Application Note

FP-0005

Diffuse Reflectance Measurement of Fluorescent Powder

Fluorescent powder has been evaluated by its fluorescence spectrum, excitation spectrum, external/internal quantum efficiency and luminescent color. In addition, diffuse reflectance spectrum is now required for obtaining the findings related to absorption spectrum. However, in the diffuse reflectance measurement by using of spectrophotometer with integrating sphere, since the scattered light and fluorescence from sample cannot be separated, only sum of scattered light and fluorescence light will be obtained as the result of reflectance measurement. Therefore, such artifact must be corrected to obtain the true reflectance.

In this application, by using sodium salicylate, a typical fluorescence powder as a sample, the procedure to eliminate the fluorescence component from such reflectance artifact will be demonstrated.
In order to reduce the reflectance artifact by fluorescence, firstly, the L42 cut filter was placed in front of the detector so that scattered light caused from irradiation light can be transmitted through the filter and, the fluorescence can be cut by the filter. Secondly, in the single beam mode, spectra of standard white plate and sample were measured without using of L42 filter. Thirdly, the same single beam spectra were measured with using the L42 filter.
The transmittance of L42 will be the ratio between two spectra of standard white plate measured with filter and without filter (a) of Fig. 1). The single beam spectra of sodium salicylate measured with filter and without filter are shown in b) of Fig. 1. The L42 cut filter can transmit the 50% of light at 420 nm, and can cut the light of wavelength shorter than 420 nm and so it is evident that the transmittance in the range shorter than 420 nm was significantly reduced when measured with filter. Also, the spectrum of sodium salicylate measured without filter indicates that most of the signal intensity shorter than 370 nm was from fluorescence.

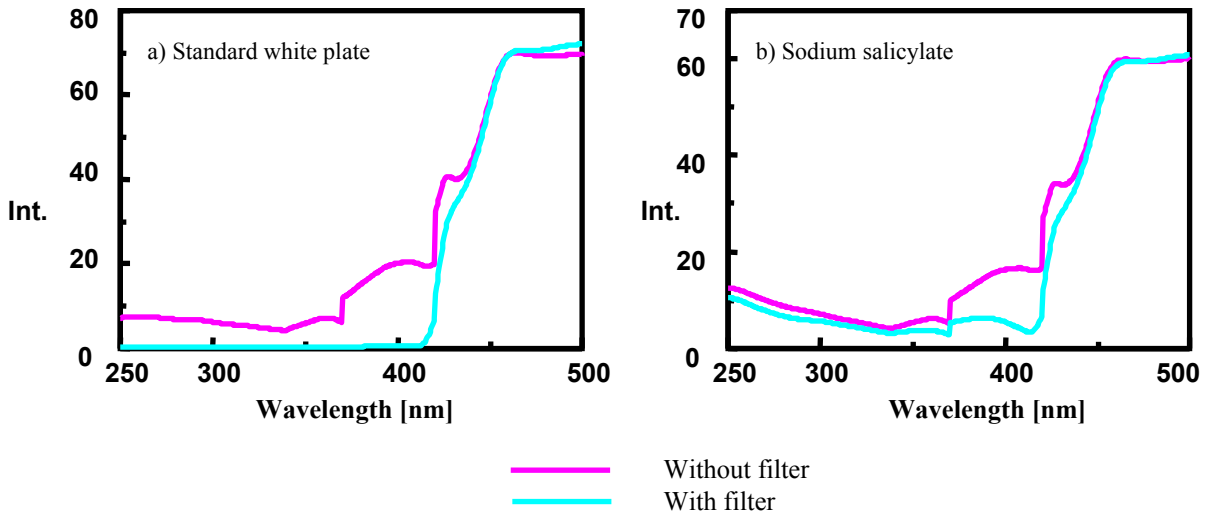

Fig. 1 S.B. spectra

The fluorescence spectra of sodium salicylate measured with L42 filter and without filter are shown in Fig. 2. The peak measured with filter (light blue in color) was observed as fluorescence and the peak without filter (pink in color), as total fluorescence and then the ratio of peak area was calculated, which is a factor to obtain the total fluorescence from fluorescence. The calculated ratio was 1.0556. By multiplying the factor 1.0556 with the single beam spectrum of sodium salicylate measured with filter (light blue in color; Fig. 1, b), the total fluorescence was obtained. Then, the true diffuse reflectance component was obtained by the subtracting the total fluorescence from single beam spectrum of sodium salicylate measured without filter (pink in color; Fig. 1, b).

