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Test Method for Electrical Surface Resistivity of Fabrics

Developed in 1954 by AATCC Committee RA32; revised 1963, 1968, 1970, 1972, 1973, 1982, 1995, 2000 (with title change); reaffirmed 1969, 1975, 1978, 1989, 2011, 2018; editorially revised 1974, 1984, 1985, 1997, 2004, 2008, 2019; editorially revised and reaffirmed 1987, 2005.

1. Purpose and Scope

1.1 The purpose of this test method is to determine the electrical surface resistivity of fabrics. The surface electrical resistivity may influence the accumulation of electrostatic charge of a fabric (refer to AATCC TM84, Test Method for Electrical Resistance of Yarns).

2. Principle

2.1 Specimens at equilibrium with specified atmospheric conditions of relative humidity and temperature are measured for electrical resistance between parallel electrodes by means of an electrical resistance meter.

3. Terminology

3.1 **electrical resistivity,** n.—material property of a substance whose numerical value is equal to the ratio of the voltage gradient to the current density.

NOTE: For the purposes of this method, surface resistivity is calculated by using the measured electrical resistance between superficially positioned parallel plates or concentric rings and their spacing and is reported as ohms per square. This test method in effect measures the resistance of a material to the flow of current between two electrodes.

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 in all laboratory areas.

4.2 The safety recommendations provided by the manufacturer of the radioactive bar should be followed.

4.3 The radioactive bar emits alpha radiation which is externally harmless to the human body. The radioactive isotope polonium 210 is toxic and precaution should be exercised to prevent ingestion or inhalation of the solid material. Do not take the radioactive bar apart or touch the radioactive strip under the grid. If the strip is touched or handled, wash hands thoroughly at once. Return the device to the manufacturer when it loses its effectiveness as a static eliminator or for disposal if use is to be discontinued. ***Do not discard as scrap.***

5. Apparatus and Materials

5.1 Electrical resistance meter (see 11.1).

5.2 Conditioning and test chamber (see 11.2).

5.3 Standard resistors.

5.4 Radioactive bar.

5.5 Two rectangular flat metal surfaces of suitable size to serve as electrodes.

5.5.1 As an alternative, two concentric ring electrodes of spacing suitable to the material being measured and the purpose of the results.

6. Test Specimens

6.1 Adjust the size of fabric test specimens to suit the electrodes of the particular equipment being used. When using parallel plate electrodes, the width of the specimen must not exceed the width of the electrodes. When using the concentric rings, any size specimen at least as large as the outer ring may be used. Avoid contaminating the area on which the measurement is to be made.

6.2 *Specimens for use with instruments providing parallel plate electrodes.* Prepare 2 sets of 3 test specimens each, 1 set each so that the direction of testing is parallel to the yarns in the length direction of the fabric and 1 set with the direction of testing parallel to the width direction of the fabric.

6.2.1 *Test specimens for use with instruments providing concentric ring electrodes.* Prepare 1 set (3 test specimens) since, with this type instrument, the resistance is measured in both fabric length and fabric width directions simultaneously.

6.2.2 Depending on the fabric construction or end-use, it may be advisable to differentiate between face and back measurements. Each test specimen should be taken from a different part of the fabric.

7. Procedure

7.1 Calibrate the electrical resistance meter according to the manufacturer's recommendations. This calibration should be repeated periodically.

7.2 Condition the test specimens in a suitable testing chamber or conditioning room at a predetermined relative humidity that will reflect the conditions at which information on the electrical resistivity of the fabric is needed.

7.2.1 For most fabrics which require antistatic treatments or whose static propensity is critical, measurements at 20% relative humidity will be most meaningful.

7.2.2 In less critical situations 40% relative humidity may be employed.

7.2.3 For special requirements other relative humidities may be used. For example, preconditioning at 50 ± 2% RH at 21 ± 2°C (70 ± 5°F) is required for antistatic sheeting, film and textiles for use in hospital operating rooms (see 11.2.1). Measurements may be made under other conditions or ranges of conditions that are applicable to the end use (such as 65% RH and 24°C [75°F]). It is preferable to keep the temperature or humidity consistent for all measurements.

7.2.4 If it is necessary to measure electrical resistivity under a broad range of conditions, additional tests may be run at 65% RH and at 24°C (75°F) or other settings applicable to the end use. It is preferable to keep the temperature or humidity consistent for all measurements (see 11.3).

7.3 Optionally remove static charges on the surface of the fabric by passing a radioactive bar over both sides of the fabric.

7.4 Place a test specimen in firm contact with the electrodes. The contact with the electrodes should be such that, when additional pressure is applied between the fabric and the electrodes, the test results are not affected.

7.4.1 In the case of equipment using parallel plate electrodes, place the test specimen in contact with the electrodes with the direction of the test perpendicular to the adjacent edges of the electrode. Measure the electrical resistance of the fabric in both the length and width directions. Since the charge will follow the path of least resistance, record only the lower reading by direction.

7.4.2 For concentric ring electrodes, the charge follows the path of least resistance automatically.

7.5 Measure the electrical resistance of the test specimen according to the operating instruction and procedures for the

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