

Thermo Scientific DCA Radian analyzers series (formerly sold under the CAHN brand) offer powerful and versatile approaches to the comprehensive understanding of the complex interactions at liquid-liquid and liquid-solid surfaces.

Thermo Scientific DCA Radian Analyzers



Applications:

- Films/Fibers
- Textiles
- Powders
- Composites
- Adhesives
- Biomedical Polymers
- Inks
- Paints
- Oil Recovery
- Shampoos
- Detergents
- Pharmaceuticals
- Eye-Care Products
- Moisture Barriers

Whether you need to improve adhesion, apply a coating or modify a surface, a Thermo Scientific DCA Radian system provides solutions for:

- Surface energies, wettability, cleanliness and topographical homogeneity of solid sheets, films, and fibers
- Surfactant analysis with the automatic Critical Micelle Concentration (CMC) program
- Dry material absorption, wicking rate
- Contact angle of powders, Washburn Method

Dynamic Contact angle

Automated dynamic contact angle (DCA) instruments overcome the limitations of static contact angle measurement devices by measuring much larger surfaces on liquid solutions rather than single drops on a plate. This eliminates the risk of concentrated contaminants or incomplete profiles. DCAs operate by holding a plate in a fixed vertical position, attaching it to a microbalance and moving a probe liquid contained in a beaker at constant rate up and down over the plate. A unique contact angle hysteresis curve is produced by the microbalance as it measures the force exerted by the moving contact angle in advancing and receding directions.

The dynamic contact angle is then calculated from the modified Young's equation (Wilhelmy equation): $\cos \theta = \text{Force} / (\text{surface tension} \times \text{wetted perimeter})$.

This system can be applied to most solid surfaces including single fibers as small as 1 μm in diameter. Contact angle measurements obtained by a Thermo Scientific DCA range from 0° to 180° with a precision of ± 0.001 .

Wetting is an effect commonly characterized by a zero, or close to zero, contact angle that allows a liquid to easily spread over a solid surface.

Automatic Critical Micelle Concentration (Auto CMC) Accessory Features and Specifications

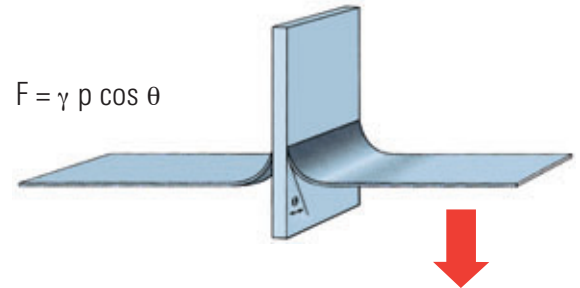
- Fully automated "smart" system operation
- Programmable, serial or fast dosing
- Bi-directional (clockwise and counterclockwise) stirring
- Unique direct contact circulation
- Closed loop temperature control via remote sensor
- Real-time statistical analysis and control

Specifications	DCA Radian 322	DCA Radian 315
Measurement Range:		
Surface Tension	0.1-500 mN/m	1-1000 mN/m
Contact Angle	0-180 degrees	0-180 degrees
Measurement Precision:		
Surface Tension	± 0.0001 mN/m	± 0.001 mN/m
Contact Angle	± 0.001 degrees	± 0.01 degrees
Balance Precision:	0.1 μgram	1 μgram
Sample size:		
Max Weight	3.5 grams	100 grams
Max Diameter	75 mm	75 mm
Min Fiber Diameter	0.001 mm	0.1 mm
Stage Travel:		
Total Range	70 mm	70 mm
Programmable Range	40 mm	40 mm
Resolution	0.0001 mm	0.0001 mm
Max Speed	264 $\mu\text{m}/\text{sec}$	264 $\mu\text{m}/\text{sec}$
Min Speed	2 $\mu\text{m}/\text{sec}$	2 $\mu\text{m}/\text{sec}$
Temperature Range:	-10°C to 100°C	-10°C to 100°C

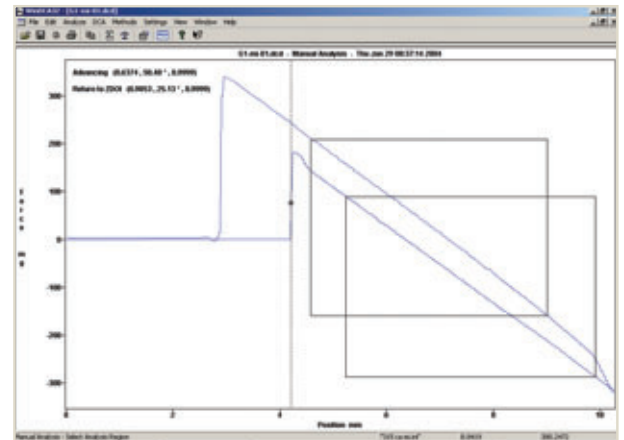
Surfactant Analysis

The unique ability of a surfactant or "surface active agent" to diffuse to the surface of a liquid, adsorb to the surface and subsequently lower the surface tension of the solution has resulted in the widespread use of surfactants as additives in many products. A surfactant molecule works by orienting its polar and apolar head and tail groups at the air/liquid interface. When present in sufficient quantities, surfactant molecules can aggregate to form clusters or "micelles" which prevent further changes in the surface tension of the liquid solution.

The concentration of the surfactant when micelle formation occurs is characteristic of the "critical micelle concentration" (CMC) of the solution. Adding more surfactant beyond the CMC cannot only destroy the effectiveness, but also can significantly increase the cost of the formulation. Many products benefit from the addition of surfactants, including shampoos, detergents, pharmaceuticals, eye-care products, paints and inks. Surfactants can even be impregnated into the non-woven inner liner of a baby's diaper to increase and accelerate the absorbency of the diaper while creating an effective moisture barrier.



$$F = \gamma \rho \cos \theta$$



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