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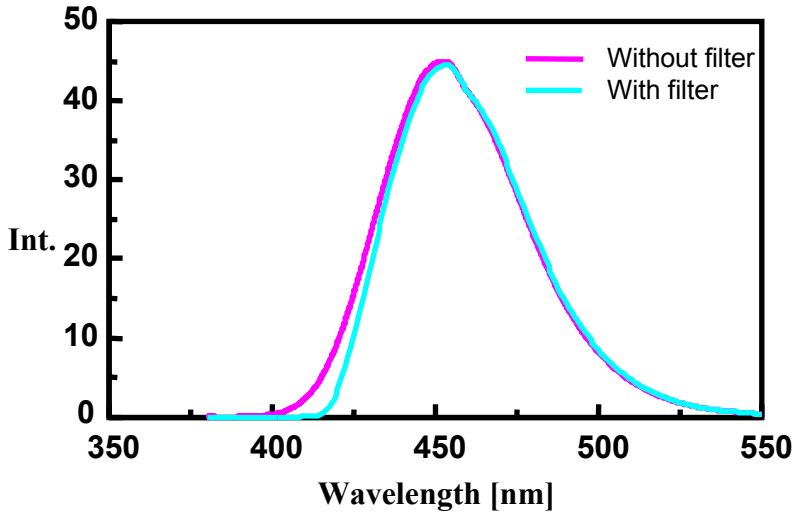

Fig. 2. Fluorescence spectra of sodium salicylate.

The true diffuse reflectance component of sodium salicylate is shown in Fig. 3 together with the diffusive reflectance component of the standard white plate obtained in the same procedure. Since such component of standard white plate can be considered as 100% Line, the diffuse reflectance spectrum of sodium salicylate (Fig. 4) was obtained by the ratio of two spectra in Fig. 3.

NOTE:
Cut-off wavelength of L42 filter is 410 nm. Therefore, this correction procedure can be applied only to the wavelength range shorter than 410 nm.

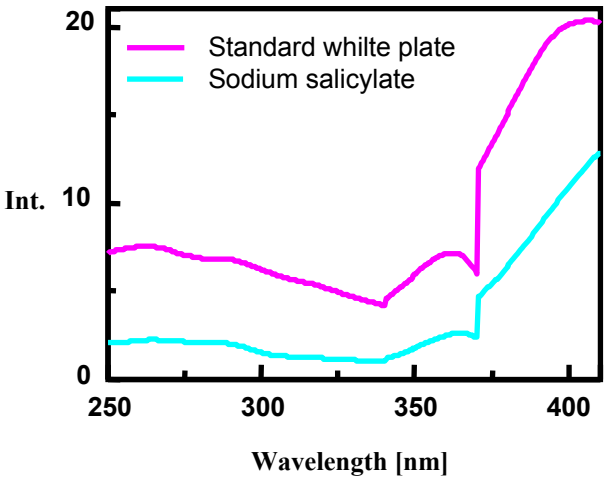

Fig. 3. Diffuse reflectance component.

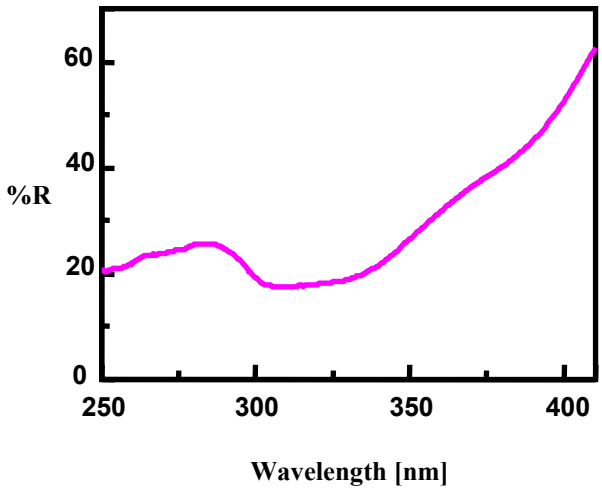

Fig. 4. Diffuse reflectance spectrum of sodium salicylate.

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