Application Note

UV-0012

JASCO V-7000 Series Polarizer Evaluation System

Polarizer is a typical optical device which has been used for such several purposes as polarized sunglasses, polarized filter, display part of electronics instruments. Typical example of the display part of electronics is liquid crystal display. With innovation for higher quality of the above high technology products, much higher accuracy have been required for quality control of the polarizer to evaluate optical characteristic or color design. Liquid crystal display industry is especially proceeding to achieve higher quality of display, and it is now getting very important to evaluate shielding capability more precisely on condition that polarized prisms are in crossed-Nicol status. In this Application Note, the most suitable system for precise measurement of such polarizer will be explained.

The evaluating system consists of JASCO high-end models of V-7000 series spectrophotometer, polarizer, sample holder and integrating sphere (Figure 1). Against linearly polarized light formed by a polarizer in front of the sample, the sample to be measured is so located as in the position of crossed-Nicol and parallel and then each of transmittance spectra for crossed-Nicol and parallel is measured.

There are several kinds of polarizers of which diffuse transmittance range is from weak to strong. Therefore, the sample needs to be mounted just in front of the integrating sphere in order to measure diffuse transmittance. It is also possible to evaluate only linear transmittance light component by making some distance between the integrating sphere and the sample.

Since monitoring transmittance around crossed-Nicol position enables to determine sample axis, the angle of the crossed-Nicol/parallel can be set precisely with good reproducibility (Figure 2). It is also possible to determine the sample axis automatically.

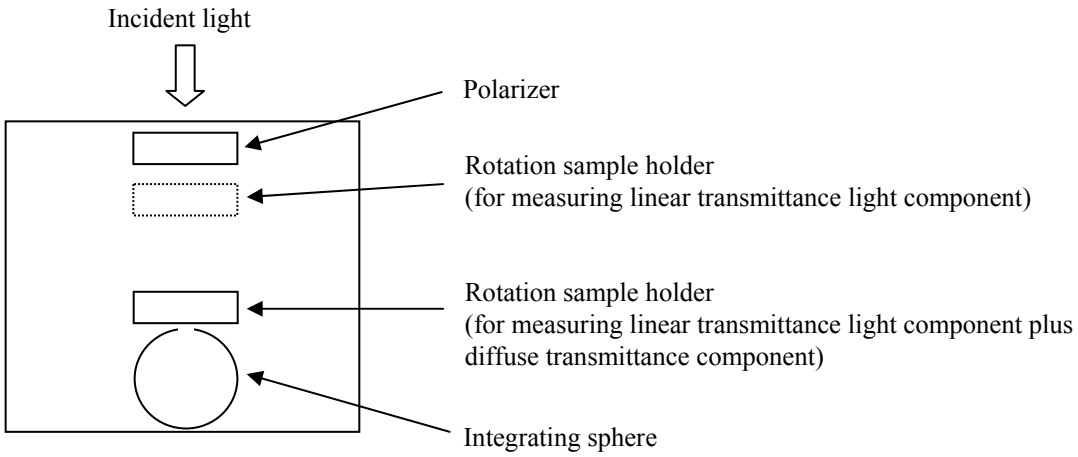

Figure 1 Sample compartment diagram

By using a dedicated software, this evaluation system can automatically execute several kinds of calculations which are required for spectral measurement and evaluation of polarizer. Using the measurement data under crossed-Nicol / parallel conditions such as single transmittance, parallel transmittance, orthogonal transmittance and degree of polarization, this system can also implement the calculations of dichroism and oriented spectra. Based on the above calculated values, following items can be also calculated automatically such as luminosity-corrected single transmittance, luminosity-corrected parallel transmittance, luminosity-corrected orthogonal transmittance and luminosity-corrected degree of polarization on condition of weighted averaging of specified light source and CIE luminosity. In addition, color analysis calculation can be also done automatically.

