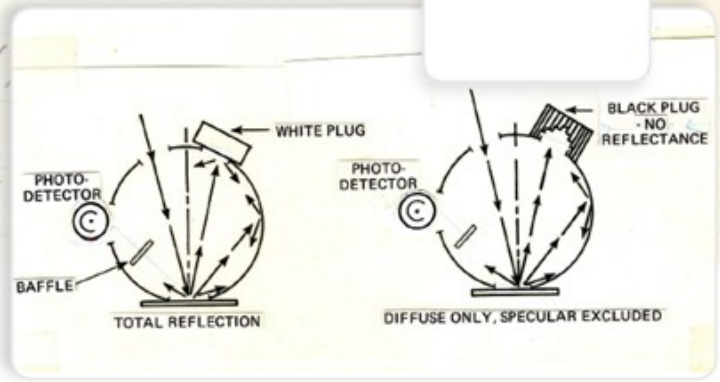
Applications Note

AN 1113



Daylight Filters

Filters selectively absorb light of certain wavelengths to produce the spectral distribution of wavelengths desired.

Abstract

Occasionally you may run across a reference to "tungsten filtered to approximate daylight" in product literature or instrumental specification in a method. Daylight filters have been around since the 1930s, and they are still used today.

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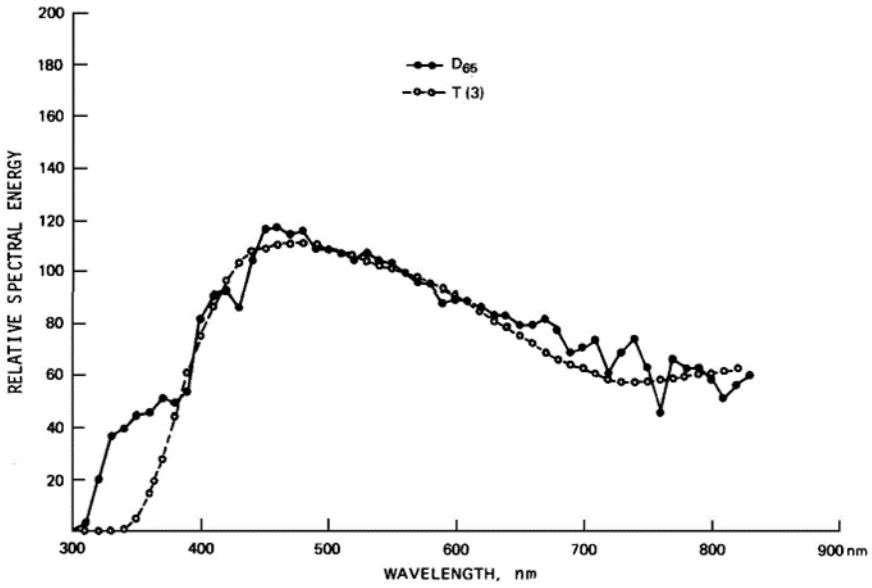
In instruments with tungsten light sources, daylight filters serve to alter the spectral energy distribution of the illumination falling on samples so that the illumination approximates daylight. The usual target energy distribution is D65. Only the visible region of the spectrum is "filtered to daylight," however, since tungsten sources cannot match the UV output of natural daylight. The usual daylight filter is blue glass, which absorbs long red wavelengths. All legacy HunterLab spectrophotometers that use tungsten light sources (such as LabScan, ColorQuest II, ColorQuest 45/0, and SpectraProbe) contain daylight filters. HunterLab D25-series colorimeters have tungsten sources, but not daylight filters. Only the infrared region of D25 illumination is filtered to minimize sample heating. Instead, a filter pack on the detector is optimized for the condition of illuminant C and the 2° standard observer.

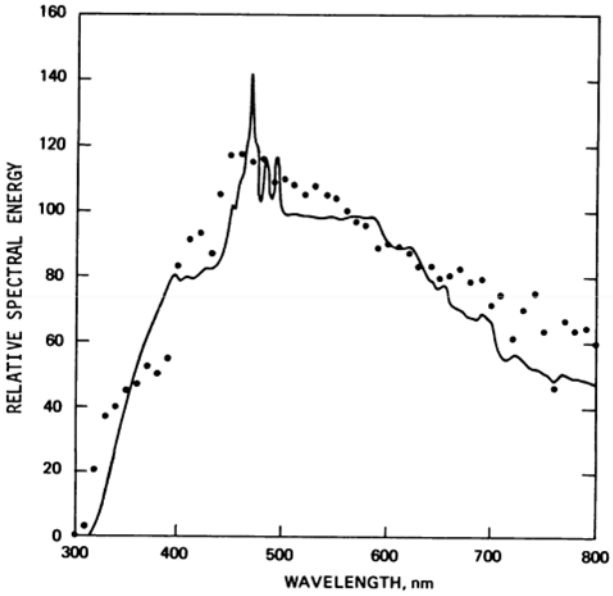
Xenon flash lamps have a much higher color temperature than tungsten lamps (6000 K, as opposed to 3000 K), so they naturally have a spectral energy distribution more like D65 (the color temperature of daylight is 6500 K). These instruments, such as the ColorFlex EZ, UltraScan PRO, and UltraScan VIS, do not require any balancing filters in their light sources.

The graphs below illustrate the spectral power distribution of the illuminant D65, filtered tungsten, and filtered xenon. The filtered sources match daylight quite well.

Spectral energy distribution curve for filtered tungsten source compared with illuminant D65[1].



[1]From F. Grum, S. Saunders, and T. Wightman, *Tappi*, **53**, 1970; and G. Wyszecki, *Die Farbe*, **19**, 1970.



Spectral energy distribution curve for filtered 75-watt xenon lamp (solid line) compared with illuminant D65 (dots)[2].

Although a *constant* source spectral energy distribution in a spectrophotometer is required to ensure repeatable measurements, conformance of the source to some *defined illuminant* (such as D65) is only important in cases where the sample being tested is fluorescent.

[2]From F. Grum, S. Saunders, and T. Wightman, *Tappi*, **53**, 1970; and G. Wyszecki, *Die Farbe*, **19**, 1970.

References

Billmeyer, Fred W., Jr. and Saltzman, Max, *Principles of Color Technology*, New York: John Wiley & Sons, Inc., 1981.

Hunter, Richard S. and Harold, Richard W., *The Measurement of Appearance*, New York: John Wiley & Sons, Inc., 1987

About HunterLab

HunterLab is the technology leader in color measurement solutions, providing instruments, software, knowledge and service to a wide variety of industries.
With over 5 decades of experience in more than 65 countries, HunterLab applies our leading edge technology to your products helping you measure and communicate color simply and effectively.

 12/2023

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