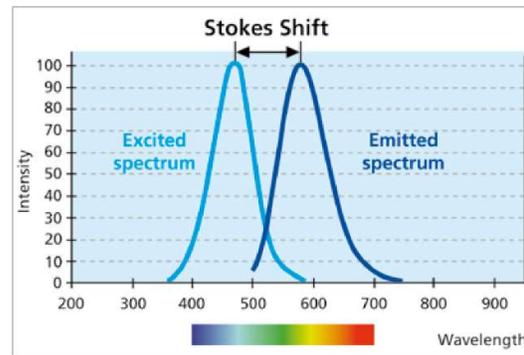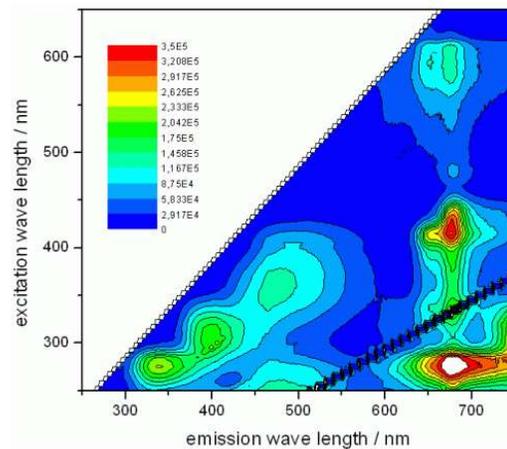## Fluorescence

Fluorescence is the spontaneous emission of light by a substance that has absorbed light. Part of the emitted light is released as heat. Therefore, the fluorescent light is typically of lower energy and thus, has a longer wavelength than the exciting light. This phenomenon is called "Stokes Shift" and well known for optical brighteners that absorb light in the UV-range and emit the fluorescent light in the blue wavelength range. However, it can also occur in the visible range e.g., light excited in the blue wavelength range can be shifted to the green, yellow or red wave-length range.

Measurement of Fluorescence

Traditional color measuring instruments work with both a polychromatic illumination (e.g. tungsten lamp, xenon flash etc.) and a monochromatic detection (grating, filter array etc.).

As commercially available spectrophotometers use different light sources, the measurement results will be different for specimens containing fluorescent ingredients. Different light sources show different spectral power distributions and therefore, the amount of illuminated light exciting the fluorescent components will be different. Depending on the specific excitation range, a particular fluorescent component will absorb the excitation light and emit the fluorescent light in the longer wavelength range. Consequently, the amount of emitted fluorescent light will differ dependent on the amount of the excitation light. Thus, the measurement results of spectrophotometers with different light sources cannot be compared.

In practice, fluorimeters are used to evaluate fluorescent samples. These setups use monochrome illumination and thus, can detect the amount of fluorescent light independently of the specific light sources. The monochrome illuminations need to be calibrated to the same level. For colorimetric calculations under different illuminants this calibration must be done in respect to each illuminant type.

The spectro2guide is a revolution in color measurement. It unites a fluorimeter and a portable spectrophotometer in one instrument. For illumination a full spectrum, white power LED and 12 monochromatic LEDs are used. The detector is a miniaturized spectrometer detecting light in the range of 360 – 700 nm. By comparing the characteristic spectral power distributions of the white power LED and the 12 monochromatic LEDs, it is able to detect, allocate and quantify the fluorescent light. In addition, the spectro2guide is able to calculate how the specimen will look like under different illuminants ("Fluorescence metamerism") and it can calculate how the color will change when the fluorescence has degraded (ΔEwoFl).
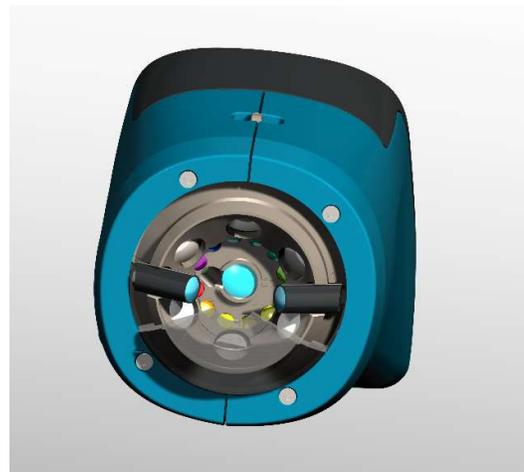
It is the first portable spectrophotometer on the market, which can be used for a reliable Quality Control of fluorescent specimens.

spectro2guide

Three in One
Color. Gloss. Fluorescence.

The spectro2guide spectrophotometer represents the next step in the evolution of color measurement. Just like its predecessor, color and 60° gloss are measured simultaneously. Completely new is the quantification of fluorescence by measuring like a fluorimeter with monochrome illuminations. Colorful graphs show the fluorescent results on the display and new fluorescent indices are calculated for easy analysis.

Perfectly formed Design
Approachable. Balanced. Upfront.

