Designation: D8005 – 23

Standard Test Method for Color of Clear Liquids (Platinum-Cobalt Scale)[1]

This standard is issued under the fixed designation D8005; 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 a procedure for the visual measurement of the color of near clear liquids. It is applicable only to materials in which the color-producing bodies present have light absorption characteristics nearly identical with those of the Platinum-Cobalt (Pt-Co) color standards used.

1.2 This test method has been found applicable to the color measurement of clear, liquid samples, free of haze, with nominal Pt-Co color values between 0 and 100. It is applicable to nonfluorescent liquids with light absorption characteristics similar to those of the Pt-Co color standard solutions. Test Methods D1209, D1686, and D5386 deal with the visual and instrumental measurement of near-clear liquids.

1.3 In determining the conformance of the test results using this method to applicable specifications, 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.*

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)

D3437 Practice for Sampling and Handling Liquid Cyclic Products

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

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

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

2.2 *Other Documents:*

OSHA Regulations, 29 CFR paragraphs 1910.1000 and 1910.1200[3]

3. Summary of Test Method

3.1 A specimen is placed in a Nessler tube and compared to a series of prepared Pt-Co standards.

4. Significance and Use

4.1 The major objective of the visual Pt-Co method of color measurement is to rate specific materials for yellowness. The yellowness is frequently the result of the undesirable tendency of liquid hydrocarbons to absorb blue light due to contamination in processing, storage, or shipping.

[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 D16.01 on Benzene, Toluene, Xylenes, Cyclohexane and Their Derivatives.

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[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, Mail Stop: SDE, Washington, DC 20401, http://www.access.gpo.gov.

*A Summary of Changes section appears at the end of this standard

5. Apparatus

5.1 *Spectrophotometer,* equipped for liquid samples and for measurements in the visible region.

5.1.1 The spectrophotometer used must be clean and in first-class operating condition. The instrument should be calibrated in accordance with the instructions in the Standards for Checking and Calibration of Spectrophotometers (200 cm to 1000 cm).[4]

5.2 *Spectrophotometer Cells,* matched having a 10 mm light path.

5.3 *Color Comparison Tubes*—Matched 100 mL, tall-form Nessler tubes, provided with ground-on, optically clear, glass caps. Tubes should be selected so that the height of the 100 mL graduation mark is 275 mm to 295 mm above the bottom of the tube.

5.4 *Color Comparator*—A color comparator constructed to permit visual comparison of light transmitted through tall-form 100 mL Nessler tubes in the direction of their longitudinal axes. The comparator should be constructed so that white light is passed through or reflected off a white glass plate and directed with equal intensity through the tubes, and should be shielded so that no light enters the tubes from the side.[5]

6. Reagents

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.[6] Other grades may be used, provided it is first ascertained that the agent 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 reagent water conforming to Type I or II of Specification D1193.

6.3 *Cobalt Chloride (*$CoCl_2{\cdot}6H_2O$*).*

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

6.5 *Potassium Chloroplatinate (*K_2PtCl_6*).*

6.6 *Pt-Co Stock Solution*—Dissolve 1.245 g of potassium chloroplatinate (K_2PtCl_6) and 1.00 g of cobalt chloride ($CoCl_2{\cdot}6H_2O$) in water. Carefully add 100 mL of hydrochloric acid (HCl, sp gr. 1.19) and dilute to 1 L with water. The absorbance of the 500 Pt-Co stock solution in a cell having a 10 mm light path, with reagent water in a matched cell as the reference solution,[7] must fall within the limits given in Table 1.

NOTE 1—This stock solution is commercially available from reputable chemical suppliers.

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

Wavelength, nm	Absorbance
430	0.100 to 0.120
455	0.130 to 0.145
480	0.105 to 0.120
510	0.055 to 0.065

6.7 *Pt-Co Standards*—From the stock solution, prepare color standards in accordance with Table 2 and Table 3 by diluting the required volumes to 100 mL with water in the Nessler tubes. Cap the tubes and seal the caps with shellac or a waterproof cement. D16 PTP results show significant changes in the standards. Standards should be replaced within a year.

7. Hazards

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

8. Sampling and Handling

8.1 Refer to Practice D3437 for proper sampling and handling of liquid hydrocarbons analyzed by this test method.

9. Procedure

9.1 Introduce 100 mL of specimen into a Nessler tube, passing the specimen through a filter if it has any visible turbidity. Cap the tube, place in the comparator, and compare with the standards.

