



Standard Test Method for Color of Clear Electrical Insulating Liquids (Platinum-Cobalt Scale)¹

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1. Scope

1.1 This test method covers a procedure for the visual determination of the color of askarels and other clear liquids.

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

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:

D 1193 Specification for Reagent Water²

D 1209 Test Method for Color of Clear Liquids (Platinum-Cobalt Scale)³

D 1500 Test Method for ASTM Color of Petroleum Products (ASTM Color Scale)⁴

3. Summary of Test Method

3.1 The color determined by this test method is a numerical value derived by comparing the color of the test specimen with that of a series of numbered color reference standards using transmitted light under prescribed conditions. The procedure described is based on that for measuring the color of water and clear liquids according to the platinum-cobalt scale. This scale is suitable for measurements over the color range from 5 to 300. The color of test specimens darker than 300 on the platinum-cobalt scale must be measured according to the ASTM Color Scale as described in Test Method D 1500. The use of the platinum-cobalt scale in this way is primarily of value as an expansion of the lower part of the ASTM Color Scale, especially in the range between 0 and 1.

4. Significance and Use

4.1 Color is significant chiefly as an indicator of contami-

nation in electrical insulating liquids. Frequently this contamination is the result of solvent action between the askarel and other materials in the apparatus involved. No definite relationship can be established between color and the physical and electrical characteristics of the liquid; for that reason color in itself has limited value as a measure of condition. For more precise determination of color, Test Method D 1209 may be used.

5. Apparatus

5.1 *Color Comparison Tubes*—Matched, tall-form Nessler tubes, graduated at the 50-mL mark, and provided with ground-on, optically clear glass caps.

5.2 *Color Comparator*—A color comparator constructed to permit visual comparison of light transmitted through tall-form 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*—Use reagent grade chemicals in all tests. Unless otherwise indicated, all reagents will 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.

6.2 *Purity of Water*—Use reagent water conforming to Specification D 1193.

6.3 *Solvent*, suitable, clear.

6.4 *Cobaltous Chloride* ($\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$).

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

6.6 *Potassium Chloroplatinate* (K_2PtCl_6).

¹ This test method is under the jurisdiction of ASTM Committee on D-27 on Electrical Insulating Liquids and Gases and is the direct responsibility of Subcommittee D 27.07 on Physical Tests.

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² *Annual Book of ASTM Standards*, Vol 11.01.

³ *Annual Book of ASTM Standards*, Vol. 06.04.

⁴ *Annual Book of ASTM Standards*, Vol 05.01.

⁵ A unit available from Scientific Glass and Instruments, Inc. P.O. Box 6, Houston, TX 77001, has been found suitable for this purpose.

⁶ "Reagent Chemicals, American Chemical Society Specifications," Am. Chemical Soc., Washington, DC. For suggestions on the testing of reagents not listed by the American Chemical Society, see "Reagent Chemicals and Standards," by Joseph Rosin, D. Van Nostrand Co., Inc., New York, NY and the "United States Pharmacopeia."

7. Preparation of Color Standards

7.1 *Platinum-Cobalt Stock Solution*—Dissolve 1.245 g of K_2PtCl_6 (containing 0.5 g of platinum) and 1.000 g of $CoCl_2 \cdot 6H_2O$ (containing about 0.25 g of cobalt) in water. Add 100 mL of HCl (sp gr 1.19) and dilute to 1 L with water. This solution has a color of 500.

NOTE 1—The color standard stock solution (platinum-cobalt solution) can be purchased with a color of 500 from laboratory supply firms.

7.2 *Platinum-Cobalt Standards*⁷—The unit of color is that color produced by 1 mg of platinum per litre. From the stock solution, prepare color standards, as given in Table 1, by diluting the required volumes to 50 mL with water in the Nessler tubes. Cap the tubes and seal the caps with shellac or a waterproof cement.

⁷ The preparation of these platinum-cobalt standards was originally described by Hazen, A., *American Chemical Journal*, ACJOA, Vol 14, 1982, p. 300. The description given in this Test Method D 2129 is identical with that given in the *Standard Methods for the Examination of Water and Sewage*, American Public Health Assn., Ninth Edition, p. 14. A description is also given by Scott, W. W., *Standard Method of Chemical Analysis*, D. Van Nostrand Co., Inc., Fifth Edition, Vol 2, p. 2048.

TABLE 1 Platinum-Cobalt Color Standards (for 50-mL Tubes)

Color Standard Number	Stock Solution, mL	Color Standard Number	Stock Solution, mL	Color Standard Number	Stock Solution, mL
5	0.5	35	3.5	150	15.0
10	1.0	40	4.0	200	20.0
15	1.5	50	5.0	250	25.0
20	2.0	60	6.0	300	30.0
25	2.5	70	7.0	350	35.0
30	3.0	100	10.0	400	40.0
				450	45.0

8. Procedure

8.1 Introduce 50 mL of the test specimen into a Nessler tube, passing the sample through a filter if it has any visible test specimen turbidity. Cap the tube, place in the comparator, and compare with the standards.

8.2 If the recorded color of the test specimen is greater than 300, do not use the platinum-cobalt scale. Use Test Method D 1500 to measure color.

9. Report

9.1 Report which method was used, Test Method D 2129 or Test Method D 1500.

9.2 Report as the color, the number of the standard that most nearly matches the test specimen. In the event that the color lies midway between two standards, report the darker of the two.

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

10. Precision and Bias

10.1 The repeatability of this test method is being looked at with the intention of generating a precision statement. The reproducibility of this test method will not be completed as too few labs are presently performing this test.

11. Keywords

11.1 clear liquids; color; insulating liquids; platinum-cobalt color scale

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