Designation: ~~D1824 – 16~~ D1824 – 24

Standard Test Method for Apparent Viscosity of Plastisols and Organosols at Low Shear Rates[1]

This standard is issued under the fixed designation D1824; 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.

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

1. Scope*

1.1 This test method covers the measurement of plastisol and organosol viscosity at low shear rates.

1.2 Apparent viscosity at high shear rates is covered in Test Method D1823.

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

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~~safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

NOTE 1—This test method resembles ISO 3219-1977 in title only. The content is significantly different.

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D883 Terminology Relating to Plastics
D1755 Specification for Poly(Vinyl Chloride) Resins
D1823 Test Method for Apparent Viscosity of Plastisols and Organosols at High Shear Rates by Extrusion Viscometer
E1 Specification for ASTM Liquid-in-Glass Thermometers
E456 Terminology Relating to Quality and Statistics
E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method
E2935 Practice for Evaluating Equivalence of Two Testing Processes

2.2 *ISO Standard:*

ISO 3219-1977: Polymers in the Liquid, Emulsified, or Dispersed State—Determination of Viscosity With a Rotational Viscometer Working at a Defined Shear Rate[3]

[1] This test method is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.15 on Thermoplastic Materials. Current edition approved ~~April 1, 2016~~April 1, 2024. Published ~~April 2016~~April 2024. Originally approved in 1961. Last previous edition approved in ~~2010~~2016 as ~~D1824 - 95~~D1824 - 16.~~(2010). DOI:10.1520/D1824-16.~~ DOI:10.1520/D1824-24.

[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] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

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

3. Terminology

3.1 For definitions of terms used in this test method and associated with plastics issues refer to the terminology contained in D883.

3.2 For terms relating to precision and bias and associated issues, the terms used in this test method are in accordance with the definitions in Terminology E456.

3.3 *Definitions:*

3.3.1 *organosol, n*—a suspension of a finely divided polymer in a plasticizer, together with a volatile organic liquid.

3.3.2 *plasticizer, n*—a substance incorporated in a material to increase its workability, flexibility, or distensibility.

3.3.3 *plastisol, n*—a liquid suspension of a finely divided PVC polymer or copolymer in a plasticizer.

3.3.4 *poly(vinyl chloride), n*—a polymer prepared by the polymerization of vinyl chloride as the sole monomer (vinyl chloride content in monomer not less than 99 %).

3.3.5 *viscosity, n*—the property of resistance of flow exhibited within the body of a material.

3.3.5.1 *Discussion*—
In testing, the ratio of the shearing stress to the rate of shear of a fluid. Viscosity is usually taken to mean "Newtonian viscosity," in which case the ratio of shearing stress to rate of shearing strain is constant. In non-Newtonian behavior which is the usual case with plastics materials, the ratio varies with the shearing rate. Such ratios are often called the "apparent viscosities" at the corresponding shear rates. (See viscosity coefficient.) (IUPAC symbol: η) (ISO)

4. Summary of Test Method

4.1 The sample is conditioned to the proper temperature and its viscosity is determined.

5. Significance and Use

5.1 The suitability of a dispersion resin for any given application process is dependent upon its viscosity characteristics.

5.2 The viscosity defines the flow behavior of a plastisol or organosol under low shear. This viscosity relates to the conditions encountered in pouring, casting, molding, and dipping processes.

6. Apparatus

6.1 *Viscometer, Concentric Cylinder Rotational*—The essential instrumentation required providing the minimum rotational viscometer analytical capabilities include:

6.1.1 A *drive motor* to apply a unidirectional displacement to the specimen at a rate from 0.5 to 60 r/min constant to ±0.5 %.

6.1.2 A *force sensor* to measurement the torque developed by the specimen by the rotational element.

6.1.3 A *coupling shaft*, or other means, to transmit the rotational displacement from the motor to the spindle.

NOTE 2—It is helpful to have a mark on the shaft to indicate appropriate test fluid level.

6.1.4 A *rotational element, spindle or tool* of the right circular cylindrical shape as shown in Fig. 1, to fix the specimen between the drive shaft and a stationary position.

NOTE 3—The rotational element dimensions *L* and *D*, are selected so that the measured viscosity is between 10 and 90 % of the range of that element.

6.1.5 A *data collection device*, to provide a means of acquiring, storing, and displaying measured or calculated signals, or both. The minimum output signals required for rotational viscometry are torque, rotational speed, temperature and time.

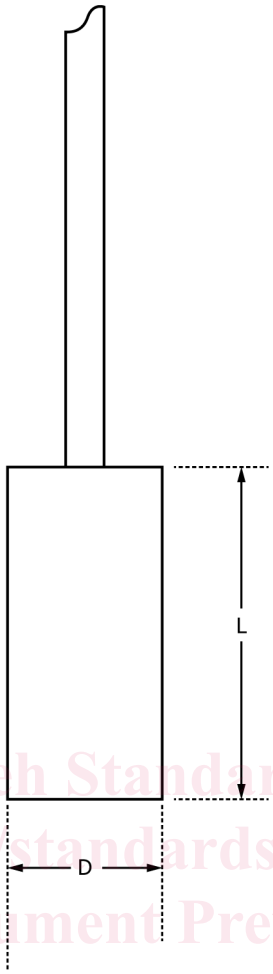

FIG. 1 Rotational Spindle Configuration

NOTE 4—Manual observation and recording of data are acceptable.

6.1.6 A *stand* to support, level, and adjust the height of the drive motor, shaft and rotational element.

6.1.7 Auxiliary instrumentation considered useful in conducting this method includes:

6.1.7.1 *Data analysis capability* to provide viscosity, stress or other useful parameters derived from the measured signals.

6.1.7.2 A *level* to indicate the vertical plumb of the drive motor, shaft and rotational element.

6.1.7.3 A *guard* or other method to protect the rotational element from mechanical damage due to contact between the rotational element and the container walls.

6.2 *Sample Containers, Tin Cans, or Glass Jars,* 500-mL (1-pint) capacity with minimum dimensions of 80 mm (3.15 in.) inside diameter by 80 mm (3.15 in.) depth.

6.3 *Temperature Measurement Device*—ASTM Solvents Distillation Thermometer having a range from −2 to +52°C (28 to 126°F) and conforming to the requirements for Thermometer 37C as prescribed in Specification E1. ~~Use of~~ ; also acceptable are temperature measuring devices such as liquid-in-glass thermometers, thermocouples, or platinum resistance thermometers having equivalent or better accuracy and precision, while covering the temperature range of Thermometer 37C. (**Warning—**Mercury has been designated by EPA and many state agencies as a hazardous material that can cause central nervous system, kidney, and liver damage. Mercury, or its vapor, may be hazardous to health and corrosive to materials. Caution should be taken when handling