The new instrument follows a very simple rule, which is not so easy to put into practice: "Form follows function". Due to its balanced and upfront design, the display is always in the right position and easy-to-read, whether on horizontal, vertical, large or small surface areas – even true for overhead work. You no longer need to bend out of shape for measurement and data reading. The display flips around for you.

Brilliant Color Display
Swipe. Touch. Measure.

As for mobile phones, there is a trend towards ever-larger displays. The new spectro2guide is completely in line with this trend offering a 3.5" color touchscreen – the largest on the market. An icon-based menu, colorful data tables and graphics ensure an intuitive smart phone like operation. As you are used to, you can touch or swipe with your fingers – it even works when wearing gloves. Alternatively, you also can use a stylus, which is enclosed in the housing – always handy.

Preview with Camera
Strike. Score. Save.

An integrated camera shows a live preview of the measurement spot. To ensure precise positioning and to prevent false readings on imperfections or scratches, the measurement spot is magnified by a factor of 4.5:1. It is so easy – just press the measurement button halfway and the live preview is active.

spectro2guide

BYK LED Technology
High-tech. Smart. Experienced.

Like the predecessor, the spectro2guide uses innovative, high performance LED technology as light sources. Smart testing combined with our long-standing experience guarantees an outstanding performance of the LEDs. Short-term, long-term and temperature stability as well as a homogeneous illumination spot are unsurpassed in the industry. As a result, a superior accuracy and excellent inter-instrument agreement allow use of digital standards. One binding reference eliminates sources of error and physical standards no longer need to be exchanged. Digital standards bring the complete supply chain on target.

Tricky Fluorescence
Excited. Emitted. Shifted.

To quantify fluorescence two new indices, ΔFI and ΔE_{woFI}, are calculated. The index ΔFI (delta Fluorescence) indicates whether and how much fluorescent light is emitted by the standard and the sample – important for everybody who wants to avoid any fluorescent ingredients in the product material. The index $\Delta EwoFI$ (delta E without Fluorescence) calculates how the color will change when the fluorescence has degraded. In addition, the spectro2guide calculates how fluorescent specimens will look like under different illuminants ("Fluorescence Metamerism").

Smart Docking Station
Park. Charge. Control.

Accurate readings require reliable calibration. As first spectrophotometer on the market, the spectro2guide offers auto diagnosis and an automatic calibration function. The spectro2guide with the docking station make a perfect couple – the white calibration standard is always protected and a reliable calibration is guaranteed. Moreover, the docking station automatically charges the instrument. You only have to park the spectro2guide, the rest happens automatically. The smart docking station offers you a 2-in-1 advantage: Be ready at any time, be safe at any time – do not lose time with charging and daily calibration by hand.

Flexible Data Transfer
Wireless. Boundless. Flawless.

Adaptable to your situation and specific location, the spectro2guide offers three possibilities to transfer data: Via docking station or directly connected with USB cable or wireless with Wi-Fi function. Your data transfer is now guaranteed flawless and not tied down by a cable length.

smart-lab Color

Online Control in the laboratory

Color control in the laboratory requires on one hand open and flexible data analysis and on the other hand efficient data handling of large data sets. Measure your products offline or online and transfer the results to smart-lab Color and you will get professional QC-reports, immediately.

Online Measurement - and instant data analysis

Just connect the spectro2guide with the PC, measure the master panel, apply the respective tolerances and compare the actual samples against the standard. The data are displayed in a data table with Pass/Fail information and shown in various color graphs. Alternatively, you can recall a standard and samples from a database and quickly add new readings. Popular functions such as saving, deleting or copying can be executed with right mouse click.

## Standard Management - extensive flexibility of tolerance methods

smart-lab includes powerful standard management which allows defining Pass / Fail tolerances based on any color control parameter.

Digital Standard – guarantees a seamless workflow

Thanks to the outstanding inter-instrument agreement of spectro2guide smart-lab enables you to use "digital standards" on a global basis with your entire supply chain. Export and import your color standards in xml file format and send them by email to your supply chain. Thus, color control data are reliable and communication among all parties is seamless and efficient.

Color data analysis – variety of measurement reports

Results are simultaneously displayed in a data table and a graph highlighting the samples being out of specification. Easily toggle between measurement conditions like different illuminants or SPIN/SPEX. Multiple settings can even be combined in one project allowing the user to have multiple pass/fail criteria at one glance. Graphically display color results in the way that works best for your application: scatter plot, line graph, metamerism graph and spectral curves can be selected by just a mouse click.
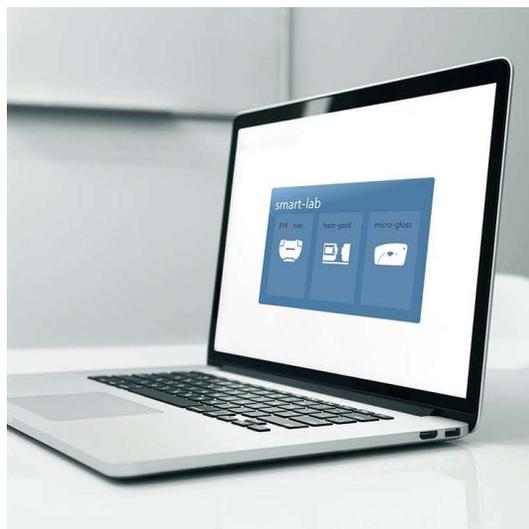
Fluorescence evaluation – new reports for new requirements

