



Designation: D 849 – 97

## Standard Test Method for Copper Strip Corrosion by Industrial Aromatic Hydrocarbons<sup>1</sup>

This standard is issued under the fixed designation D 849; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the Department of Defense.*

### 1. Scope

1.1 This test method determines the corrosiveness of industrial aromatic hydrocarbons to a copper strip.

NOTE 1—For a similar copper strip test applicable to other petroleum products, see Method D 130 and Test Method D 1838.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

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.* For specific hazard statements, see Section 8.

### 2. Referenced Documents

#### 2.1 ASTM Standards:

B 152 Specification for Copper Sheet, Strip, Plate, and Rolled Bar<sup>2</sup>

D 130 Test Method for Detection of Copper Corrosion from Petroleum Products by the Copper Strip Tarnish Test<sup>3</sup>

D 1838 Test Method for Copper Strip Corrosion by Liquefied Petroleum (LP) Gases<sup>3</sup>

D 4790 Terminology of Aromatic Hydrocarbons and Related Chemicals<sup>4</sup>

#### 2.2 Other Documents:

OSHA Regulations, 29 CFR, paragraphs 1910.1000 and 1910.1200<sup>5</sup>

#### 2.3 ASTM Adjuncts:

ASTM Copper Strip Corrosion Standards (13 photolithed

aluminum strips; includes Method D 130)<sup>6</sup>

### 3. Terminology

3.1 See Terminology D 4790 for definition of terms used in this test method.

### 4. Summary of Test Method

4.1 A polished copper strip is immersed in 200 mL of specimen in a flask with a condenser and placed in boiling water for 30 min. At the end of this period, the copper strip is removed and compared with the ASTM Copper Strip Corrosion Standards.

### 5. Significance and Use

5.1 This test method is suitable for setting specifications, for use as an internal quality control tool, and for use in development or research work on industrial aromatic hydrocarbons and related materials. It also gives an indication of the presence of certain corrosive substances which may corrode equipment, such as acidic compounds or sulfur compounds.

### 6. Apparatus

6.1 *Flask*, 250-mL, of chemically resistant glass with flat bottom and vial mouth.

6.2 *Glass Condenser*, 30-mm, with the inside diameter of the condenser tube not less than 10 mm. A cork is used to connect the flask with the condenser. A condenser and flask with ground-glass joints may also be used.

6.3 *Strip Polishing Vise*, to hold the copper strip firmly without marring the edges. For convenient vises see Method D 130.

6.4 *Water Bath*, of convenient design, able to maintain boiling water such that the contents of the flask are submerged during the test.

### 7. Reagents and Materials

7.1 *Wash Solvent*—Any volatile, sulfur-free hydrocarbon solvent may be used provided that it shows no tarnish at all

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D-16 on Aromatic Hydrocarbons and Related Chemicals and is the direct responsibility of Subcommittee D16.0A on BTX Cyclohexane and Their Derivatives.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 02.01.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 05.01.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 06.04.

<sup>5</sup> Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

<sup>6</sup> Available from ASTM Headquarters. Request PCN 12-401300-00. Names of suppliers in the United Kingdom can be obtained from the Institute of Petroleum. Two master standards are held by the IP for reference.

when tested at 100°C (212°F) for 1 h. Knock-test grade isooctane (**Warning**—See 8.2) is a suitable solvent and should be used in case of dispute.

7.2 *Polishing Materials*—Silicon carbide grit paper of varying degrees of fineness including 65- $\mu\text{m}$  (240-grit) paper or cloth; also a supply of 105- $\mu\text{m}$  (150-mesh) silicon carbide grain and pharmaceutical grade absorbent cotton (cotton wool).

7.3 *Copper Strips*—Use strips 12.5 mm ( $\frac{1}{2}$  in.) wide, 1.5 to 3.0 mm ( $\frac{1}{16}$  to  $\frac{1}{8}$  in.) thick, cut 75 mm (3 in.) long from smooth-surfaced, hard-tempered, cold-finished copper of 99.9 + % purity. Electrical bus-bar stock is generally suitable (hard-temper, cold-finished type-electrolytic tough pitch (ETP) copper conforming to UNS C11000 in Specification B 152. Drill a 3.2-mm ( $\frac{1}{8}$ -in.) hole approximately 3.2 mm ( $\frac{1}{8}$  in.) from one end in the center of the strip. The strips may be used repeatedly but should be discarded when surfaces become deformed on handling.

