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Standard Test Method for Pressure-Sensitive Tack of Adhesives Using an Inverted Probe Machine[1]

This standard is issued under the fixed designation D 2979; 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 measurement of the pressure-sensitive tack of adhesives. This test method is applicable to those adhesives which form a bond of measurable strength rapidly upon contact with another surface and which can be removed from that surface cleanly, that is, without leaving a residue visible to the eye. For such adhesives, tack may be measured as the force required to separate an adhesive and the adherend at the interface shortly after they have been brought into contact under a defined load of known duration at a specified temperature.

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.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D 907 ~~Terminology of Adhesives~~ Terminology of Adhesives

E 4 Practices for Force Verification of Testing Machines

E 171 Specification for ~~Standard~~ Atmospheres for Conditioning and Testing Flexible Barrier Materials

3. Terminology

3.1 *Definitions*—Many terms in this test method are defined in Terminology D 907.

4. Summary of Test Method

4.1 This test method involves bringing the tip of a cleaned probe of defined surface roughness into contact with the adhesive at a controlled rate, under a fixed pressure, for a short time, at a given temperature; and subsequently breaking the bond formed between the probe and adhesive, also at a controlled rate. Tack is measured as the maximum force required in breaking the adhesive bond.

5. Significance and Use

5.1 This test method provides a quantitative measure of the pressure-sensitive tack of the adhesive.

5.2 The method is designed for the adhesive mass itself and is suitable for measuring the tack of pressure-sensitive adhesives for use on both rigid and flexible backings.

5.3 This test method is suitable for quality control and research purposes.

6. Apparatus

6.1 *Probe*—A Type 304 stainless steel rod, 5.0 mm (0.197 in.) in diameter, machined at one end of 90° to the longitudinal axis. The tip is finished to a surface roughness of not more than 500 or less than 250 nm (20 to 10 µin.) rms as measured by a surface-measuring device.[3]

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[1] This test method is under the jurisdiction of ASTM Committee D14 on Adhesives and is the direct responsibility of Subcommittee D14.50 ~~on Hot-Melt and Pressure-Sensitive Adhesives.~~

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[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* ~~, Vol 15.06.~~volume information, refer to the standard's Document Summary page on the ASTM website.

~~[3] Annual Book of ASTM Standards, Vol 15.09.~~

[3] An example of a suitable surface-measuring device is a Surfindicator manufactured by Gould, Inc., Gage and Control Div., 4601 Arden Dr., El Monte, CA.

NOTE 1—When the adhesive is supported on flexible backings, or is greater than 0.25 mm (0.010 in.) thick, a probe with a spherical crown of 0.05 mm (0.002 in.) high, and with a 62.5-mm (2.5-in.) radius may be used.

6.2 *Pressure-Loading Weight*—An annular ring whose inside diameter is slightly larger than the probe diameter. The ring weight is such that the pressure applied to the sample is 9.79 ± 0.10 kPa (1.42 psi).

NOTE 2—Contact pressures of 0.98, 1.96, or 4.90 kPa (0.14, 0.28 or 0.71 psi) may be obtained by employing annuli of different weight. These lower pressures as well as ones of 98 kPa (14.2 psi) or higher can be used to show the effect of pressure directly when tack is pressure-dependent.

6.3 *Force Gage*—A spring device with an indicator that retains the maximum force reading until reset manually. The spring characteristics is such that between 8.9 and 22.2 N (2 and 5 lb) are required to extend it the permissible 2.5 mm (0.10 in.). Mount the probe directly on the force gage.

NOTE 3—Other force-measuring devices such as strain gage load cells, or devices with different force-deflection characteristics may be used in certain instances. Tack values obtained with these devices will differ in magnitude but will be related to standard values obtained with the specified gage.

6.4 *Testing Machine*[4]—A mechanical system for bringing the adhesive into contact with the probe, automatically controlling the dwell time during which the adhesive and probe are in contact under pressure, and subsequently pulling the adhesive away from the probe. The machine is capable of maintaining a constant crosshead speed of 10 ± 0.1 mm/s (24 ± 0.24 in./min), sensing contact of probe with adhesive, stopping for 1 ± 0.01 s, and then reversing at the same 10 ± 0.1 mm/s (24 ± 0.24 in./min) speed. The machine supports the probe such that its top surface is parallel to the plane of the adhesive at the time of contact to less than a 0° 10 min angle between them. Probe to have force measurement accuracy of ±1 % of reading, when calibrated in compliance with Practices E 4requirements.

NOTE 4—For some special purposes it may be desirable to measure the tack at dwell times as short as 0.1 s or as long as 100 s, depending on how quickly the adhesive bond is to be established in the end use.

7. Test Specimens

7.1 If specimen is not already coated with adhesive, coat the adhesive on smooth, clear polyester (polyethylene terephthalate, PET) film backing 0.05 mm (0.002 in.) thick. The recommended dry adhesive thickness is 0.025 mm (0.001 in.).

NOTE 5—Other films may also be used provided they do not react with the adhesive or elongate excessively during the test. Microscope slides or cover glasses may be used to give rigid support to the adhesive.

7.2 Adhesives already on some supporting material are examined as they exist.

8. Conditioning

8.1 *Testing Room*— Test in a standard laboratory atmosphere, in accordance with Specification E 171.

9. Procedure

9.1 Clean the probe with an absorbent material such as surgical gauze or tissue wet with a completely volatile solvent that is a good solvent for the adhesive under test. To be suitable, the material must be lint-free during use, absorbent, and contain no additives that are soluble in the cleaning solvents used. Wipe with another piece of solvent-wet absorbent material, and finally wipe the probe with a clean dry piece of absorbent material to remove excess solvent. Wait 20 s or a sufficiently longer time if necessary, to allow for complete evaporation of the solvent and temperature equilibration.

9.2 Place an appropriately sized specimen of supported adhesive, sticky side down, on the annular ring weight. Use a specimen large enough to cover the hole in the weight without slippage during the test and small enough so that it does not adhere to the carrier supporting the weight. Place the weight in the carrier.

NOTE 6—The proper relation of the supported adhesive on the ring weight to the probe is sketched in Fig. 1. One possible arrangement of the carrier and force gage is also illustrated.

9.3 At a speed of 10 ± 0.1 mm/s, bring the probe into contact with the adhesive. After a dwell time of 1.0 ± 0.01 s separate the probe from the adhesive at 10 ± 0.1 mm/s.

9.4 Record the tack as the maximum force in newtons required to separate the probe from the adhesive.

9.5 Make at least five determinations taken at random points on the supported adhesive. With grossly rough or nonuniform adhesive surfaces more than five determinations may be necessary to obtain the desired statistical reliability of the average tack value.

9.6 Clean the probe surface with solvent after each test. In instances where tack values neither tend to increase or decrease systematically, cleaning may be limited to each series of test on a given adhesive.

NOTE 7—If there is evidence of contamination by lint, large dust particles, thumb prints, etc., the test shall be discounted. If the probe surface shows to the unaided eye presence of deposited adhesive, the test shall also be discounted.

[4] An example of a suitable surface-measuring device is a Surfindicator manufactured by Gould, Inc., Gage and Control Div., 4601 Arden Dr., El Monte, CA.
[4] An example of a suitable machine is the Polyken Probe Tack Tester available from Chemsultants International, Mentor, OH.