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ICS 59.080.30
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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 43822-2024

Textiles - Determination of the drying rate of fabrics at their absorbent capacity

纺织品 织物最大吸水量下干燥速率的测定

Issued on: March 15, 2024 **Implemented on: October 1, 2024**

Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC

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1 Scope

The document describes a test method for the drying rate of fabrics at their maximum water absorption under specified conditions.

It applies to fabrics of all kinds and to articles made from them.

2 Normative references

The contents of the following documents constitute indispensable provisions of the document through normative reference in its text. For dated references, only the edition corresponding to that date applies; for undated references, the latest edition, including all amendments, applies.

Two documents are listed: GB/T 6529 Textiles-Standard atmospheres for conditioning and testing, and GB/T 6682 Water for analytical laboratory use-Specification and test methods.

3 Terms and definitions

3.1 absorbent capacity: the maximum quantity of water that the specimen can absorb under specified conditions.

3.2 drying rate: the quantity of water in the specimen evaporated per unit time under specified conditions. A note states that the drying rate is affected by the weave structure of the sample, the fibre composition, the finishing process, the testing atmosphere and the quantity of water added in the test.

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3.3 drying time: the time needed under specified conditions for all the water applied to the specimen to evaporate. A note states that in the document a series of different volumes of water is added to the specimen and that the different volumes correspond to different drying times.

3.4 start time: the moment at which the specimen comes into contact with the water when water is added to the specimen.

3.5 end time: the moment at which all the water applied to the specimen has evaporated. A note states that this is the moment corresponding, on the temperature-time curve, to the point of intersection between the straight line fitted to the part of greatest slope before the water has fully dried and the straight line fitted to the gentle part of the curve after the water has fully dried.

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4 Principle

The maximum water absorption of the specimen is determined under specified conditions. Water drop volumes of about 10 %, 25 %, 50 %, 75 % and not more than 90 % of that maximum water absorption are then selected as the quantities of water added and are applied to the specimen in turn; the time needed for the specimen to return to its initial temperature after each addition is measured, from which the drying rate corresponding to each quantity of water added is calculated. The five sets of data of quantity of water added and corresponding drying rate are fitted non-linearly, and the drying rate of the specimen at its maximum water absorption is calculated.

5 Test apparatus and reagents

5.1 Temperature recorder, able to record and store the change of specimen temperature every second and to transmit the data to a computer.

5.2 Infrared temperature sensor, with a temperature measuring range covering (15 +/- 0.1) °C to (50 +/- 0.1) °C.

5.3 Wind box, with a fan inside, able to provide an air speed of (2.5 +/- 0.5) m/s in the specimen holding area of (13 +/- 0.1) cm diameter with no specimen clamped.

5.4 Micropipette or high precision pipetting pump, with a precision of +/- 0.003 mL.

5.5 Absorbent paper or water drop detector; the absorbent paper is about 14 cm long and about 5 cm wide and shows a clear colour change after absorbing water, and the water drop detector is able to detect whether water drips from the specimen.

5.6 Anemometer, with a measuring range covering (0.1 +/- 0.1) m/s to (5.0 +/- 0.1) m/s, installed above the specimen surface at approximately the central position at a vertical distance of (1 +/- 0.1) cm from the specimen surface, recording the speed of the air passing through the specimen.

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5.7 Specimen holder, annular, with an internal diameter of (13 +/- 0.1) cm.

5.8 Water leakage detection plate.

5.9 Water for the test, complying with grade 3 water of GB/T 6682, at a temperature of (20 +/- 2) °C.

Figure 1 shows the test apparatus, its key listing: 1 temperature recorder; 2 infrared temperature sensor; 3 wind box; 4 fan; 5 specimen holding area; 6 absorbent paper; 7 anemometer; 8 specimen holder; 9 water leakage detection plate. A note states that the water leakage detection plate is located directly below the specimen holding area inside the wind box. The dimensions in the figure are in centimetres.

6 Conditioning and testing atmosphere

The specimen is conditioned to equilibrium in the standard atmosphere specified in GB/T 6529, and the test is carried out in the standard atmosphere conditions specified in GB/T 6529.

