Formulaction
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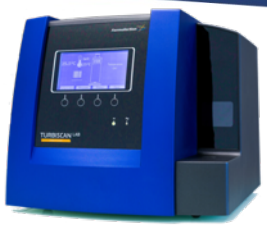
TURBISCAN LAB



Particle size vs stability

- A unique technology to cover all your needs -

RAW MATERIALS

Introduction

Particle size of dispersions is a key parameter for end-use properties in many industries: coverage of paint, quality of sunscreens, vaccine efficiency, ink colors and intensity, etc. Particle size is also essential for shelf-life determination and it can give indication for the quality of the dispersion. However, validating stability based simply on the particle size studies can be misleading and this study shows the limitation of particle size analysis in determining dispersion stability. It compares particle size measurements to the Turbiscan® stability data, the leading technology in the direct stability measurement.

KEY **BENEFITS**

ONLINE

NO DILUTION

FAST

How it works

Turbiscan technology, based on Static Multiple light scattering (SMLS), consists on illuminating a sample with an infrared light source and acquiring backscattered (BS) and Transmitted (T) signals.

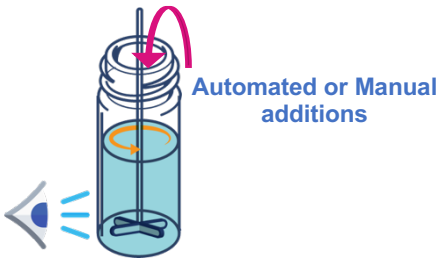
$$BS\ and\ T = f(\varphi, d, n_p, n_f)$$

The signal is directly linked to the particle's concentration (φ) and size (d) according to the Mie Theory, with refractive index of continuous (n_f) and dispersed phase (n_p) being fixed parameters. The measurement of the BS and T can be performed either on scanning mode, to provide homogeneity and stability measurement, or with very high frequency for fast time resolved and online measurement.

The measurements are done without any dilution & on native sample.

Additionally, the Turbiscan can be associated with 2 dispersing tools allowing to increase its capabilities:

- T- MIX for automated fast formulation screening with a stirring bar directly inside the measurement cell. **Subject of this note.**
- T-LOOP for online measurements and scale up or process optimizations. (see Notes Flow 4-6).



Experiment and method set up

In the application note TS-FLOW-02, the Turbiscan was used to determine the best dispersant between SDS, CTAB, and DG for a TiO_2 powder dispersion in water at 0.5wt%. Both nature and concentration were studied with the Turbiscan® via a **non-dilution, online and ultra-fast** measurement of TiO_2 particle size (0.5 wt% in water). The table 1 hereunder presents the results of this primarily study.

Table 1: Dispersing agent, optimal concentration to reach the minimum particle size for TiO_2 suspension in water

Sample	Manufacturer Name	Optimal Dispersant conc.[%]	Initial d_{SMLS}
DG	Decyl glucoside	0.9	0.98
CTAB	Hexadecyltriammonium bromide	0.8	1.02
SDS	Sodium dodecyl sulphate	1.0	0.94

This preliminary study can be used to define the best surfactant and/or adjust the dispersant concentration for the specific formulation. It is worth noticing that particle size achieved is within the same range (approx. 1µm) thus, similar stability should be expected.

The suspensions are then prepared (TiO_2 at 0.5wt% in water) with the optimal concentration listed in the table1 and measured directly in the cell with the Turbiscan using the via online dispersing tool T-MIX. The study can be done without any sample preparation nor dilution, in *scan mode.* The "scan mode" acquires BS and T in function of sample height in order to detect destabilizations (migration and particle size growth). The scans are repeated every 10 min for approx. 10 hours.