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Light Blocking Effect of Textiles and Related Materials: Photodetector Method

Developed in 1976 by AATCC Committee RA36; reaffirmed 1979, 1984, 1989; editorially revised 1983, 1984, 1985, 1986. Discontinued 1994; Reactivated and revised 2014 (with new title); reaffirmed and editorially revised 2015.

Foreword

AATCC Test Method (TM) 148-1989, Light Blocking Effect of Curtain Materials, was discontinued in 1994. During the time of its discontinuance, the need for a method to measure this property continued. The method has now been rewritten and retitled for reactivation, in parallel with an alternative method using a standard laboratory sphere spectrophotometer used in transmission mode (see TM203, Light Blocking Effect of Textiles: Spectrophotometric Method). The two methods are not equivalent (see 14.1).

1. Purpose and Scope

1.1 The test method measures the light blocking properties of textile and related materials using a photometer.

1.2 This method is applicable to all types of fabrics, including coated textiles and other textile-based constructions.

2. Principle

2.1 By measuring the amount of light from a test lamp, and the amount of light from the same lamp transmitted through a test material, the percent of light blocked by the material is determined. This represents the material's light blocking effect.

3. Terminology

3.1 **diffuse transmission**, n.—process by which incident light, while being transmitted through an object, is redirected or scattered over a range of angles.

3.2 **light**, n.—electromagnetic radiation weighted by the luminosity function of the human eye.

3.3 **light blocking**, n.—the ability of a textile to prevent the transmission of light.

3.4 **non-diffuse transmission**, n.—process by which incident light is transmitted through an object in a rectilinear, straight-through manner, without diffusion.

3.5 **photometer**, n.—an instrument used for measuring light

3.6 **total transmission**, n.—the amount

of light transmitted comprising diffuse plus non-diffuse transmission.

3.7 **transmission**, n.—process by which incident light is transmitted through an object.

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 materials 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 in all laboratory areas.

4.2 The manufacturer's safety recommendations should be followed when operating laboratory testing equipment.

5. Uses and Limitations

5.1 The results may depend on the specific light source used in the instrument. This is quoted as part of the report.

5.2 For materials of high light blocking effect, the method is limited by the ability of the system to measure very small amounts of light, in turn depending on the sensitivity of the instrument, together with the output of the light source used (see 14.3).

5.3 The test measures non-diffuse transmission through the material under test. It is designed to exclude diffuse transmission (scattered light) (see 14.1).

6. Calibration

6.1 The measurement is of an SI-based quantity (lux), and the instrument should be calibrated to traceable standards at intervals recommended by the manufacturer, typically on an annual basis.

7. Apparatus

7.1 The apparatus (see Fig. 1) consists of a rectilinear box constructed of light-impermeable materials with internal dimensions of 360 ± 20 mm high, 280 ± 20 mm wide, and 200 ± 20 mm deep with matte black internal surfaces. On one side

is a circular opening of dimensions to fit the sensor of a photometer with a clamp to hold the sensor in place at the internal surface of the box. Directly opposite is a circular opening 50 ± 3 mm in diameter. A sliding shutter of opaque material allows this opening to be completely blocked. Magnetic bars provide a convenient means of clamping a fabric specimen in close contact with the outside wall of the opening, but other means of fixing a specimen against the opening may be used. A lamp housed within a metal reflector is mounted so that it is aligned with the two holes in the box. The distance from the lamp to the surface of the test fabric is 300 mm. To accommodate different lamps, it is convenient to have the housing mounted on a track so that the distance to the specimen can remain constant.

8. Test Specimens

8.1 For a (purportedly) evenly-blocking material, cut or mark three representative test specimens from the sample. Do not take specimens from within 10% of the width from the selvage or machine edge of the fabric.

8.2 If testing a complete curtain or roll of fabric, test three locations across the width.

8.3 If testing reveals that the transmission characteristics vary excessively between specimens, even if not obvious to the eye, increase the number of specimens (see section 11 and 14.2).

8.4 Materials with small-scale (less than the 50 mm size of the specimen exposed) variation in transmission characteristics (based on fabric structure, or printed decoration, for example) may require additional specimens to be cut.

8.5 Materials with large (greater than the 50 mm size of the specimens exposed) repeats of varying transmission characteristics may have the light blocking effect of each area measured separately.

8.6 Include sampling information in the test report.

9. Conditioning

9.1 Prior to testing, condition test specimens as directed in ASTM D1776, Standard Practice for Conditioning and Testing Textiles. Condition the specimens for at least 4 h in an atmosphere of $21 \pm 1^\circ\text{C}$ ($70 \pm 2^\circ\text{F}$), $65 \pm 2\%$ RH, by laying each