TURBISCAN *ma* 2000

Applications

- Sedimentation
- Creaming
- Phase separation
- Flocculation
- Coalescence
- Stability
- Particle characterisation (mean diameter, density)

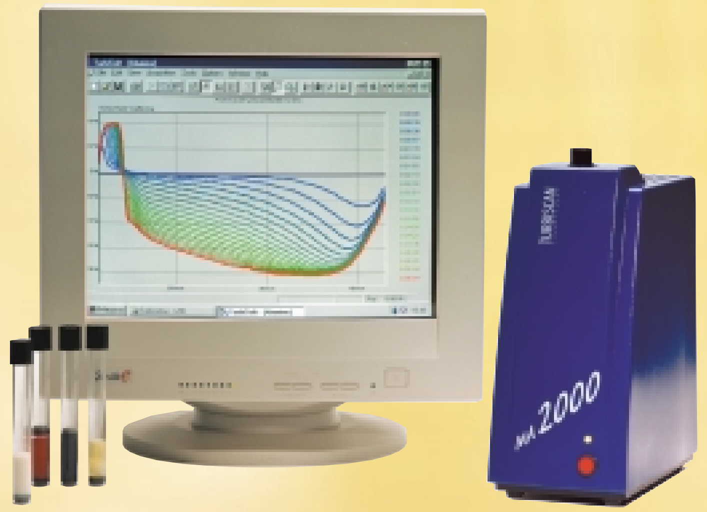
The TurbiScan MA 2000 is designed as a formulation and a product stability control tool. The early stage detection allows to quickly correct formulations and to shorten ageing tests. The kinetic analysis visualisation is the only way to document stability studies in an easy to interpret format. Providing information about the mechanisms involved in a destabilisation, the TurbiScan MA 2000 allows to fully understand these physical processes and to apply the proper correction to the formulation.

From a simple stability control to a quantified analysis of physical destabilisation, the TurbiScan MA 2000 is the perfect tool to formulate and control the quality of concentrated dispersion and emulsion.

Applications fields

- Pharmaceuticals
- Cosmetics
- Agro-Food
- Detergents
- Glues and varnishes
- Polymers
- Waste-water treatment
- Paints and cements
- Pigments and inks
- Agro-chemical
- Petroleum and lubricants
- Bio-chemistry
- Paper & Textiles
- Photography

Application notes are available on demand.



Customers

Some of the major companies relying on instruments developed by FormulAction : Elf-Atochem, Fuji-Xerox, Henkel, Hutchinson, L'Oréal, Merk, Mobil, Nestle, Novartis (Ciba-Geigy), PPG Industries, Procter & Gamble, Rhône-Poulenc ...

TURBISCAN *ma* 2000

Features

Acquisitions

One acquisition every 40 µm along the 80 mm scan height
From one scan every 20 seconds to one scan per day in automatic mode
Up to 400 programmable measurements
Calibration : physical measurement with external standards,
an automatic calibration is then performed before each scan.
Quality Control : standards provided on demand
Repeatability : absolute incertitude for manual measurements ≤ 0.5%
absolute incertitude for automatic measurements ≤ 0.1%

Software

- Windows 95, 98 and NT compatible (year 2000 compatible)
- Date and time : automatic and programmable
- Setting program : acquisition frequency and number
- Data transfer : copy / paste raw curves or kinetic curves
- Visualisation modes : T or BS only, T and BS superimposed or separated, evolution of BS or T as a function of time, evolution of λ or λ* as a function of time, cream or sediment layer thickness as a function of time...

Wide measurement range

- concentration : 0 to 60 % v/v
- particle diameter : 0,1 to 1000 µm

Specifications

Reading head TurbiHead

Emission : pulsed infrared light source (850 nm)
Detection : transmission & backscattering photodiodes

Measurement cells

5 ml glass cells, Teflon bottom plug with Viton O-Ring, Teflon cap

Minimum computer configuration

IBM-compatible computer (minimum 486DX33 8MbRam)
Microsoft Windows 95,98, NT

Communication link

RS 232 C interface

Ergonomics and Safety

Designed to work in lab work conditions and easy to maintain. CE

Dimensions :

Height 27.5 cm, Width : 13 cm, Depth : 23.5 cm, Weight : 5 kg

Please ask for other Formulaction products :
On Line measurement, ageing station...

