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GB/T 15330-2020

Replacing GB/T 15330-1994

Test method for water penetration rate of pressure-sensitive tape

压敏胶粘带水渗透率试验方法

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Foreword

This Standard was drafted in accordance with the rules given in GB/T 1.1-2009.

This Standard replaces GB/T 15330-1994 “Test method for water penetration rate of pressure - Sensitive tapes”. Compared with GB/T 15330-1994, the main technical differences in this Standard are as follows:

- modified application scope of the standard (see Clause 1 of this Edition, Clause 1 of Edition 1994);

- added normative references (see Clause 2 of this Edition);

- modified terms and definitions (see 3.1, 3.2 of this Edition, Clause 2 of Edition 1994);

- added classification of test methods (see Clause 4 of this Edition);

- added test methods, which are divided into test method for water penetration rate on vertical direction of pressure-sensitive tape (see Clause 5 of this Edition) and test method for water penetration rate on cross section direction of pressure-sensitive tape (see Clause 6 of this Edition);

- modified principle (see 5.1, 6.1 of this Edition, Clause 3 of Edition 1994);

- modified test box in instruments and equipment (see 5.2.1 of this Edition, Clause 4 of Edition 1994);

- added ring test cover and round test cover (see 5.2.2, 6.2.2 of this Edition);

- added electronic balance requirements in instruments and equipment, division is 0.0001g (see 5.2.6 of this Edition);

- added solvents required to use and requirements in instruments and equipment (see 5.2.8, 6.2.8 of this Edition);

- added weights required to use and requirements in instruments and equipment (see 5.2.9, 6.2.9 of this Edition);

- added edge sealing material in instruments and equipment (see 5.2.10 of this Edition);

- added sampling requirements (see 5.3 of this Edition);

- added requirements for standard test environment (see 5.4 of this Edition);

Test method for water penetration rate of pressure-sensitive tape

1 Scope

This Standard specifies test principle, instruments and equipment, preparation of test piece, test steps and result calculation for water penetration rate of pressure-sensitive tape.

This Standard includes test methods for water penetration rate on vertical direction and on cross section direction of pressure-sensitive tape. The test method for water penetration rate on vertical direction of pressure-sensitive tape is applicable to single-sided or double-sided pressure-sensitive tape. The test method for water penetration rate on cross section direction of pressure-sensitive tape is applicable to double-sided pressure-sensitive tape.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 4851-2014, *Measurement of static shear adhesion for adhesive types*

GB/T 22396, *Terminology relating to pressure sensitive adhesive products*

3 Terms and definitions

For the purposes of this document, the terms and definitions defined in GB/T 22396 as well as the followings apply.

3.1 water penetration rate on vertical direction; $WPR_{vertical}$

under certain conditions, the mass per unit area of water permeating the tape perpendicular to the direction of the glue surface per unit time

NOTE: Usually it is expressed in grams per square meter day [$g/(m^2 \cdot d)$].

3.2 water penetration rate on cross section direction; $WPR_{cross\text{-}section}$

under certain conditions, the mass per unit length of water permeating the tape in the cross-sectional direction per unit time

NOTE: Usually it is expressed in grams per square meter day [g/(m^2·d)].

4 Classification

According to the different directions of the water penetration pressure-sensitive tape position, the test method for water penetration rate of pressure-sensitive tape is divided into test method for water penetration rate on vertical direction of pressure-sensitive tape ($WPR_{vertical}$) and test method for water penetration rate on cross section direction of pressure-sensitive tape ($WPR_{cross\text{-}section}$).

5 Method One: Test of water penetration rate on vertical direction of pressure-sensitive tape ($WPR_{vertical}$)

5.1 Principle

The pressure-sensitive tape is pasted on the test box with desiccant. Cover with a ring test cover to form a test piece.

The test piece is immersed under a certain water pressure. Weigh the mass of the test piece at regular intervals. When the mass gain of the test piece in a fixed time interval reaches equilibrium, use the mass increase in unit time and unit area of tape to express the water penetration rate on vertical direction of the tape.

5.2 Instruments and equipment

5.2.1 Test box: made of non-moisture-absorbing material; its water vapor transmission rate is zero (aluminum or stainless steel is recommended). The test box has flat, smooth and rigid edges. The size is shown as Figure 1.

5.3 Sampling

Sampling is carried out in accordance with the provisions of 5.4.3 and 5.4.4 in GB/T 4851-2014.

5.4 Standard test environment

The standard environment temperature is (23±1)°C. The relative humidity is (50±5)%.

5.5 Number of test pieces

Each sample at least makes 3 test pieces.

5.6 Preparation of test piece

5.6.1 Use solvent to wipe clean the bonding surface of the test box and the ring test cover. Place in the standard test environment for at least 10min.

5.6.2 Fill the test box with anhydrous calcium chloride to about 10mm away from the opening. Ensure that calcium chloride does not contact the tape in subsequent operations.

5.6.3 Glue the specimen to the edge of the test box. No bubbles or wrinkles allowed. Trim the tape protruding from the edge of the test box. Then align the ring test cover with the outer edge of the test box and glue it. It is recommended to directly cut the tape specimen into a disc with the same diameter as the outer edge of the test box before bonding.

5.6.4 For single-sided tape, when bonding as above, it needs to borrow other double-sided tapes (PET double-sided pressure-sensitive tape is recommended). Conduct auxiliary bonding of test cover and adhesive tape without adhesive surface. It is recommended to cut the auxiliary double-sided tape directly into the same shape as the ring test cover. Note that the auxiliary double-sided tape is allowed to cover the water permeability test area of the specimen.

5.6.5 Use impermeable sealing material to seal the outer circumference of the test piece.

5.6.6 The total weight of the test piece and the total weight during the test shall not exceed 80% of the range of the electronic balance used.

5.6.7 Put a 1000g weight on the test piece horizontally for 10min. Note that the weight is not allowed to contact the tape adhesive surface.

5.7 Test steps

Δ_i - The mass change of the test piece after the i^{th} test T time, in grams (g);

Δ_{i+1} - The mass change of the test piece after the $i+1^{th}$ test T time, in grams (g);

Relative change rate of Δ_i - The change rate of the weight of the test piece in the $i+1^{th}$ time interval, %.

When the relative change rate of at least 3 adjacent Δ_i does not exceed 10%, the test is completed.

Take the arithmetic mean of the 3 adjacent Δ_i as the final result, recorded as $\Delta_{average}$.

5.9 Result calculation

According to formula (3), calculate the water penetration rate on vertical direction ($WPR_{vertical}$) of each specimen in the measured area, to the nearest of 0.01g/(m^2·d).

$$WPR_{vertical} = \frac{\Delta_{average} \times 24}{T \times 0.002\ 462} \qquad \cdots\cdots(3)$$

Where,

$WPR_{vertical}$ - The water penetration rate on vertical direction, in grams per square meter day [g/(m^2·d)];

$\Delta_{average}$ - The arithmetic average value obtained when the relative change rate of three adjacent Δ_i does not exceed 10%, in grams (g);

24 - 1 day is 24 hours;

T - Time when the test piece is immersed in water, in hours (h);

0.002462 - The test area of specimen, in square meters (m^2).

6 Method Two - Test of water penetration rate on cross section direction of pressure-sensitive tape ($WPR_{cross-section}$)

6.1 Principle

The pressure-sensitive tape is pasted on the edge of the test box with desiccant. Cover a cover plate of same area to form a test piece.

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