



Standard Test Methods for Surface and Interfacial Tension of Solutions of Surface- Active Agents¹

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1. Scope

1.1 These test methods cover the determination of surface tension and interfacial tension of solutions of surface-active agents, as defined in Terminology D 459. Two methods are covered as follows:

Method A—Surface Tension.

Method B—Interfacial Tension.

1.2 Method A is written primarily to cover aqueous solutions of surface-active agents, but is also applicable to non-aqueous solutions and mixed solvent solutions.

1.3 Method B is applicable to two-phase solutions. More than one solute component may be present, including solute components that are not in themselves surface-active.

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 practices and determine the applicability of regulatory limitations prior to use.* Material Safety Data Sheets are available for reagents and materials. Review them for hazards prior to usage.

2. Referenced Documents

2.1 ASTM Standards:

D 459 Terminology Relating to Soaps and Other Detergents²

3. Apparatus

3.1 *Tensiometer*—Either the du Nouy precision tensiometer or the du Nouy interfacial tensiometer, equipped with either the 4 or the 6-cm circumference platinum ring, as furnished by the manufacturer, may be used. The tensiometer shall be placed on a sturdy support that is free from vibrations and other disturbances such as wind, sunlight, and heat. The wire of the ring shall be in one plane, free of bends or irregularities, and circular. When set in the instrument, the plane of the ring shall be horizontal, that is, parallel to the surface plane of the liquid being tested.

3.2 *Sample Container*—The vessel for holding the liquid

shall be not less than 6 cm in diameter, and sufficiently large to ensure that the contact angle between the ring and the interface is zero.

4. Preparation of Apparatus

4.1 Clean all glassware thoroughly. The use of fresh chromic-sulfuric acid cleaning mixture, followed by a thorough rinsing in distilled water, is recommended.

4.2 Clean the platinum ring by rinsing thoroughly in a suitable solvent and in distilled water, before taking a set of measurements. Allow the ring to dry, and then heat to white heat in the oxidizing portion of a gas flame.

5. Calibration of Apparatus

5.1 The tensiometer is, in fact, a torsion balance, and the absolute accuracy depends on the length of the torsion arm, which is adjustable. Torsion may be applied to the wire by means of either the dial-adjusting screw (which controls the dial reading) or a rear adjusting screw. Calibration consists essentially in adjusting the length of the torsion arm so that the dial scale will read directly in dynes per centimetre. The precision tensiometer shall be calibrated in accordance with the following: 5.1.1-5.1.3; the interfacial tensiometer shall be calibrated in accordance with 5.1.1-5.1.4.

5.1.1 Level the tensiometer. A liquid level of the type employed on analytical balances may be used. Place the level on the table that holds the sample for testing, and adjust the leg screws of the tensiometer until the table is horizontal. Pull the torsion wire taut by means of the tension screw, and adjust the dial reading and the vernier to zero. Insert the platinum ring in the holder, and place a small piece of paper across the ring. This will serve as a platform to hold the calibrating weight. Turn the rear adjusting screw of the torsion wire until the index level of the arm is opposite the reference line of the mirror; this automatically compensates for the weight of the paper platform. Next, place an accurately standardized weight of between 500 and 800 mg on the paper platform and turn the dial-adjusting screw until the index level of the arm is opposite the reference line of the mirror. Record the dial reading to 0.10 division. Call this “gamma-c.”

5.1.2 Calculate what the reading “gamma-c” obtained in 5.1.1 *should be* when the tensiometer is properly adjusted, as follows (Note 1):

$$\gamma_c = (M \times g)/2L \quad (1)$$

¹ These test methods are under the jurisdiction of ASTM Committee D12 on Soaps and Other Detergents and are the direct responsibility of Subcommittee D12.15 on Physical Testing.

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² *Annual Book of ASTM Standards*, Vol. 15.04.