UV/VIS Application Note

Gardner Color

Introduction

Manufacturers of clear, colorless and transparent liquids count the color on APHA/Pt-Co/Hazen scale to assure the purity and aesthetic appeal of their products. Beyond the yellowness measured by APHA, yellow to brown/red liquids in samples such as rosins, fatty acids, polymerized fatty acids, drying oils, varnishes and related products are suited for measuring Gardner color scale.

This application provides precise way for measuring the Gardner color of products in the range 1 to 18. As the standard range from 1 to 18, the color shifts from light to dark, increasing from dominant yellow – greenish tint – red/brown tint.

Mettler-Toledo UV/Vis instruments measure the percent transmittance of the product and automatically calculate and provide the Gardner color number using illuminant C and 2° observer.

In this application note, the Gardner color measurement is performed using the UV/Vis excellence spectrophotometer together with LabX, the PC software, containing pre-defined methods.

Fig. 1: Gardner color scale

Material & Method

Instruments and Accessories

- UV/Vis Spectrophotometer (e.g. 30254726)
- CuvetteChanger (30236313)
- Quartz cuvette 10 mm (30258738)

Sample & Reagents

- Olive oil
- Cashew oil
- Paint varnish
- Acetone

Measurement

Procedure

- Samples are measured directly without any preparation using 10 mm quartz cuvette.
- Samples to be tested should be clear; in case of cloudiness/haziness it is advisable to filter/centrifuge the sample. Pre-treatments must not change its color.
- In case of highly viscous samples (resin/fatty acids), its transfer into the cuvette is done along the wall as to avoid the bubble formation.
- ISO 13632 describes the sample preparation and procedure in case of rosin samples.
- Initial cleaning of the cuvette is done with acetone because most of resins, edible oils (fatty acids) and varnish are found to be miscible with it. The following cleaning can be done with water. Avoid first cleaning with water, as it may form an emulsion with the sample and the cuvette get even more dirty.
- Depending on the type of sample, it is important to ensure its miscibility before aliquoting it in a cuvette; the respective solvent should be used to clean cuvette.

Measurement parameters

Method	Scanning
Observer	2 °
Illuminant	C
Calculation	Gardner

Results

Two different types of fatty acid i.e. olive and cashew oil and varnish samples are measured in six replicates using. Table no. 1 shows the results reported in Gardner color unit. Results obtained are reproducible and repeatable with relative standard deviation of less than 0.3 %.

Sample	Mean (Gardner)	SD	Srel (%)
Olive oil (Fatty acid)	3.02	0.00	0.00
Cashew oil (Fatty acid)	6.68	0.00	0.00
Paint varnish	16.23	0.04	0.23

Table 1: Results in Gardner color unit

References

- ASTM D1544 - Standard Test Method for Color of Transparent Liquids (Gardner Color Scale)
- ASTM D6166 - Standard Test Method for Color of Naval Stores & Related Products (Gardner Color Scale)
- ISO 4630 - Clear liquids – Estimation of Color by Gardner Color Scale

Further information

www.mt.com/uv-vis