Designation: D4789 – 12

Standard Test Method for Solution Color of Bisphenol A (4,4′-Isopropylidenediphenol)[1]

This standard is issued under the fixed designation D4789; 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 describes the procedure for determination of the Platinum-Cobalt Color of bisphenol A (4,4′-Isopropylidenediphenol) dissolved in methanol.

1.2 This test method has been found applicable for the determination of Platinum-Cobalt color of bisphenol A between 20 and 100 color units.

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

1.4 *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.* For specific hazard statements, see Section 8.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

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

D4297 Practice for Sampling and Handling Bisphenol A (4,4′ -Isopropylidinediphenol)

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

E180 Practice for Determining the Precision of ASTM Methods for Analysis and Testing of Industrial and Specialty Chemicals (Withdrawn 2009)[3]

2.2 *Other Documents:*

OSHA Regulations, 29 CFR paragraphs 1910.1000 and 1910.1200 [4]

NIST *Letter Circular LC 1017*, Standard for Checking the Calibration of Spectrophotometers (200 to 1000 nm) [5]

3. Summary of Test Method

3.1 Bisphenol A is dissolved in methanol. This solution is then transferred to a color comparison tube and the color compared to that of the Platinum-Cobalt Color Standards, either visually or by means of a spectrophotometer. The color is reported as that closest to the applicable standard.

4. Significance and Use

4.1 Color is caused by impurities in the bisphenol A. The acceptable amount of color depends on the end-use of the bisphenol A.

4.2 This test method can be used for internal quality control or for setting specifications.

5. Interferences

5.1 The presence of any turbidity or haze will affect the color reading.

5.2 A bisphenol A color that is off-hue, or tinted with respect to the color standards, may interfere with proper color comparison.

6. Apparatus

6.1 *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 to 295 mm above the bottom of the tube.

6.2 *Color Comparator,* constructed to permit visual comparison of light transmitted through tall-form, 100 mL Nessler tubes in the direction of their longitudinal axis; and so that white light is passed through or reflected off a white glass plate

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

Current edition approved Aug. 15, 2012. Published August 2012. Originally approved in 1988. Last previous edition approved in 2008 as D4789 – 08. DOI: 10.1520/D4789-12.

[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] The last approved version of this historical standard is referenced on www.astm.org.

[4] 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.

[5] Available from National Institute of Standards and Technology (NIST), 100 Bureau Dr., Stop 1070, Gaithersburg, MD 20899-1070, http://www.nist.gov.

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

and directed with equal intensity through the tubes. It should be shielded so that no light enters the tubes from the sides.

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

NOTE 1—The spectrophotometer must be clean and in excellent operating condition. The instrument should be calibrated in accordance with the instructions given in NIST *Letter Circular LC 1017*. For good agreement with the visual method, the spectrophotometer or colorimeter should be a filter type instrument.

6.4 *Spectrophotometer Cells,* cells of different path lengths may be used as long as the equipment is calibrated with the same length cells as the sample solution.

6.5 *Filter Paper,* glass fiber filter, 1.2-µm pore retention.

7. Reagents

7.1 *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 reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

7.2 *Methanol*—Check for color against deionized water; if the methanol is not water white, redistill in an all-glass system.

7.3 *Platinum-Cobalt Color Standards*—Prepared in accordance with Test Method D1209.

8. Hazards

8.1 Consult current OSHA regulations, suppliers' Material Safety Data Sheets, and local regulations for all materials utilized in this test method.

9. Sampling

9.1 Sample the material in accordance with Practice D4297.

10. Procedure

10.1 Weigh 50 g of bisphenol A. Transfer to a 150-mL Erlenmeyer flask.

10.2 Measure 70 mL of methanol. Add to the Erlenmeyer flask containing the bisphenol A.

10.3 Stir until all the bisphenol A is dissolved.

10.4 Transfer the methanol solution to a color comparison tube, fill to the 100-mL mark, and cap the tube.

10.5 If there is any visible turbidity, pass the methanol solution through a filter and refill the comparison tube.

10.6 Visually compare the methanol solution comparison tube with the color standards. A spectrophotometer can be used to determine the transmittance at a wavelength of 436 nm, which would be an indication of the color intensity.

10.7 If a timed color development test is run, measure the color 30 min after the bisphenol A is dissolved in the methanol. (**Warning—**Use of a spectrophotometer may provide values which are higher or inconsistent with those obtained by using color comparison tubes.)

11. Report

11.1 Report the following information:

11.1.1 The number of the standard that most nearly matches the specimen. If the color lies midway between two standards, report the darker of the two.

11.1.2 The result to the nearest 5 units. Duplicate runs that agree within 10 units absolute are acceptable for averaging (95 % confidence level).

11.2 If there is a difference in hue between the specimens and the standards, and a definite match cannot be made, report the range over which an apparent match is obtained, and report the material as "off-hue."

12. Precision and Bias[7]

12.1 *Precision*—An interlaboratory study was conducted which included six laboratories analyzing three specimens of bisphenol A from three different sources. One analyst in each of six laboratories performed duplicate determinations and repeated on a second day, for a total of 72 determinations. Practice E180 was used in developing these precision estimates.

12.1.1 *Intermediate Precision, (formerly called Repeatability)*—The standard deviation of results (each the average of duplicate determinations), obtained by the same analyst on different days, was estimated to be 2.0 units absolute at 18 df. Two such averages should be considered suspect if they differ by more than 10 units absolute.

12.1.2 *Reproducibility*—The standard deviation of results (each the average of duplicate determinations), obtained by analysts in different laboratories has been estimated to be 9.0 units absolute at 5 df. Two such averages should be considered suspect if they differ by more than 35 units absolute.

12.2 *Bias*—Since there is no accepted reference material suitable for determining the bias in this test method bias has not been determined.

13. Quality Guidelines

13.1 Laboratories shall have a quality control system in place.

13.1.1 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.

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

[6] *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.

[7] Supporting data have been filed at ASTM International Headquarters and may be obtained by requesting Research Report RR:D16-1010.

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

13.1.4 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.

14. Keywords

14.1 bisphenol A; color; color test; 4,4′-Isopropylidenediphenol

SUMMARY OF CHANGES

Committee D16 has identified the location of selected changes to this standard since the last issue (D4789 – 08) that may impact the use of this standard. (Approved August 15, 2012.)

(1) Sections 1, 12, and 13 were updated to current editorial guideline verbiage and format.

(2) Section 1.2 was added based on information in the Research Report.