

Designation: D 1925 - 70 (Reapproved 1988)^{ε1}

An American National Standard

AMERICAN SOCIETY FOR TESTING AND MATERIALS
1916 Race St., Philadelphia, Pa. 19103Reprinted from the Annual Book of ASTM Standards, Copyright ASTM
If not listed in the current combined index, will appear in the next edition.

Standard Test Method for Yellowness Index of Plastics¹

This standard is issued under the fixed designation D 1925; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

^{ε1} NOTE—Section 1.3 was added editorially October 1988.

1. Scope

1.1 This test method is intended primarily for determining the degree of yellowness (or change of degree of yellowness) under day-light illumination of homogeneous, nonfluorescent, nearly colorless transparent or nearly white translucent or opaque plastics. It is applicable to transmittance of transparent and translucent plastics and to reflectance of opaque plastics (Note 1). It is based upon tristimulus values calculated from data obtained on the Hardy-G.E.-type spectrophotometer,² but other apparatus is satisfactory if equivalent results are obtained.

1.2 The values stated in SI units are to be regarded as the standard.

NOTE 1—This test method has not been demonstrated for the determination of transmitted yellowness of plastics having a luminous transmittance below 25 %, and it has not been demonstrated for the determination of reflected yellowness of translucent plastics.

1.3 *This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems 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:

- D 618 Methods of Conditioning Plastics and Electrical Insulating Materials for Testing³
- E 259 Recommended Practice for Preparation of Reference White Reflectance Standards⁴
- E 308 Method for Computing the Colors of Objects by Using the CIE System⁵

3. Terminology

3.1 Definitions:

¹ This test method is under the jurisdiction of the ASTM Committee D-20 on Plastics and is the direct responsibility of Subcommittee D20.40 on Optical Properties.

Current edition approved Jan. 22, 1970. Published March 1970. Originally published as D 1925 - 62T. Last previous edition 63T.

² This spectrophotometer is described in Recommended Practice E 308. It is available as the Diano/Hardy Recording Spectrophotometer manufactured by the Diano Corp., P.O. Box 346, 75 Forbes Blvd., Mansfield, MA 02048.

³ Annual Book of ASTM Standards, Vol 08.01.

⁴ Annual Book of ASTM Standards, Vol 06.01.

⁵ Annual Book of ASTM Standards, Vol 14.02.

3.1.1 *yellowness*—deviation in chroma from whiteness or water-whiteness in the dominant wavelength range from 570 to 580 nm.

NOTE 2—A definition of a method of obtaining dominant wavelength may be found in the literature.⁶

3.1.2 *yellowness index (YI)*—the magnitude of yellowness relative to magnesium oxide for CIE Source C. Yellowness index is expressed as follows:

$$YI = [100(1.28X_{CIE} - 1.06Z_{CIE})]/Y_{CIE}$$

where:

X_{CIE} , Y_{CIE} , and Z_{CIE} = tristimulus values (Note 3) of the specimen relative to Source C.

NOTE 3—By this test method, positive (+) yellowness index describes the presence and magnitude of yellowness; a specimen with a negative (−) yellowness index will appear bluish.

3.1.3 *change in yellowness index (ΔYI)*—the difference between an initial value, YI_0 , and YI determined after a prescribed treatment of the plastic.

$$\Delta YI = YI - YI_0$$

NOTE 4—By this calculation, positive (+) ΔYI indicates increased yellowness and negative (−) ΔYI indicates decreased yellowness or increased blueness.

4. Significance and Use

4.1 Yellowness index obtained by this test method correlates reasonably well with the magnitude of yellowness perceived under day-light illumination.

4.2 Yellowness index of transparent and translucent plastics is a function of thickness. Comparison should be made only between specimens of comparable thickness.

4.3 For control work, tristimulus colorimeters are useful so long as their inaccuracies and differences from this primary test method are known.

4.4 This test method achieves its greatest accuracy in the determination of differences in yellowness index of sample versus a control of similar material and colorant composition. Change of yellowness index determined by this test method has proved useful in evaluation of degradation of plastics under exposure to heat, light, or other environment.

5. Apparatus

5.1 *Spectrophotometer, Recording*,² conforming to the requirements of Practice E 308. Other apparatus is satisfac-

⁶ Hardy, A. C., *Handbook of Colorimetry*, Technology Press, Cambridge, MA.