



## Complete emulsion optimization - Surfactant concentration screening -

### Introduction

In the formulation process, once the surfactant is selected, the concentration corresponding to the minimum cost /efficiency ratio still needs to be adjusted. The Turbiscan®, is the leading technology in direct stability measurement and thus can be a perfect solution to rapidly define the optimum concentration that preserves highest efficiency with low cost and ensures long shelf life. With its new capabilities to measure particle size with no dilution, online directly in the measurement cell, the Turbiscan becomes a full characterization tool for rapid formulation optimization without user intervention during analysis. This application papers shows how the Turbiscan LAB, associated with T-LOOP module, helps select the right surfactant concentration by reaching required size and stability properties.

### 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.

$$BS \text{ and } T = f(\phi, d, n_p, n_f)$$

The signal is directly linked to the particle's concentration ( $\phi$ ) 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. (see Notes Flow 1-3).
- T-LOOP for online measurements and scale up or process optimizations. **Subject of this note.**

### Experiment and method set up

Aim of the work: Study the impact of Tween 20 concentration on the emulsification properties and stability of a 20% O/W emulsion.

The emulsion type: 20% O/W emulsion stabilized with Tween 20 at different concentrations from 0.25% to 1.5%.

Sample preparation: A Pre-Mix of water and surfactant is prepared under magnetic stirring for couple of minutes. The oil is then added to the Pre-Mix under agitation and Sonication for 10 minutes.

Sample analysis: Particle size measurement is done via SMLS and directly during agitation, using the **T-LOOP** module to monitor the online emulsification process (the kinetics of droplet size reduction). The measurement frequency is set at 10 measurement per seconds.

After 10 minutes, the samples are placed in the 20 mL vial and placed in the Turbiscan set in **scan mode** for stability measurement.

