurement, which the waveform can show.

Measurement Principle

When pressurized air flows constantly through a capillary, the pressure inside the capillary changes in a regular cycle. → (a) to (d).

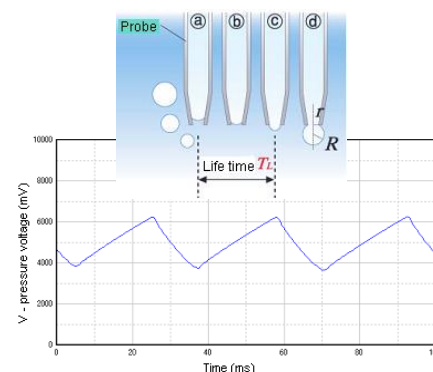
When the radius of curvature of the bubble R equals the radius of capillary's outlet r the pressure will reach its maximum. → (c)

The cycle from (a) to (c) is called lifetime or surface age.

Then the size of the bubble increases quickly, while the bubble pressure decreases, until the bubble finally detaches from the capillary. → (d)

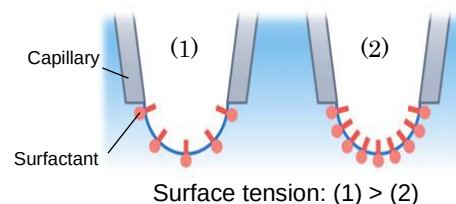
The cycle from (c) to (d) is called deadtime.

A new bubble forms and a new bubble formation cycle from (a) to (d) begins.



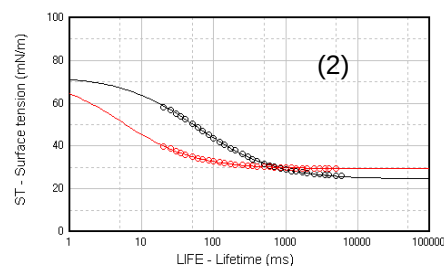
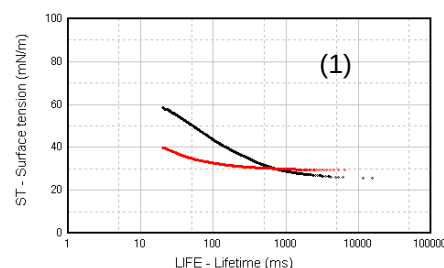
The bubble pressure method measures the maximum pressure and determines the surface tension using the Laplace equation.

The quantity of surfactants which adsorbs on the bubble surface during the lifetime reduces the surface tension.



Software Performances

- Displays the row data of the measurement results in real time. → (1)
- Applies the fitting method according to Hua & Rosen to extrapolate the surface tension right after bubble generation and at equilibrium. → (2)
- Displays up to 11 data samples on a single sheet for comparison.
- Stores data in CSV file format for easy export of data to and handling and treatment in MS Excel.



Applications

- Surfactants: Study of fundamental properties
- Inks, coating agents: Instantaneous wettability
- Fountain solution in offset printing: Adsorbing speed of surfactants
- Aerosol, emulsion: Instantaneous generation of small droplets
- Detergents, Extinguishants: Initial foaming

Specifications

	BP-D5
Measurement method	Maximum bubble pressure
Measurement range	Surface tension: 10 to 100 mN/m Surface age: 20 to 5000ms, Fixed surface age mode: 20 to 1000ms
Resolution	Surface tension: 0.01mN/m, Lifetime: 0.1ms
Repeatability	0.5mN/m (in terms of standard deviation based on manufacturer's standard)
Measurement temp	10 to 70 °C (a separate refrigerated/heating circulator is required)
Sample volume	About 80mL
Sample viscosity range	0.5 to 10mPa·s
Instrument dimensions (WxDxH)	320 x 315 x 475 mm
Instrument Weight	About 18.5 kg
Power supply	AC 100 to 240V, 50/60Hz, 50W, 80VA
Utilities	Clean dry and oil-free pressurized air at 0.4 to 0.7Mpa
Operating Environment	Temperature: +10 to 35 °C, humidity: 30 to 80 %RH (non-condensing) Positioned away from sources of electrical noise and vibration

* The specifications and designs are subject to change without notice.

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