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Spectrophotometric Analysis

Pass/Fail Judgment of Colored Film Using the Spectral Evaluation Function of LabSolutions™ UV-Vis Software

Ultraviolet-visible spectrophotometers are used routinely in various industries for acceptance inspections of raw materials and quality inspections of products. In the materials and chemical industries in particular, ultraviolet-visible spectrophotometers are used as the reference for determining the transmittance of film and filters. However, inspections on such products require burdensome tasks after spectrum measurement, such as reading the transmittance of specific wavelengths or calculating the absorbance ratio of multiple peaks, in order to judge the acceptability of products.

The LabSolutions™ UV-Vis software provides the spectral evaluation function as a standard feature so that inspections can be performed efficiently. This function automatically carries out analysis, including peak detection and calculation after spectrum measurement and makes a pass/fail judgment.

This article introduces an example of pass/fail judgments on transmittance measurements of colored film using the spectral evaluation function.

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■ Spectral Evaluation Function

The spectral evaluation function automatically carries out a pre-registered analysis on measurement results and enables pass/fail judgment to be made on these analysis results (evaluation values). Fig. 1 shows the detailed settings window of the spectral evaluation function.

Evaluation items include point pick, maximum value, minimum value, peak, and valley, and the ability to use these items individually or in combination makes it possible to support all kinds of evaluations.
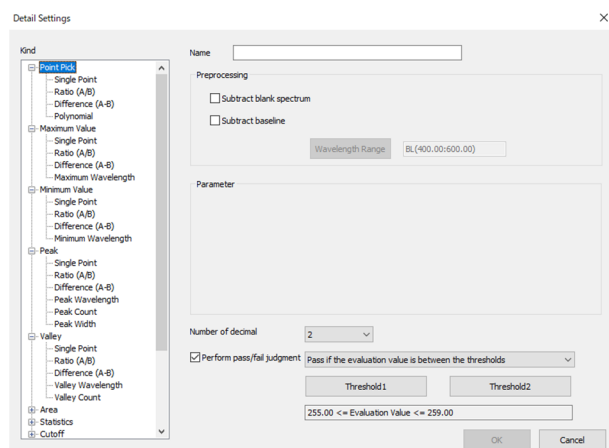

Fig. 1 Detailed Settings Window of the Spectral Evaluation Function

■ Transmittance Testing of Colored Film

We performed the transmittance testing on two types of commercially available colored film using the spectral evaluation function of LabSolutions UV-Vis software. Fig. 2 shows the picture of the samples.
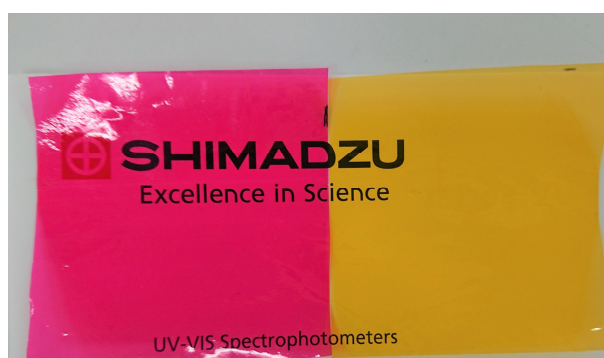

Fig. 2 Picture of Samples

The UV-1900 UV-VIS spectrophotometer was used for spectrum measurement. Fig. 3 shows the external appearance of the UV-1900 and Table 1 lists the measurement conditions.

Fig. 3 UV-1900 UV-VIS Spectrophotometer

Table 1 Measurement Conditions

Measuring wavelength range	:	190 nm to 1100 nm
Scan speed	:	Medium speed
Sampling interval	:	1.0 nm
Slit width	:	1 nm
Light source changing wavelength	:	340 nm

First, the spectral evaluation item needs to be set. This function allows setting of multiple items that can be evaluated at the same time.

Fig. 4 shows the detailed settings window of the spectral evaluation function and Fig. 5 shows an enlarged view. The red film was regarded as the acceptable product and evaluation was performed using "Cutoff - Over" in the spectral evaluation function to differentiate the red film from the yellow film. When "Cutoff - Over" is selected, judgment is made based on the wavelength at the point when the measured transmittance has exceeded the threshold in the set wavelength range. In this example, we set the criterion of a pass judgment to the condition that the wavelength at which transmittance exceeds 50 % is 550 nm or higher.

