



Designation: D8087 – 18

Standard Test Method for Color of Maleic Anhydride in the Molten State and After Heating (Platinum-Cobalt Scale) Using Tristimulus Colorimetry¹

This standard is issued under the fixed designation D8087; 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.

1. Scope

1.1 This test method covers an instrumental method for the CIE (Commission International de l'Eclairage) tristimulus measurement of the color of maleic anhydride melt before and after prolonged heating under specified conditions of time and temperature. The measurement is converted to color values in the platinum-cobalt system.

1.2 This test method covers the range 0 to 100 Pt-Co color.

1.3 In determining the conformance of the test results using this method to applicable specification, results shall be rounded in accordance with the rounding off methods of Practice E29.

1.4 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.5 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use. For specific hazard statements, see Sections 7, 10.3, and 10.6.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

D1193 Specification for Reagent Water

D1209 Test Method for Color of Clear Liquids (Platinum-Cobalt Scale)

D1686 Test Method for Color of Solid Aromatic Hydrocarbons and Related Materials in the Molten State (Platinum-Cobalt Scale)

D3438 Practice for Sampling and Handling Naphthalene, Maleic Anhydride, and Phthalic Anhydride

D5386 Test Method for Color of Liquids Using Tristimulus Colorimetry

D6809 Guide for Quality Control and Quality Assurance Procedures for Aromatic Hydrocarbons and Related Materials

D8005 Test Method for Color of Clear Liquids (Platinum-Cobalt Scale)

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

E179 Guide for Selection of Geometric Conditions for Measurement of Reflection and Transmission Properties of Materials

E308 Practice for Computing the Colors of Objects by Using the CIE System

E313 Practice for Calculating Yellowness and Whiteness Indices from Instrumentally Measured Color Coordinates

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

2.2 *Other Document:*³

OSHA regulations, 29 CFR paragraphs 1910.1000 and 1910.1200

3. Summary of Test Method

3.1 A specimen is melted at 60°C.

3.2 Color is measured by tristimulus values of light transmitted by a freshly melted specimen as percent of light transmitted by distilled water. Convert the measured tristimulus values by appropriate equations to the platinum-cobalt scale.

¹ This test method is under the jurisdiction of ASTM Committee D16 on Aromatic, Industrial, Specialty and Related Chemicals and is the direct responsibility of Subcommittee D16.02 on Oxygenated Aromatics.

Current edition approved Feb. 1, 2018. Published June 2018. DOI: 10.1520/D8087-18

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from U.S. Government Printing Office, Superintendent of Documents, 732 N. Capitol St., NW, Washington, DC 20401-0001, http://www.access.gpo.gov.

3.3 After heating for 2 h at 140°C, the color of the specimen is again measured by tristimulus values. Then convert the measured tristimulus values by appropriate equations to the platinum-cobalt scale.

4. Significance and Use

4.1 The color of maleic anhydride can be an indication of the purity of these materials. A high color after heating normally indicates contamination or decomposition.

4.2 This standard is suitable for process quality control and determining if the product meets specifications.

5. Apparatus

5.1 Instrument, with the following provision:

5.1.1 Instrument Sensor, shall provide a beam for illuminating the sample cell in transmission. The instrument shall be capable of converting light measured in total transmission through the sample cell to CIE X Y Z tristimulus color values for the measurement conditions of CIE illuminant C and the CIE 1931 2 degree standard observer as described in Guide E179 and Practice E308.

5.1.2 The CIE X Y Z tristimulus color values shall be convertible to the instrumental yellowness index (YI) defined by Practice E308 and Practice E313. A correlation between measured yellowness index (YI) (Practice E313) values and the Pt-Co standard solutions shall be used to yield an equivalent instrumental Pt-Co rating for liquid hydrocarbon samples.

5.1.3 Sample Cells, shall have clear, colorless, parallel entrance and exit windows. The internal distance between the faces shall be user selectable from 20 to 50 mm. When measuring samples using cells of the same path length, a path length tolerance of ±3 % or less is appropriate. Matched cells are preferred but not required. Sample cells shall be high temperature resistant.

5.1.4 Heated Bath or Oven—electric dry block or oven capable of maintaining 60°C (±1°C) and 140°C (±1°C) and deep enough to completely maintain molten specimen in cell.

6. Reagents and Materials

6.1 Purity of Reagents—Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available.⁴ Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

6.2 Purity of Water—References to water shall be understood to mean colorless distilled water, conforming to Type IV of Specification D1193.

6.3 Cobalt Chloride, (CoCl₂ · 6H₂O).

⁴ Reagent Chemicals, American Chemical Society Specifications, American Chemical Society, Washington, DC. For suggestions on the testing of reagents not listed by the American Chemical Society, see *Analar Standards for Laboratory Chemicals*, BDH Ltd., Poole, Dorset, U.K., and the United States Pharmacopeia and National Formulary, U.S. Pharmacopeial Convention, Inc. (USPC), Rockville, MD.

6.4 Hydrochloric Acid (sp gr. 1.19)—Concentrated hydrochloric acid (HCl).

6.5 Potassium Chloroplatinate, (K₂PtCl₆).

6.6 Platinum-Cobalt Stock Solution—Dissolve 1.245 g of potassium chloroplatinate (K₂PtCl₆) and 1.00 g of cobalt chloride (CoCl₂ · 6H₂O) in water. Carefully add 100 mL of hydrochloric acid (HCl sp gr 1.19) and dilute to 1 L with distilled water. The absorbance of the 500 platinum-cobalt stock solution in a cell having a 10-mm light path with distilled water in a matched cell as the reference solution must fall within the limits given in Table 1.

TABLE 1 Absorbance Tolerance Limits for No. 500 Platinum-Cobalt Stock Solution

| Wavelength | Absorbance |
|------------|----------------|
| 430 | 0.110 to 0.120 |
| 455 | 0.130 to 0.145 |
| 480 | 0.105 to 0.120 |
| 510 | 0.055 to 0.065 |

6.7 Platinum-Cobalt Standards—From the stock solution prepare color standards in accordance with Table 2 by diluting the required volumes to 100 mL with water in volumetric flasks. When properly sealed and stored these standards are stable for at least one year. 500 Platinum-Cobalt standards may also be purchased.

7. Hazards

7.1 Consult current OSHA regulations, suppliers' Safety Data Sheet, and local regulations for all materials used in this test method.

7.2 Warning—When handling molten solids in open tubes, adequate ventilation must be provided and proper protection should be used to prevent thermal burns.

8. Sampling and Handling

8.1 Sample in accordance with Practice D3438.

TABLE 2 Platinum-Cobalt Color Standards

| Color Standard Number | Stock Solution, mL | Color Standard Number | Stock Solution, mL |
|-----------------------|--------------------|-----------------------|--------------------|
| 1 | 0.20 | 25 | 5.00 |
| 2 | 0.40 | 30 | 6.00 |
| 3 | 0.60 | 35 | 7.00 |
| 4 | 0.80 | 40 | 8.00 |
| 5 | 1.00 | 45 | 9.00 |
| 6 | 1.20 | 50 | 10.00 |
| 7 | 1.40 | 55 | 11.00 |
| 8 | 1.60 | 60 | 12.00 |
| 9 | 1.80 | 65 | 13.00 |
| 10 | 2.00 | 70 | 14.00 |
| 11 | 2.20 | 75 | 15.00 |
| 12 | 2.40 | 80 | 16.00 |
| 13 | 2.60 | 85 | 17.00 |
| 14 | 2.80 | 90 | 18.00 |
| 15 | 3.00 | 95 | 19.00 |
| 20 | 4.00 | 100 | 20.00 |