7.4 *Copper wire*, soft, about 150 mm (6 in.) in length.

7.5 *ASTM Copper Strip Corrosion Standards*, consisting of reproductions in color of typical test strips representing increasing degrees of tarnish and corrosion. The reproductions are encased in plastic in the form of a plaque. Instructions for care and use are given on the reverse side of each plaque and in Method D 130.

## 8. Hazards

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

8.2 *Isooctane* is Extremely Flammable. Harmful if inhaled. Vapors may cause flash fire. Keep away from heat, sparks, and open flame. Keep container closed. Use with adequate ventilation. Avoid buildup of vapors and eliminate all sources of ignition, especially non-explosion-proof electrical apparatus and heaters. Avoid prolonged breathing of vapor or spray mist. Avoid prolonged or repeated skin contact.

## 9. Preparation of Strips

9.1 *Surface Preparation*—Remove all surface blemishes from all six sides of the strip with silicon carbide grit paper of such degrees of fineness as are needed to accomplish the desired results efficiently. Finish with 65- $\mu\text{m}$  (240-grit) silicon carbide paper or cloth, removing all marks that may have been made by other grades of paper used previously. Immediately immerse the strip in wash solvent from which it may be withdrawn for final polishing or in which it may be stored for future use.

NOTE 2—As a practical manual polishing procedure, place a sheet of the paper on a flat surface, moisten it with wash solvent, and rub the strip against the paper with a rotary motion, protecting the strip from contact with the fingers with an ashless filter paper. Alternatively, the strip may be prepared by use of motor-driven machines using appropriate grades of dry paper or cloth.

9.2 *Final Polishing*—Remove a strip from the wash solvent. Holding it in the fingers protected with ashless filter paper, polish first the ends and then the sides with the 150-mesh

silicon-carbide grains picked up from a clean glass plate with a pad of absorbent cotton moistened with a drop of wash solvent. Wipe vigorously with fresh pads of absorbent cotton and subsequently handle only with stainless-steel forceps; do not touch with the fingers. Clamp in a vise and polish the main surfaces with silicon carbide grains on absorbent cotton. Rub in the direction of the long axis of the strip, carrying the stroke beyond the end of the strip before reversing the direction. Clean all metal dust from the strip by rubbing vigorously with clean pads of absorbent cotton until a fresh pad remains unsoiled. When the strip is clean immediately attach the copper wire and immerse the strip in the specimen flask.

NOTE 3—It is important to polish the whole surface of the strip uniformly to obtain a uniformly stained strip. If the edges show wear (surface elliptical) they will likely show more corrosion than the center. The use of a vise will facilitate uniform polishing.

## 10. Procedure

10.1 Fasten the 150-mm (6-in.) length of soft copper wire through the hole provided near one end of the strip, taking care not to touch the strip with the fingers after polishing. Place the strip in the flask and add 200 mL of the sample. The specimen must not contain separated water. Filter through a dry filter paper, if necessary, to remove water. Connect the flask to the vertical reflux condenser by means of a properly bored cork stopper. It is absolutely necessary that a cork, not rubber, stopper be used, in order to avoid contamination of the specimen by sulfur from rubber stoppers. The copper wire may be allowed to extend into the condenser tube for convenience in removing the strip. Completely immerse the strip which should preferably lie flat and touch the flask only at the ends of the strip. Place the flask in the gently boiling water bath, and immerse the flask to the liquid line of the specimen within the flask. Remove the copper strip 30 min from the time the flask was immersed in the bath. Do not touch the copper strip, but remove it by the wire that has been provided. Do not allow the strip to come in contact with separated water during any part of the test, since water causes bad local staining of the copper. If it is desired to preserve the strip for future reference, dip it immediately into white shellac or lacquer.

## 11. Interpretation of Results

11.1 Compare the exposed strip with the ASTM Copper Strip Corrosion Standards described in 7.5. Hold the test strip and the Standard in such a manner that light reflected from them at an angle of approximately 45° will be observed. Report as passing strips shown in the Slight Tarnish category or better (1A or 1B); all others shall be considered failures.

## 12. Precision and Bias

12.1 In the case of pass/fail data, no generally accepted method for determining precision and bias is currently available.

## 13. Keywords

13.1 copper corrosion test



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