In order to get a general overview, a "Heat map" shows the intensity of detected light in a 2-D, false-color diagram. In addition, for each monochrome LED the total spectral remission curve of the sample is shown consisting of the spectral remission at excitation range plus the shifted fluorescent light. The results of the 12 LEDs can be toggled through by means of a slider.

Database management – easy and secure

The data are saved in a SQL database, which allows handling of large data sets over a long time period. This reliable database type also ensures full network and server compatibility. Retrieve data for further analysis based on your specific filter criteria, such as a specific color or a certain time range. Additionally, current standards and samples can be organized in projects. Projects are saved as xml-files and can be easily shared with other smart-lab users. With smart-lab, you can start faster and finish sooner without getting lost in Details.

Ultimate flexibility – Swap standard/sample and vice versa

Interested in how the previous batch compares to the current batch? Just drag & drop the data or even select a sample as the standard. Additionally, it is also possible to calculate the mean value based on a population of samples and use it as a new standard. This is of high interest when selecting a master standard out of a population of standard panels.

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smart-process

Routine process control requires systematic planning and efficient data handling of large data sets. With smart-process, all critical color parameters are saved and analyzed with one software package. An ideal QC software for production process control. With smart-process, you will know where you are, where you are going, and how to get there.

Standard Management –
manage an unlimited number of colors

smart-process includes powerful standard management for defining all essential color control parameters with Pass / Fail tolerances.

Digital Standard –
guarantees a seamless workflow

Thanks to the outstanding inter-instrument agreement of spectro2guide smart-process enables you to use "digital standards" on a global basis with your entire supply chain. Export and import your color standards in xml file format and send them by email to your supply chain. Thus, color control data are reliable and communication among all parties is seamless and efficient.

Organizer Set-up –
standardized measurement procedures

smart-process offers set-up of Organizers for clear sample identification and a menu guided operation on the instrument. Product schematics (e.g. white goods) help to define specific sampling procedures. The entered parameters can be used for filtering the measured data saved in the database. Typical identifiers are model, color or product ID – smart-process is open for your specific needs.

Data analysis –
green light for shipping

Data analysis was never easier. The data are saved in a SQL database, which allows handling of large data sets over a long time. See all your test series at once based on your specific criteria. Select filter criteria, such as a certain time range, a specific color or all "green", "yellow", "red" test series for further analysis.

Data analysis –
Detailed report of one test series

View and open the measurement data of a single test series with a click. The product schematic quickly shows you where the "problem areas" are. The data are also displayed in an easy-to-read data table highlighting the measurements out of specifications.

Monitor your process -
and document stability

Innovative data analysis reports feature scorecards with drill-in functionality as well as trend reports for all measured parameters. They are so easy to set up that statistical analysis actually becomes a fun project. Valuable time for data crunching will be saved and lengthy discussions analyzing the data will no longer be necessary.

smart-chart - Variety of Graphs

- Scatter graph to show at one glance whether all parts are within specification
- Trend graph to monitor process changes over time
- Metamerism graph for three illuminants
- Heat map to show at a glance the amount of emitted and excited fluorescent light
- Fluorescence Slider to analyze fluorescence in detail

spectro2guide Training

BYK-Gardner offers you more than just an instrument. We train you on color theory, how to operate spectro2guide and data analysis with smart-chart. Therefore, the instrument comes with a 1-day training course including:

1. Color, Gloss and Fluorescence Theory
■ Building blocks of color and gloss: illuminant, observer, object
■ Color differences with interpretation
■ Fluorescent Measurement and data analysis

2. spectro2guide Operation
■ Set-up of instrument and docking station
■ Operation

3. smart-lab training
■ Standard management
■ Data analysis using standard reports:
– Scatter graph for P/F color analysis
– Metamerism graph to judge color match under different illuminants
– "Heat map" for fluorescence analysis
– Fluorescence Slider for detailed fluorescence analysis by each excitation range
■ Create your own reports in Excel®:
– Transfer data from the database to Excel®

2. Operation and Software training – smart-process
■ Standard management
■ Set-up an "organizer" to create a routine measurement procedure
■ Send Organizer to instrument
■ Data transfer to smart-chart and saving in a database
■ Data analysis using standard reports:
  – Test Report of a single test series
  – Scorecard: Executive summary over a selected time range
  – Trend Report of a specific color / product over specified time range
■ Create your own reports in Excel®:
  – Transfer data from the database to Excel®

Coming soon!

spectro2guide XS
… with extra small aperture