9.1.1 For samples between 1 and 20, use standards that are 1 Pt-Co color unit apart.

9.1.2 For samples between 20 and 100, use standards that are 5 Pt-Co color units apart.

TABLE 2 Platinum-Cobalt Color Standards for Very Light Colors

Color Standard Number	Stock Solution, mL	Color Standard Number	Stock Solution, mL
1	0.20	11	2.20
2	0.40	12	2.40
3	0.60	13	2.60
4	0.80	14	2.80
5	1.00	15	3.00
6	1.20	16	3.20
7	1.40	17	3.40
8	1.60	18	3.60
9	1.80	19	3.80
10	2.00	20	4.00

[4] See NIST Circular LC-1017.

[5] The sole source of supply of the apparatus known to the committee at this time is Scientific Glass and Instruments, Inc., P.O. Box 6, Houston, TX 77001. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,[1] which you may attend.

[6] *ACS Reagent Chemicals, Specifications and Procedures for Reagents and Standard-Grade Reference Materials*, 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.

[7] See the manufacturer's instruction manual for complete details for operating the spectrophotometer.

TABLE 3 Platinum-Cobalt Color Standards

Color Standard Number	Stock Solution, mL	Color Standard Number	Stock Solution, mL
25	5	65	13
30	6	70	14
35	7	75	15
40	8	80	16
45	9	85	17
50	10	90	18
55	11	95	19
60	12	100	20

TABLE 4 Repeatability and Reproducibility Results

Average Pt-Co Color	Repeatability r	Reproducibilty R
3	3	5
10	4	8
21	6	6
30	4	4
60	7	11

10. Report

10.1 Report as the Pt-Co color the number of the standard that most nearly matches the specimen. In the event that the color lies midway between two standards, report the darker of the two.

10.1.1 For samples with a Pt-Co color between 1 and 20, when the color lies midway between two standards, report the darker of the two.

10.1.2 For samples with a Pt-Co color between 20 and 100, when the color lies midway between the two standards, estimate the value.

10.2 If, owing to differences in hue between the specimen and the standards, a definite match cannot be obtained, report the range over which an apparent match is obtained, and report the material as "off-hue."

11. Precision[8]

11.1 An ILS was conducted which included three laboratories analyzing three samples two times for samples between 3 and 20 Pt-Co color. Two laboratories analyzed five samples two times for samples between 30 and 60 Pt-Co color. Practice E691 was followed for the design and analysis of the data; the details are given is ASTM Research Report RR:D16-1063. The ILS did not meet the minimum requirements of Practice E691 of six laboratories, four materials and duplicate analyses of each material.

11.2 *Repeatability (r)*—Results should not be suspect unless they differ by more than shown in Table 4. Results differing by less than r have a 95 % probability of being correct.

11.3 *Reproducibility (R)*—Results submitted by two labs should not be considered suspect unless they differ by more than shown in Table 4. Results differing by less than R have a 95 % probability of being correct.

11.4 *Bias*—This test procedure has no bias because the value of the test result is defined only in terms of the test method.

12. Quality Guidelines

12.1 Laboratories shall have a quality control system in place.

12.1.1 Confirm the performance of the test instrument or test method by analyzing a quality control sample following the guidelines of standard statistical quality control practices.

12.1.2 A quality control sample is a stable material isolated from the production process and representative of the sample being analyzed.

12.1.3 When QA/QC protocols are already established in the testing facility, these protocols are acceptable when they confirm the validity of test results.

12.1.4 When there are no QA/QC protocols established in the testing facility, use the guidelines described in Guide D6809 or similar statistical quality control practices.

12.2 *Interlaboratory Testing:*

12.2.1 A program that includes multiple laboratories analyzing the same samples is strongly encouraged. This program should allow labs to compare their results with other laboratories. This is particularly important when a plant is selling the product to customers, or the laboratory is analyzing the product for acceptance. Producers and customers need to have confidence that the results from different producers are comparable.

12.2.2 ASTM currently has a Proficiency Testing Program that sends a sample of mixed xylenes, p-xylene, and benzene to multiple labs twice a year for testing. Other programs are acceptable.

13. Keywords

13.1 clear liquids; color; platinum-cobalt color scale; Pt-Co

[8] Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR:D16-1063. Contact ASTM Customer Service at service@astm.org.