TURBISCAN

Fragrance and Stability in H&PC

Fast and quantify stability comparison

Givaudan

INTRODUCTION

Today most of Fabric Care products are liquid dispersions (laundry liquid detergent, liquid fabric softener, laundry gel, etc.) These products are constituted of many ingredients but are known to be kinetically stable. This means that the mixture remains stable through the whole shelf life without any instability signs like phase separation, cloudiness and flocculation etc. The fragrance and/or microcapsules play an important role in the product quality perception by the consumers. However, adding the fragrance into this already complex mixture can easily cause stability problems.

The Turbiscan™ technology is a complete tool that enables to detect variations in bothclear and opaque samples. The variations are due to the particle and micelle movements and so are representative to the kinetics of destabilization (flocculation, sedimentation, phase separation etc.). Turbiscan™ can detect these phenomena hours or even weeks before the visual control conclusions.

FAST **QUANTIFIED DESTABILIZATION** **SENSITIVE**

Reminder on the Technique

Turbiscan instrument, based on Static Multiple Light Scattering, consists on sending a light source (880 nm) on a sample and acquiring backscattered and transmitted signal. Combining both detectors (BS & T) enables to reach wider concentration range. The backward reflected light comes from multiple scattering (photons scatter several times on different particles or drops).

This signal intensity (BS) is directly linked to different parameters, according to the Mie theory :

$$BS \text{ and } T = f(\varphi, d, np, nf)$$

Method

In this application note, 2 different studies are shown:

- Fragrance stability in a heavy-duty liquid detergent
- Study of instability reason in liquid detergent formulation

Fragrance Stability in a Heavy-Duty Liquid Detergent

The aim of this study is to limit the effect of the fragrance on the final stability. Three emulsions are studied:

- Stable un-perfumed liquid detergent (use as the target)
- Liquid detergent with original perfume
- Liquid detergent with optimized perfume

All formulations are analyzed using the Turbiscan technology at 45°C during a period of 7 hours, the following graph is obtained.

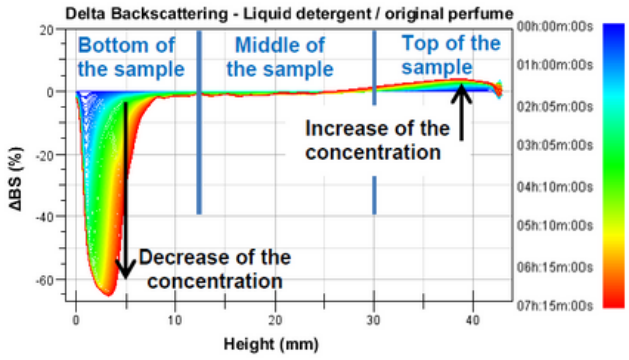

Figure 1: Backscattering variation for sample with original perfume

From the graph in Figure 1, we can observe a phase separation of the emulsion. At the bottom of the sample (left of the graph) light intensity decreases meaning that the oil concentration decreases. At the top of the sample (right of the graph) light intensity increase is observed corresponding of the oil creaming.

It is possible to monitor the destabilization kinetics in the samples versus aging time, thanks to the Turbiscan Stability Index (TSI). It sums all the variations detected in the sample (creaming, clarification, size variation and quantifies it with a single number. At a given time, the higher the TSI, the worse the stability of the sample .

Fragrance and Stability in H&PC

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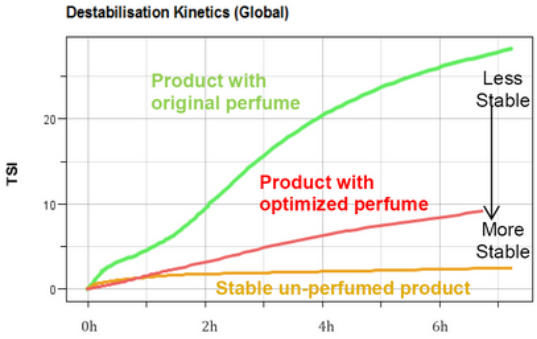

Figure 2 : Turbiscan Stability Index for all samples

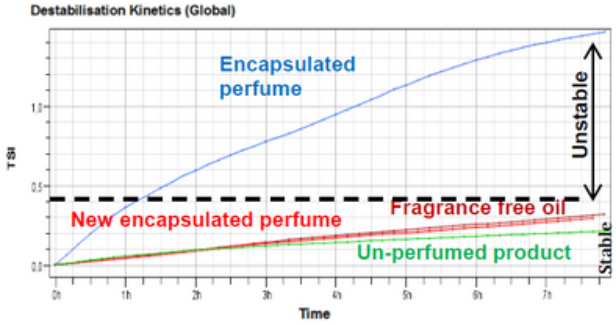

Figure 3 : Turbiscan Stability Index for all samples

Sample	TSI (7 hours)
Original Perfume	26
Optimized Perfume	8.4
Un-perfumed	2.3

Table 1 : Turbiscan Stability Index values for all samples

Sample	TSI (7 hours)	TSI (1 hour)
Encapsulated Perfume	1.4	0.38
New Encapsulated Perf.	0.3	0.07
Fragance free oil	0.3	0.07
Un perfumed product	0.2	0.07

Table 2 : Turbiscan Stability Index values for all samples

As observed on Figure 2 and Table 1, the original perfume affects significantly the stability of the formulation. Consequently, the fragrance was optimized to reach an acceptable level of destabilization according to the internal criteria. Thanks to the Turbiscan™ and the automatic computation of the TSI, the most stable fragrance formula in the liquid detergent base was identified in only few hours as compared to days or weeks with visual observation.

Study of instability reason in liquid detergent formulation

In this second study, an unstable liquid fabric softener has been investigated in order to identify the reason of the instabilities. The destabilization can be observed visually, a phase separation appears and so the fragrance-free oil and the encapsulated perfume are floating at the top of the samples after few days of storage at 37°C.

The formulation is constituted of:

- Fragrance free oil
- Encapsulated fragrance
- Unperfumed base of the liquid softener

All the ingredients are analyzed with the Turbiscan for 7 hours The TSI (Turbiscan Stability Index) is automatically computed from the software , the following graph is generated.

Only 7 hours it was possible to identify that theencapsulated fragrance is the main cause of the instability. However, after just 1 hour the same conclusion could be made. Based on this information, the fragrance system was modified and so the instability issue solved. In Figure 3 and Table 2, we observe that the new fragrance system provides stable product.

CONCLUSION

Turbiscan™ provides quick and simple method for characterization of the fragrance effect on stability. It was also possible to rapidly identify the reason of instabilities in a formulated product by analyzing each phase separately. Thanks to the generated data, the issue was corrected and the product improved.