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Asuryan

CHAUVIN ARNOUX INDATECH

Agro Pharma Chemicals



Determination of solutions color using UV-Vis spectroscopy

The color of solutions plays a fundamental role in the pharmaceutical, chemical and agri-food industries. It provides crucial information on their composition and stability. This is why this critical parameter must be checked in these sectors to guarantee the quality of the products manufactured.

Objective

The Pt-Co (Hazen) color scale is a method for measuring the color of chemical solutions. Depending on the color of the solution, a numeric value in Pt-Co units is assigned to quantify the color.

The more intense the color of the solution, the higher the value in Pt-Co units. The goal of the study is to quantify the "yellowness" in accordance with the ASTM-E313 and ASTM-E308 standards, using a range of Pt-Co standard solutions at different concentrations.



Asuryan : the solution for in-line analysis of the critical parameters

Indatech supplies a unique inspection solution capable of checking both the chemical and physical characteristics of liquids. Asuryan can be used to perform quick, non-destructive in-line analyses.

It is capable of:

- Measuring up to 3 channels simultaneously
- Precisely analyzing the chemical composition of liquids
- Measuring with variable optical path lengths
- Characterizing the particle sizes by multi-angle measurement

Measuring color: how?

The solutions to be measured were prepared by dilution of a Pt-Co stock solution with distilled water, with reference to the designation D-5386-04. The samples were measured using our Asuryan UV-Vis spectrometer connected to our cuvette-holder with 180° transmission, using a quartz cuvette with a 10 mm optical path length.

The visible spectral range was used to determine the color from 380 to 780 nm.

The acquisition parameters were defined with an 11 ms integration time and 50 scans. These 50 scans correspond to 50 measurements automatically averaged to improve the signal/noise ratio.

Table 1: Description of the prepared Pt-Co samples

Sample	Concentration (%)	Pt-Co number
S1	2	10
S2	10	50
S3	20	100
S4	30	150
S5	40	200
S6	50	250
S7	60	300
S8	80	400
S9	100	500

Results and discussion

Our Asuryan Ready software offers the possibility to determine the X, Y and Z tristimulus coordinates on the basis of the transmittance spectrum measured (using pure water as the reference). This can then be used to calculate the Yellowness Index (YI) of the solutions.

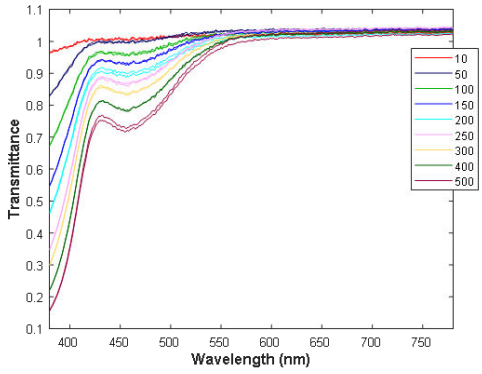

Figure 1:
Transmittance spectra (380-780 nm) of the standard samples, colored according to the Pt-Co value. Two repetitions per sample.

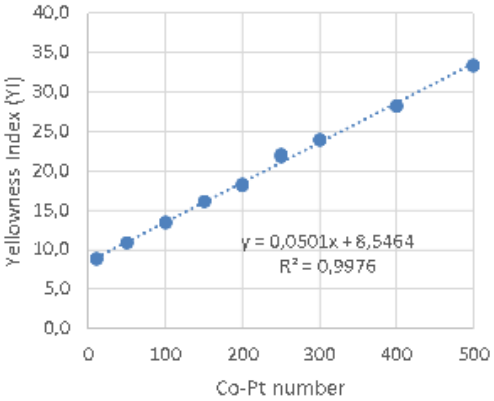

Figure 2:
Calibration curve: YI vs Pt-Co

We obtained an excellent calibration curve with an R^2 value of 0.998. This means it is now possible to determine the color of new samples using the equation of this calibration curve.

Our Asuryan Ready software can be used to calculate the YI on the basis of a spectrum measured on a sample. Then, by applying the equation of the calibration curve, we obtain the Pt-Co value which indicates the yellowness of the solution measured.

It is possible to characterize the samples at-line with a customized support or directly in-line with an Indatech probe or flow-cell. This flexibility can be extremely useful in various application contexts.

Advantages of the Asuryan spectrometer

UV-Vis technology offers a flexible solution for color monitoring in-line or in the laboratory:

- Quick measurement enabling the quantification of solutions' color according to various standard scales
- A set of probes, flow-cells and cuvette-holders allowing reliable, reproducible measurements
- Physical and chemical characterization of the products with different optical path lengths and scattering angles



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