DISTRIBUTOR

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A NEW CONCEPT OF ABSOLUTE PHYSICAL MEASUREMENT

TURBISCAN *ma* 2000

Concentrated

dispersion & emulsion

stability
and instability
analysis

Formulation and quality control of

- **emulsions**
- **suspensions**
- **foams**

FormulAction

TURBISCAN *ma* 2000

Detects concentrated dispersion nascent destabilisation's phenomena and unravels their mechanisms

to improve formulations, shorten and document ageing tests.

Without dilution, it operates on emulsions, suspensions and foams:
Up to 60% v/v concentrated
From 0.1 µm to 1 mm particle size

HOW IT WORKS ?

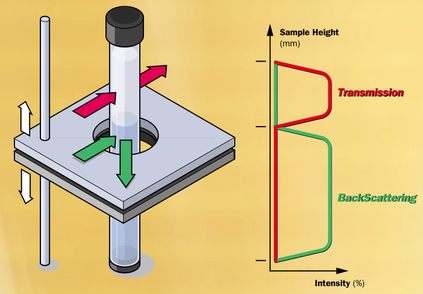
Multiple light scattering measurement for concentrated dispersion analysis

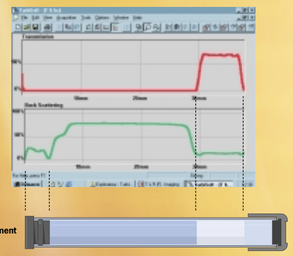
This vertical scan macroscopic analyser *consists of a reading head moving along a flat-bottomed cylindrical cell, while scanning the entire sample height. The reading head itself consists of a pulsed near infrared light source and two synchronous detectors:*

-The transmission detector picks up the light transmitted through the product,

-The backscattering detector receives the light backscattered by the product (135°).

The reading head acquires ***transmission and backscattering data*** *every 40 µm on a maximum height of 80 mm. The profile obtained characterise the product homogeneity, particles concentration and mean diameter. It is represented on the software screen by a curve showing the percentage of backscattered or transmitted light as a function of the sample height (in mm).*
The acquisition along the product is then repeated with a programmable frequency to obtain a superimposition of product fingerprints characterising ***the stability or instability*** *of the product, whether they are* ***identical or not.***





Multiple Light Scattering Theory

The measurement performed allows the quantification of the physical processes involved :
backscattered (**BS**) and transmitted (**T**) light fluxes measured depend respectively on the ***mean path length of photons in the dispersion*** **λ** and **λ***. These physical absolute parameters, depending on particle diameter **d** and volume fraction **Φ**, give information on the real state of the dispersion (no dilution required).

$$BS \approx \left[\frac{dh}{\lambda^*}\right]^{1/2}$$

dh *= detection area height*

$$T \approx exp\left[-\frac{ri}{\lambda}\right]$$

ri *= measurement cell internal radius*

$$\lambda^* = \left[\frac{2d}{3\Phi(1-g)Q_s}\right]$$

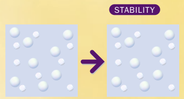
g(d) *= Assymetry factor*
Qs(d) *= Scattering efficiency factor*

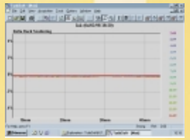
$$\lambda = \left[\frac{2d}{3\Phi Q_s}\right]$$

Destabilisation Phenomena Characterisation

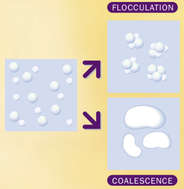
Dispersions instability is often the result of two different physical processes :
Particle size increase (droplets or aggregates) due to coalescence or flocculation phenomena,
Particles migration within the samples leading to creaming or sedimentation.
The TurbiScan MA 2000 performs a kinetic analysis allowing the detection of these phenomena at an early stage.