7 Sampling

7.1 For fabric samples, a full width piece of more than 0.5 m is cut from each sample, avoiding the first 2 m or more at the end of the piece; for articles, at least one unit is taken.

7.2 For fabric samples, the specimens are cut evenly distributed within the area more than 150 mm from the selvedge; no two specimens are to lie at the same warp (longitudinal) and weft (transverse) position. Three specimens are cut, of size (15.0 +/- 0.5) cm x (15.0 +/- 0.5) cm. For articles, the specimens are selected from a representative part. Sampling avoids defects and creases that would affect the test result.

8 Test procedure

8.1 Using the specimen holder (5.7), the specimen is mounted in the specimen holding area of the test apparatus (see Figure 1) with the test face upwards, flat and evenly tensioned, avoiding large deformation of the specimen; before the fan in the wind box (5.3) is started, no serious sagging is to appear at the centre of the specimen.

8.2 Using the micropipette or high precision pipetting pump (5.4), about 0.05 mL of water is dripped onto the specimen surface and the time from the water drop touching the specimen surface until it is fully spread and no longer shows specular reflection is measured; this is the water absorption time of the specimen. If the water absorption time is less than or equal to 30 s, the test continues; if it is greater than 30 s, the test is stopped and the sample is not suitable for this method. The fan in the wind box (5.3) is run for 5 min to dry the specimen and is then switched off.

8.3 If the wind box body is transparent, absorbent paper can be used to detect water

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leakage, the absorbent paper (5.5) being fitted onto the water leakage detection plate (5.8); if the wind box body is not transparent, a water drop detector is to be used to detect leakage.

8.4 The fan in the wind box (5.3) is started; the specimen surface may then sag slightly, and the position of the infrared temperature sensor is to be adjusted to (1 +/- 0.1) cm above the centre of the specimen surface. After the fan has run for 5 min the specimen is dry and in a stable state, and the temperature of the specimen measured at this point is the initial temperature of the specimen.

8.5 Using the micropipette or high precision pipetting pump (5.4), (0.100 +/- 0.003) mL of water is dripped at the centre of the specimen surface at a rate of (0.200 +/- 0.003) mL/s; water is added continuously to the specimen surface at that rate, the addition beginning when the micropipette or high precision pipetting pump touches the specimen.

8.6 It is observed whether leakage occurs. If no seepage occurs, the specimen is dried until its temperature returns to the initial temperature (8.4) and the temperature curve tends to be stable, and then 0.100 mL of water is added on top of the previous quantity, again at a rate of (0.200 +/- 0.003) mL/s. If seepage occurs, the specimen is dried until its temperature returns to the initial temperature (8.4) and the temperature curve tends to be stable, then the wetted absorbent paper is removed, new absorbent paper is fitted, the quantity of water is reduced by 10 % and water is added to the specimen surface again at a rate of (0.200 +/- 0.003) mL/s. The above operations are repeated until the volume of the maximum quantity of water that is estimated to be fully absorbed by the specimen without seepage is obtained; this is the maximum water absorption of the specimen. A note states that after drying, the specimen temperature may not be exactly the same as the initial temperature.

8.7 The water leakage detection plate (5.8) is removed and the specimen is dried until its temperature returns to the initial temperature (8.4) and the temperature curve tends to be stable. A note repeats that after drying the specimen temperature may not be exactly the same as the initial temperature.

8.8 A water drop volume close to but not greater than 90 % of the maximum water absorption is chosen as the largest quantity of water added, and water drop volumes of about 10 %, 25 %, 50 % and 75 % of the maximum water absorption are chosen as the other four quantities, giving five drying rate tests in all. The document gives as an example a specimen whose maximum water absorption is 0.470 mL, for which the selected volumes of water added are about 0.050 mL, 0.100 mL, 0.200 mL, 0.300 mL and 0.400 mL.

8.9 The smallest quantity of water in the series is added to the specimen at the position corresponding to the infrared temperature sensor, and the temperature recorder (5.1) records the temperature change of the tested part of the specimen every second until the specimen temperature returns to the initial temperature and the temperature curve tends to be stable. The anemometer (5.6) is used to measure and record the air speed during the

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