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100 Barr Harbor Dr., West Conshohocken, PA 19428
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Standard Test Method for Clarity and Cleanness of Paint and Ink Liquids[1]

This standard is issued under the fixed designation D 2090; 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 examination of any unpigmented liquid for use in paints and inks, including fatty oils and acids, drier solutions, solvents, miscellaneous chemicals, varnishes, resin solutions, clear lacquers, and other clear coatings for the presence or absence of undesirable components.

1.2 *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 1003 Test Method for Haze and Luminous Transmittance of Transparent Plastics[2]

D 1210 Test Method for Fineness of Dispersion of Pigment-Vehicle Systems[3]

D 1545 Test Method for Viscosity of Transparent Liquids by Bubble Time Method[4]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 There are various terms for clarity or cleanness of liquids, which are established as trade vernacular in describing undesirable components of a liquid. The following seven are preferred over the other terms (in bold face) related to them:

3.1.2 *foreign matter*—any visible material unrelated to the true origin of the liquid specified.

3.1.3 *sediment*—any solid which can settle or be centrifuged from the main portion of the liquid, for example, **foots, meal, grain, gum.**

3.1.4 *skins*—partial solid layers of material which may form, from the material itself or otherwise.

3.1.5 *turbid*—a relatively great amount of nonsettling **floc, gels, suspended matter, particles, droplets,** or other **insoluble** or **separated matter,** even though the liquid is **translucent** and transmits at least a little light.

3.1.6 *hazy*—a relatively small amount of nonsettling, finely dispersed matter which is not visibly homogeneous with the mass of the liquid specified, even though the liquid is **transparent** and transmits most of the light incident upon it.

3.1.7 *clear*—a complete lack of any visible nonuniformity when viewed in mass, in bottles or test tubes, by strong transmitted light.

3.1.8 *clean*—a complete lack of any visible nonuniformity sometimes referred to as **seeds**, when viewed in thin films by any macroscopic or microscopic use of visible light.

4. Summary of Test Method

4.1 The sample is visually examined in its original container, in the specified sample containers, and then in a film thin enough to show any nonuniformity.

5. Significance and Use

5.1 The results of the clarity and cleanness examinations are used as controls in production, and for specification acceptance of any nonpigmented liquid used in paints and inks.

6. Sampling

6.1 Sampling of one or more containers of a liquid is especially important for the validity of a clarity or cleanness test, and each type of container, such as tank car, tanktruck, drum, carboy, etc., requires its own detailed sampling procedure. Temperature conditions and periods affect amounts of solidified matter which may form, or volatilized matter lost, such as phosphatides, waxes, or high melting acids solidified from fatty oils or acids, or low boiling solvents volatilized from varnishes, resin solutions, etc. Therefore, the precise mechanics, the date, time and temperature of sampling, the type of sample container and the temperature of the container, light, and any other critical sample storage conditions shall be specified.

7. Conditioning Sample

7.1 Because limits may be desired on the amounts of gums or other solids which will separate from a liquid very slowly at various temperatures, specify limits of a time and temperature schedule for conditioning the specimen and for making the

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[2] *Annual Book of ASTM Standards*, Vol 08.01.

[3] *Annual Book of ASTM Standards*, Vol 06.01.

[4] *Annual Book of ASTM Standards*, Vol 06.03.

examination. When not stated otherwise, the sample is presumed to have been stable for any period of time and observed at 77°F (25°C).

8. Procedure

8.1 Examine all parts of the sample and its container under at least 50 ft-candles (53.8 1x) of light for any nonuniformity.

8.2 Transfer some of the sample to fill a clean Gardner-Holdt tube as specified in Test Method D 1545 to leave an air bubble under a clean stopper. Tilt the tube at a small angle from the horizontal so that the air bubble will move slowly and permit observation in the moving liquid of any fine particles that may produce a haze in the specimen.

8.3 Drain the tube of 80 to 90 % of its contents, replace the stopper, let stand vertically for 15 min or other time specified to allow a highly viscous specimen to complete its flow to the bottom, while leaving a very thin film of the specimen over the upper walls of the tube, and while still protected from extraneous dust and from evaporation. Examine the drained, vertical tube by both transmitted and reflected strong light to detect particles of any sort in the thin film. A liquid may appear *clear* in mass, yet not *clean* in a thin film.

