



Standard Test Method for Solar Photometric Transmittance of Sheet Materials Using Sunlight¹

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1. Scope

1.1 This test method covers the measurement of solar photometric transmittance of materials in sheet form. Solar photometric transmittance is measured using a photometer (illuminance meter) in an enclosure with the sun and sky as the source of radiation. The enclosure and method of test is specified in Test Method E 1175 (or Test Method E 1084).

1.2 The purpose of this test method is to specify a photometric sensor to be used with the procedure for measuring the solar photometric transmittance of sheet materials containing inhomogeneities in their optical properties.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

- E 772 Terminology Relating to Solar Energy Conversion²
- E 891 Tables for Terrestrial Direct Normal Solar Spectral Irradiance for Air Mass 1.5²
- E 1084 Test Method for Solar Transmittance (Terrestrial) of Sheet Materials Using Sunlight²
- E 1175 Test Method for Determining Solar or Photopic Reflectance, Transmittance, and Absorptance of Materials Using a Large Diameter Integrating Sphere²

2.2 CIE Standard:

Standard Illuminant D65³

3. Terminology

3.1 *Definitions*—For definitions of other terms used in this test method, refer to Terminology E 772.

3.1.1 *illuminance, n*—luminous irradiance.

3.1.2 *luminous (photometric), adj*—referring to a radiant (or radiometric) quantity, indicates the weighted average of the spectral radiometric quantity, with the photopic spectral luminous efficiency function (see Annex A1) being the weighting function.

3.1.3 *radiant flux, $\Phi = dQ/dt$ [Watt (W)]*, *n*—power emitted, transferred, or received in the form of electromagnetic waves or photons. See radiometric properties and quantities.

3.1.4 *reflectance, $\rho, \Phi_r/\Phi_i$* , *n*—the ratio of the reflected flux to the incident flux.

3.1.5 *solar irradiance at a point of a surface, $E_s = d\Phi/dA$* , *n*—the quotient of the solar flux incident on an element of a surface containing the point, by the area of that element, measured in watts per square metre.

3.1.5.1 *Discussion*—Measured values of transmittance and reflectance depend upon angle of incidence, solid angles of incidence and of transmission and reflection, the method of measurement of the reflected or transmitted flux, and the spectral composition of the incident flux. Because of this dependence, complete information on the technique and conditions of measurement should be specified.

3.1.6 *solar, adj*—(1) referring to a radiometric term, indicates that the quantity has the sun as a source or is characteristic of the sun. (2) referring to an optical property, indicates the weighted average of the spectral optical property, with the solar spectral irradiance $E_{s\lambda}$ used as the weighting function.

3.1.7 *spectral, adj*—(1) for dimensionless optical properties, indicates that the property was evaluated at a specific wavelength, λ , within a small wavelength interval, $\Delta\lambda$ about λ , symbol wavelength in parentheses, as L (350 nm, 3500 Å), or as a function of wavelength, symbol $L(\lambda)$. (2) for a radiometric quantity, indicates the concentration of the quantity per unit wavelength or frequency, indicated by the subscript lambda, as $L_\lambda = dL/d\lambda$, at a specific wavelength. The wavelength at which the spectral concentration is evaluated may be indicated by the wavelength in parentheses following the symbol, $L_\lambda(350 \text{ nm})$.

3.1.8 *transmittance, $\tau = \Phi_r/\Phi_i$* , *n*—the ratio of the transmitted flux to the incident radiant flux.

4. Summary of Test Method

4.1 Using sunlight as the source and a photometer as the detector, the specimen is made to be the cover of an enclosure with the plane of the specimen normal to the direct component of the incident solar radiation. Luminous transmittance is

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² Annual Book of ASTM Standards, Vol 12.02.

³ Available from Commission Internationale de l'Éclairage (International Commission on Illumination), Bureau Central de la CIE, 4 Av. du Recteur Poincaré, 75-Paris, France.