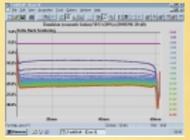
Stability
If no particule size or volume fraction change occurs, BS & T remain constant (all the profiles superimpose).



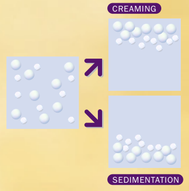


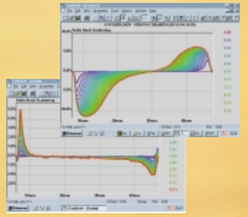
Particle size variation
Particule size variations (flocculation or coalescence) induce λ* or λ changes, and therefore BS & T variations on the whole height of the sample.





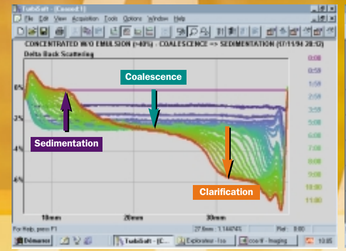
Particles migration
Particules migration phenomena (creaming or sedimentation) induce particle volume fraction changes at the extremities of the sample.
By following the migration front, ***Turbiscan MA 2000*** allows the calculation of the migration rate.

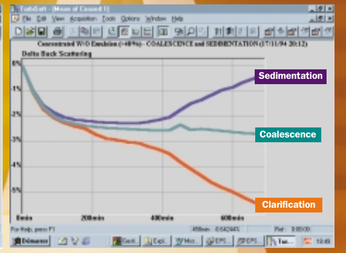




Application examples

Destabilisation understanding

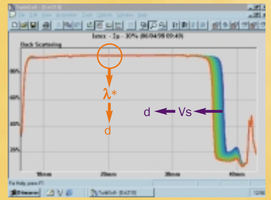




Coalescence and sedimentation of a concentrated cosmetic emulsion
(O/W, **Φ** = 40%)

The TurbiScan MA 2000 detects the destabilisation 20 times earlier than the naked eye.
Moreover, it allows to fully understand the destabilisation causes : here the coalescence phenomenon occurs first, resulting in big droplets which sediment.

Quantification

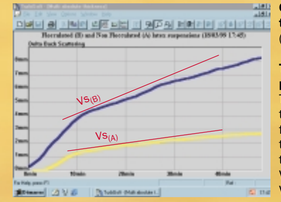


Latex suspension analysis
(Φ = 10 %, $d_{(manufacturer)}$ = 2.03 µm)

The TurbiScan MA 2000 allows to calculate the particle mean diameter :

- by measuring λ* in the sample heart (BS = 95 %, λ* = 96 µm) : d ≈ 1.9 µm
- with the settling rate measurement (shift velocity of dispersion/continuous phase interface ,Vs ≈ 8.3 10^{-8} ms^{-1}) : d ≈ 2.1 µm
  (General Law of Sedimentation, Snabre, Mills, 1994)

Comparison



Compared sedimentation of two latex suspensions
(**Φ** = 10 %)

The TurbiScan MA 2000 gives an easy to access picture of products behaviour comparison.
The drawn kinetics give the thickness evolution of the clarification phase (in the sample top) as a function of time. Due to the flocculation of the particles in the B product, their settling rate is bigger than for the A product.
Vs (A) = 8.3 10-8 ms-1 : d (A) = 2.0 µm
Vs (B) = 42 10-8 ms-1 : d (B) = 4.7 µm
d (B) is the equivalent diameter of the sphere which settles at the same speed than the floc.

User friendly interface

Functions
The acquisition program allows the analysis of products which destabilise very quickly (1 scan every 20 seconds) and quality control of stable products (1 scan per day).
Integration modes are available to draw the destabilisation kinetics : BS and T mean value variations as a function of time to analyse destabilisation intensities, peak thickness (particle migration distance) as a function of time to analyse sediment or cream layer thickness evolution.
An easy operation to directly overlay many kinetics allows the comparison of different products destabilisations.

Conviviality
All treatments can be saved (zoom, kinetic curves,...). Kinetics of reference products can be saved as templates, and easily compared with others analysis (ex : visualisation and selection of formula more or less stable than the reference).