



Designation: C813 – 90 (Reapproved 2004)

Standard Test Method for Hydrophobic Contamination on Glass by Contact Angle Measurement¹

This standard is issued under the fixed designation C813; 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 the detection of hydrophobic contamination on glass surfaces by means of contact angle measurements. When properly conducted, the test will enable detection of fractions of monomolecular layers of hydrophobic organic contaminants. Very rough or porous surfaces may significantly decrease the sensitivity of the test.

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:*²

D1193 Specification for Reagent Water

3. Terminology

3.1 *Definitions:*

3.1.1 *advancing angle*—the largest angle observable when a liquid droplet is increased in size.

3.1.2 *hydrophilic*—having a strong affinity for water; wettable.

3.1.2.1 *Discussion*—Hydrophilic surfaces exhibit zero contact angles.

3.1.3 *hydrophobic*—having little affinity for water; nonwettable.

3.1.3.1 *Discussion*—Hydrophobic surfaces exhibit contact angles appreciably greater than zero: generally greater than 45° for the advancing angle.

3.1.4 *receding angle*—the smallest angle observable when a liquid droplet is decreased in size.

3.1.5 *sessile drop*—a drop of liquid sitting on the upper side of a horizontal surface.

¹ This test method is under the jurisdiction of ASTM Committee C14 on Glass and Glass Products and is the direct responsibility of Subcommittee C14.02 on Chemical Properties and Analysis.

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

3.1.5.1 *Discussion*—See Fig. 1.

4. Summary of Test Method

4.1 The contact angle test is performed by depositing droplets of permanganate-distilled water or reagent water in accordance with Specification D1193 on the surface to be tested using a mounted hypodermic syringe, said droplets being deposited in such a way, as described herein, as to measure the advancing contact angle. The measurements shall be made by either of these two well-known methods: (1) viewing the sessile drop through a comparator microscope fitted with a goniometer scale with direct measurement of the angle; or (2) photographing the sessile drop and measuring the angle with a protractor. The interpretation of the measurements is based on the fact that organic contamination on surfaces results in contact angles appreciably higher than the near-zero angles measured on clean surfaces or those contaminated by hydrophilic materials.

5. Significance and Use

5.1 The contact angle test is nondestructive and may be used for control and evaluation of processes for the removal of hydrophobic contaminants. The test may also be used for the detection and control of hydrophobic contaminants in processing ambients. For this application, a surface free of hydrophobic films is exposed to the ambient conditions and is subsequently tested.

6. Interferences

6.1 Loss of sensitivity may result from either of the following factors:

6.1.1 The presence of hydrophilic substances on the surface to be tested, or in the water used for the test, or

6.1.2 An unusually rough or porous surface.

7. Apparatus

7.1 *Low-Power Comparator Microscope* (5× to 50×), with goniometer scale and light source for illumination of small drops.

7.2 *Camera*, that can take photographs of the drop if this alternative method is used.

7.3 *Protractor*, to measure the angle if the alternative method is used.