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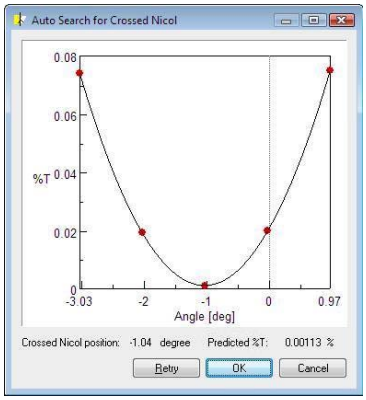

Figure 2. Calculation of crossed-Nicol position

Here is an example in which a commercial dichroic polarized plate was measured.
Sample for the measurement was placed on the position of both just in front of the integrating sphere and apart from integrating sphere.The results are shown below.
High transmittance was observed because of diffused light component when mounting the sample just in front of the integrating sphere. Measurement time was as speedy as within 90 seconds, while the data with high signal to noise ratio with the noise level of less than 0.0003% was obtained around transmittance 0.001%.

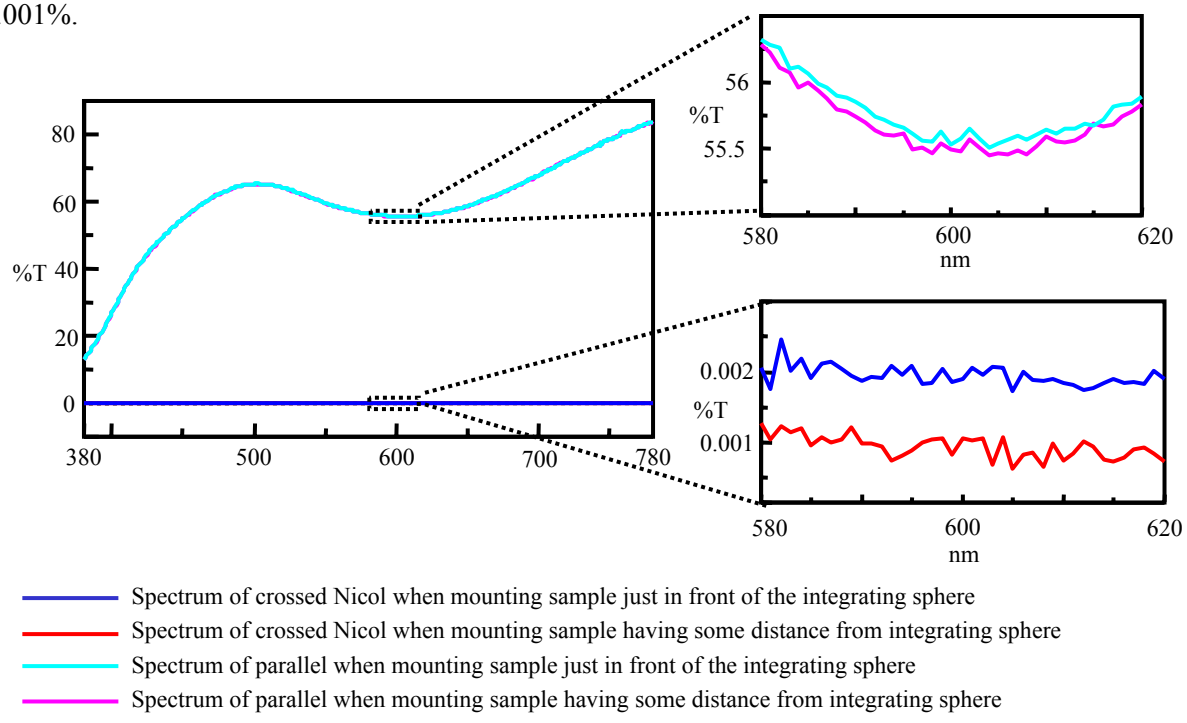

Figure 3 Transmittance spectra of polarizer for crossed-Nicol and parallel

As described the above, this evaluation system utilizing the high end models of V-7000 series spectrophotometer can provide the accuracy of crossed Nicol positioning and flexibility of sample mounting position as well as high photometric accuracy for assuring the precise and speedy evaluation of polarizer.

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