First under [Kind], select [Cutoff] and then [Over] ① . Next, set [Wavelength Range] ② under [Parameter] to the wavelength range for detection and [Threshold] ③ to the threshold value. In this example, we set 450 to 600 nm for the wavelength range and 50 for the threshold (since the judgment criterion is 50 % transmittance). Also select either option ④ to set whether a judgment is to be made when the threshold value is exceeded from the long-wavelength side or short-wavelength side (in this case we select [From short end]). Next, select the [Perform pass/fail judgment] check box ⑤. Clicking ⑥ displays the drop-down list shown in Fig. 5, and here we select [Pass if the evaluation is equal to or more than the threshold]. Lastly, set the wavelength that serves as the judgment criterion to 550 nm using [Threshold 1] ⑦.
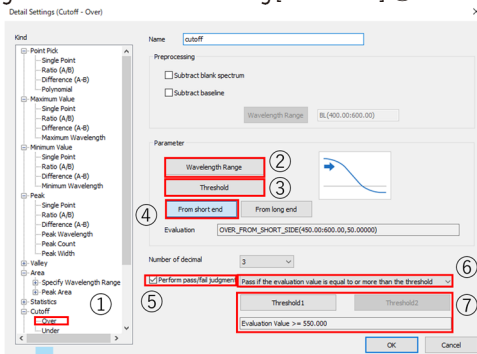

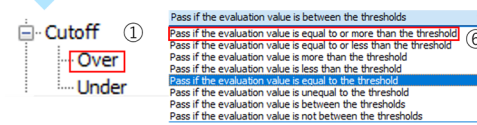**Fig. 4 Evaluation Detailed Settings Window**

Fig. 5 Enlarged View of Evaluation Detailed Settings Window
① Evaluation Type ⑥ Evaluation Conditions

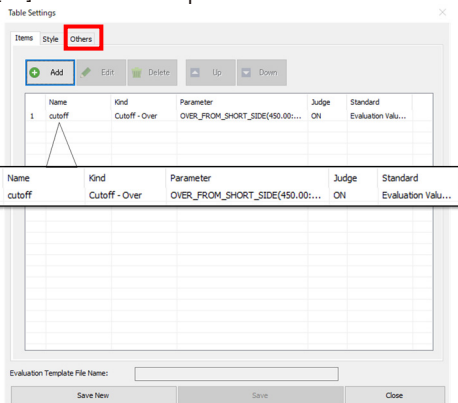Click the [OK] button to set the spectral evaluation items shown in Fig. 6.

Fig. 6 List Showing Evaluation Item for Colored Film

Click the [Others] tab in Fig. 6 and select the [After measurement, data is automatically added to the evaluation table] check box to perform pass/fail judgment automatically after spectrum acquisition (Fig. 7). Also, saving an evaluation template allows you to perform the same test at any time simply by loading the template.
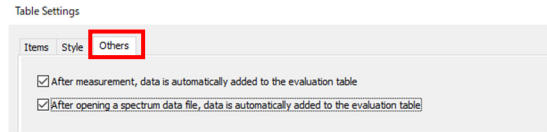

Fig. 7 Others Tab

■ Results

Fig. 8 shows the obtained transmittance spectrum of each sample and the spectral evaluation results. (Fig. 9 shows an enlarged view of the evaluation results.) "PASS" is indicated for the red film since the evaluation value is 579 nm. However, the yellow film received a "FAIL" and is colored red in the table due to having a cutoff wavelength below 550 nm.

The column color in the evaluation result table changes when a result deviates from the set evaluation criteria and this allows you to determine at a glance whether a test has passed or failed. Moreover, this table information can be copied into other applications using the copy and paste function or the [Excel Export] function to facilitate creation of various reports.
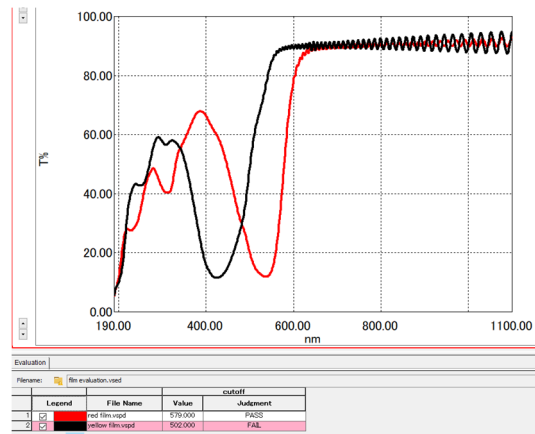

Fig. 8 Measurement Results and Spectral Evaluation Results

	Legend		File Name	Value	cutoff Judgment
1	☑		red film.vspd	579.000	PASS
2	☑		yellow film.vspd	502.000	FAIL

Fig. 9 Enlarged View of Spectral Evaluation Results

■ Conclusion

This article introduced an example of automatically performing transmittance measurement, analysis, and pass/fail judgment of colored film using the spectral evaluation function of the LabSolutions UV-Vis software. The use of this function enables various quality inspections with great efficiency.

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