NOTE 1—Many variables influence the choice of details of specimen conditioning and examination, such as:

Highly colored bitumen solutions, driers, varnishes, etc., that nevertheless may be judged to be clear and clean when examined in a very thin film.

Relative pure fatty acids may have narrow melting ranges of temperature, and their cleanness is easily observed at a temperature of 50°F (27.8°C) above their melting point, whereas gross or dark mixtures of fatty acids may have such a wide range of melting temperature that specification of time and temperature for specimen conditioning and for passing a clean test may constitute a convenient, proximate method of limiting their composition.

Glyceride oils may contain small amounts of fatty acids, phosphatides, waxes, and high melting glycerides, for example, stearin in fish oil; specification of time, temperature, and air and moisture exposure for specimen conditioning and for passing a clean test may constitute a convenient, proximate method of limiting their composition.

Solutions of varnishes, resins, driers, soaps or polymerized oils may contain tiny gel particles which spoil the appearance of high gloss paints and enamels made from them. The drained tube technique is particularly useful in detecting these particles when their index of refraction makes them difficult to detect in mass.

Test Method D 1210, may also be used for semiquantitative determination of particle size and frequency in unpigmented liquids. However, the films prepared by either Test Method D 1210 or by simple drainage on clean, vertical glass plates are more susceptible to contamination by extraneous matter during the course of the test. An instrumental means for determining haze has been used following Appendix X1.

9. Report

9.1 Report the following information:

9.1.1 Name of original or specimen container examined and any significant details of sampling procedure,

9.1.2 Temperature range and time period of specimen conditioning.

9.1.3 Temperature of specimen at time of observation, and

9.1.4 Term or terms, selected from Section 3, which describe the clarity or cleanness of the specimen.

10. Precision and Bias

10.1 *Precision*—No numerical statement of precision is possible in this qualitative method.

10.2 *Bias*—Bias cannot be determined as no reference material is available.

11. Keywords

11.1 foreign matter content; sediment; skins content

APPENDIX

(Nonmandatory Information)

X1. INSTRUMENTAL DETERMINATION

INTRODUCTION

This instrumental test method is offered for comment, and without cooperative testing, because it utilizes an existing ASTM test method to fill a recognized need. It is published as information only and offered without prejudice against other test methods.

X1.1 Summary of Test Method

X1.1.1 A specimen of liquid is placed in a cuvette and a parallel beam of light shining through it is measured at the normal (sere) angle of emergence and also at an angle 10° from normal. The ratio of intensities of the emergent beams is a measure of clarity.

X1.2 Procedure

X1.2.1 Test the specimen in accordance with Procedure A of Test Method D 1003. Use the Hazemeter, but in place of the solid specimen of plastic specified therein, pour the thoroughly mixed specimen into a 10-mm glass cell with parallel walls and place it in the specified positions on the integration sphere.

X1.3 Calculation

X1.3.1 Calculate percent haze H as follows:

$$H = (T_d/T_t) \times 100 \quad \text{(X1.1)}$$

where:

T_d = diffuse transmittance, and
T_t = total transmittance.

REFERENCES

(**1**) Nimeroff, I., "Status of ASTM Methods and Standards for Appearance Valuation," Symposium on Visual Aids for Standardizing and Communicating Product Appearance, *STP 258*, ASTM 1959.

(**2**) Billymer, Jr., F. W., "Measurement of Optical Clarity by Low-Angle Light Scattering," *Journal*, Optical Soc. Am., Vol. 49, April 1959, pp. 368–371, a method for measuring scattered light photo-electrically at a 10° angle, with an angular resolution of 1°. It is suitable for plant control applications.

(**3**) Rieger, C. J., and Carpenter, F. G., "Light Scattering by Commercial Sugar Solution," *Journal of Research*, Nat. Bureau Standards Vol 63A, November 1959, pp. 205–211.

(**4**) Method D 871, sections on determination of haze by comparison with arbitrary standards based on aqueous suspensions of fuller's earth, when balloted in Committee D-23 on Cellulose and Cellulose Derivatives, and adopted by the Society.

(**5**) Coleman Nephelometer method used by L. V. Anderson in ASTM Committee D-1, Subcommittee II, Group II, on Gum Determinations in Linseed Oil.

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