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Aqueous Liquid Repellency: Water/Alcohol Solution Resistance Test

Developed in 2004 by AATCC Committee RA56; reaffirmed and editorially revised 2005; editorially revised 2006, 2008, 2010, 2011, 2016; revised 2007; reaffirmed 2012, 2017. Technically equivalent to ISO 23232.

1. Purpose and Scope

1.1 This test method can be used to determine the efficacy of a protective finish that is capable of imparting a low energy surface on all types of fabrics, by evaluating the fabric's resistance to wetting by a selected series of water/alcohol solutions of different surface tensions.

2. Principle

2.1 Drops of standard test liquids, consisting of a selected series of water/alcohol solutions with varying surface tensions, are placed on the fabric surface and observed for wetting, wicking and contact angle. The aqueous repellency grade is the highest numbered test liquid which does not wet the fabric surface. (The scale ranges from zero to eight, with a rating of eight signifying the most repellent surface.)

3. Terminology

3.1 **grade,** n.—*in textile testing*, the symbol for any step of a multi-step standard reference scale for a quality characteristic.

NOTE: The grade is assigned to test specimens exhibiting a degree of the quality comparable to that step of the standard.

3.2 **aqueous repellency,** n.—*in textiles*, the characteristic of a fiber, yarn or fabric whereby it resists wetting by aqueous liquids.

4. Safety Precautions

NOTE: These safety precautions are for information purposes only. The precautions are ancillary to the testing procedures and are not intended to be all inclusive. It is the user's responsibility to use safe and proper techniques in handling materials in this test method. Manufacturers MUST be consulted for specific details such as material safety data sheets and other manufacturer's recommendations. All OSHA standards and rules must also be consulted and followed.

4.1 Good laboratory practices should be followed. Wear safety glasses and impervious gloves when handling test liquids in all laboratory areas.

4.2 The alcohol specified in this method is flammable. Keep away from heat, sparks and open flame. Use with adequate ventilation. Avoid prolonged breathing of vapor or contact with skin. Do not take internally.

4.3 Exposure to chemicals used in this procedure must be controlled at or below levels set by governmental authorities [e.g., Occupational Safety and Health Administration's (OSHA) permissible exposure limits (PEL) as found in 29 CFR 1910.1000; see web site: www.osha.gov for latest version]. In addition, the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) comprised of time weighted averages (TLV-TWA), short term exposure limits (TLV-STEL) and ceiling limits (TLV-C) are recommended as a general guide for air contaminant exposure which should be met (see 12.1).

5. Uses and Limitations

5.1 This test method is not intended to give an absolute measure of the resistance of the fabric to staining by all aqueous materials. Other factors, such as composition and viscosity of the aqueous substances, fabric construction, fiber type, dyes, other finishing agents, etc., also influence stain resistance. This test can, however, provide a rough index of aqueous stain resistance, in that generally the higher the aqueous solution repellency grade, the better resistance to staining by aqueous materials, especially liquid aqueous substances. This is particularly true when comparing various finishes for a given fabric.

6. Apparatus and Materials (see 12.2)

6.1 Test liquids prepared and numbered according to Table IV.

6.2 Dropping bottles (see 12.3).

6.3 White AATCC Textile Blotting Paper (see 12.4).

6.4 Laboratory gloves (general purpose is sufficient).

7. Test Specimens

7.1 Test two specimens of the same size from each sample. Specimen size should be sufficient to allow for the complete range of test liquids to be evaluated, but shall be no smaller than 20 × 20 cm (8 × 8 in.) and no larger than 20 × 40 cm (8 × 16 in.). Specimens from sample to sample should be the same size. Condition the test specimens for a minimum of 4 h at 21 ± 2°C (70 ± 4°F) and 65 ± 5% RH prior to testing (see 12.5).

8. Procedure

8.1 Place the test specimen flat on the white textile blotting paper on a smooth, horizontal surface.

8.1.1 When evaluating open weave of "thin" fabrics, conduct the test on at least two layers of the fabric; otherwise, the test liquid may wet the underlying surface, not the actual test fabric, and thereby cause confusion in the reading of the results.

8.2 Wearing clean laboratory gloves, brush the pile of napped or pile fabrics lightly with your hand in the direction giving the greatest lay of the surface prior to placing the drops of the test liquid.

8.3 Beginning with the lowest-numbered test liquid (AATCC Aqueous Solution Test Grade Liquid No. 1), *carefully* place small drops [approximately 5 mm (0.19 in.) in diameter or 0.05 mL volume] on the test specimen in three locations along the filling direction. The drops should be approximately 4.0 cm (1.5 in.) apart. The dropper tip should be held at a height of approximately 0.6 cm (0.25 in.) from the fabric surface while placing drops. DO NOT TOUCH THE FABRIC WITH THE DROPPER TIP. Observe the drops for 10 ± 2 s, from approximately a 45° angle.

8.4 If no penetration or wetting of the fabric at the liquid-fabric interface and no wicking around the drops occur, place drops of the next higher-numbered test liquid at an adjacent site on the fabric and again observe for 10 ± 2 s.

8.5 Continue this procedure until one of the test liquids shows obvious wetting or wicking of the fabric under or around the drop within 10 ± 2 s.

9. Evaluation

9.1 The AATCC Aqueous Solution Repellency Grade of a fabric is the numerical value of the highest-numbered test liquid which will not wet the fabric within a period of 10 ± 2 s. A grade of zero (0) is assigned when the fabric fails the 98% water solution test liquid. Wetting of the fabric is normally evidenced by a darkening of the fabric at the liquid-fabric interface or wicking and/or loss of contact angle of the drop. On black or dark fabrics, wetting can be detected by loss of "sparkle" within the drop.

9.2 Different types of wetting may be encountered depending on the finish, fiber, construction, etc.; and the determina-

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