



Designation: D 2870 - 86 (Reapproved 1990)

Standard Test Method for Gel Time of Tar Acids¹

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1. Scope

1.1 This test method covers determination of the gel time of tar acids in the range from 8 to 120 min.

1.2 *This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of whoever uses this standard to consult and 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:

D 2194 Test Method for Concentration of Formaldehyde Solutions²

D 3852 Practice for Sampling and Handling Phenol and Cresylic Acids²

E 1 Specification for ASTM Thermometers³

2.2 Other Document:

OSHA Regulations, 29 CFR, paragraphs 1910.1000 and 1910.1200⁴

3. Definitions

3.1 *gel time*—the time required for the polymerization reaction to proceed to a point where the viscous drag on a rotating spindle, partially immersed in the reaction mass, is sufficient to overcome the torsional force exerted on the spindle by a constant speed drive assembly, magnetically coupled to the spindle by a standard torsion spring.

3.2 *tar acid*—phenol or its homologues either individually or blended together.

4. Summary of Test Method

4.1 Observing specific conditions, an aliquot of the well-mixed specimen is blended with powdered paraformaldehyde and triethanolamine catalyst and the gel time determined using an automatic gel time test meter.

5. Significance and Use

5.1 The gel time value is a measure of the reactivity of tar acids. As a quality control procedure it is one of the techniques employed to determine batch to batch uniformity.

The gel time test also serves as a means for studying the effects of reaction variables such as composition, temperature and concentration.

6. Apparatus

6.1 Automatic gel time meter and accessories⁵ consisting of (Fig. 1):

6.1.1 *Constant-Temperature Bath.*

6.1.2 *Bath Cover Plate* with center opening to accommodate a one-hole neoprene rubber stopper and test tube and with condensing coil and immersion heater attached.

6.1.3 *Glass Spindle*, 165 by 6 mm equipped with a magnetic coupling assembly.

6.1.4 *Torsion Spring*, 44.5 by 0.25-mm piano wire.

6.1.5 *Lower Torsion Spring Vise* with magnetic assembly.

6.1.6 *Upper Torsion Spring Vise* with upper contact assembly.

6.1.7 *Lower Contact.*

6.1.8 *Feeler Gage*, 28.067 by 2.25 mm (1.105 by 3/32 in.).

6.1.9 *Test Tube*, 18 by 150 mm, borosilicate glass.

6.1.10 *Variable Transformer.*

6.1.11 *Ring Stand.*

6.1.12 *Thermometer*—An ASTM Partial Immersion Thermometer, having a range from 90 to 170°C and conforming to the requirements for Thermometer 35C as prescribed in Specification E 1.

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 Paraformaldehyde:

7.2.1 The paraformaldehyde used for this test shall be a free-flowing powder, free of lumps, passing through a 100-mesh screen.

7.2.2 The formaldehyde content shall be $93 \pm 1\%$ as determined by assay, according to the procedure outlined in Test Method D 2194, with the following exceptions:

¹ 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 D16.0C on Oxygenated Aromatics.

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² *Annual Book of ASTM Standards*, Vol 06.03.

³ *Annual Book of ASTM Standards*, Vol 14.03.

⁴ Available from Superintendent of Documents, U. S. Government Printing Office, Washington, DC 20402.

⁵ Gel time meter available from Sunshine Scientific Instrument, Inc., 1810 Grant Ave, Philadelphia, PA 19115, or its equivalent has been found satisfactory 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."