

FLAVORS & FRAGRANCES MEASUREMENT PROCEDURE

Overview

There has been an increase in demand for flavors and fragrances with an estimated annual growth of 4.5%. This growth results in the increase of quality checks for flavors and fragrances when it comes to parameters like color, taste, texture and aroma amongst others. Years of experience is required to acquire the skills of qualifying the above parameters which can be very challenging. Fortunately, color is one of the parameters which can be quantified using instrumental means, thus allowing food technologists to numerically determine the color differences or changes easily. This also enables the qualification process of colors to be much simpler.

Flavor and fragrance ingredients are primarily tested for their taste and smell functionality, but color is another test parameter increasing in criticality over the years. Most major manufacturers implements color control as a standard control procedure to ensure consistency in products' quality, as inconsistent color might mean poor quality and inferior products to consumers.

Color measurement can be conducted at various stages, the initial raw stage, the product in process stage and the finished product stage.

In this paper, we are going to share some of the tested and proven practices being used in the industry and also highlight certain challenges faced by technologist and the solutions to these challenges.

Liquid Color Flow Test



This test is applicable to majority of the products in the liquid transparent state, with variants in yellowish tones.

This color testing system can be incorporated into existing systems particularly for flavor products, where samples are first evaluated for its density and refraction values which are fed via an auto-sampler system. Flow

tubes ending after the refraction test unit can be connected to a color system, whereby the samples run through a flow cell in the color system.



This allows the liquid sample to flow through the whole system without disruption, into and out of the flow cell allowing the color system to monitor the color of the product. The Konica Minolta [Spectrophotometer CM-5](#) is one such color system which will allow automatic measurements of the transparent liquid samples easily. Accessory like the flow cell below are required to ensure quick and easy color assessment.

The flow cell and the in-out tubes are placed into the transmittance chamber of the Konica Minolta Spectrophotometer CM-5 and held securely in place using the CM-A96 Transmittance Specimen Holder or some other customized holder.

The color measurements can then be conducted automatically via the system software at predefined intervals allowing the chemist to monitor color variations of the liquid over a specified period. The usual zero and clear calibrations can still be carried out easily with this flow cell.

The above color system can be implemented into most flavors and fragrances testing system easily without major modifications.

Manual Color Test

Viscous Liquid

The above liquid color flow test can be automated because the product is fluid enough to flow through the flow cell for automatic measurement, however this may not be possible for some product types.

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For transparent liquid samples that are more viscous, using the flow cell for automatic measurements may not be possible. Instead, an open top cell / cuvette should be used to fill up the cell with the viscous sample. Do note that this however has to be measured manually.

Turbid Liquid

For liquid samples with certain level of turbidity, care must be taken while still using the transmittance mode of measurement. Different cell holders and open cells sizes similar to those below maybe required, depending on the type of application, to help the users conduct the measurements with ease.

In the flavour and fragrance industry, it is very common to work on samples of minute quantities. Therefore, the Konica Minolta CM-5 system also offers solution with cell holders and measurement procedures meant for such small quantity sample type.



Small Quantity Cell Holder

Cells of Different Sizes

Standard Cell Holder

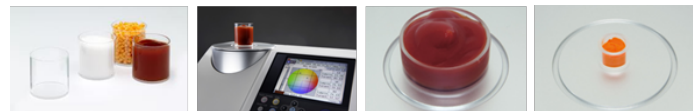
However, if the transmittance mode of measurement does not give good representable results, it may be an indication that the sample is not suitable to be measured in the transmittance mode due to its translucent or turbidity level. Under such circumstances, switching to the reflectance mode of measurement would be better.

Depending on the instrument design or type, it is important to carefully select the correct type of cuvette or cell to be used, so as to reduce or prevent edge loss if possible. For such cases, only manual measurement is possible and in some cases, a white background is recommended to be used during measurement.

Opaque Liquid

Apart from measuring small quantities of transparent liquid samples, the Konica Minolta Spectrophotometer CM-5 also caters to the measurement of small quantities of opaque liquid, paste or powder samples using accessories like the mini petri dish.

For opaque liquid samples, the reflectance measurement mode is a must to be used together with petri dishes or tube cells accessories like those shown below.



Tube Cells

Top Port Design

Petri Dish

Mini Petri Dish

At times, there are even situations where certain samples need to be measured using its original glass storage containers and this is also made possible with the CM-5 top port design, which made such measurements easy and quick.

Though the color system is used primarily for the evaluation of color differences in a product, it can also be used as an indirect indicator of change to the flavour and fragrance products when exposed to storage, shelf life, performance and stability evaluation testing.

Conclusion

Flavors and fragrances industry is well-positioned to experience a period of sustained growth backed by emerging markets consumption boom, coupled with R&D investments in health and wellness solutions and some niche areas like ethnic flavors.

At the same time, the evolving markets are requiring flavors and fragrances companies to focus, more than ever to stay attuned to consumer trends.

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The above test procedures are just some recommendations for food technologists or R&D scientists to look into and help them speed up their testing process in order to stay ahead of competitions.



For more information on the Spectrophotometer CM-5 and the SpectraMagic NX Pro Software, kindly visit the following web sites for more information.

Spectrophotometer CM-5

<http://sensing.konicaminolta.asia/products/cm-5-spectrophotometer/>

SpectraMagic NX Pro Software

<http://sensing.konicaminolta.asia/products/spectramagic-nx/>

Alternatively, you can email to us at ssg@konicaminolta.sg or call us at 65 6895 8685 to find out more from our light & color team on the product capabilities or to have a no-obligation discussion with our application specialists to help you select the appropriate models for your specific application.