GB

NATIONAL STANDARD OF THE

PEOPLE'S REPUBLIC OF CHINA

ICS 83.180

G 38

GB/T 15331-2020

Replacing GB/T 15331-1994

Test method for water vapor transmission rate of pressure-sensitive tapes

压敏胶粘带水蒸气透过率试验方法

Issued on: November 19, 2020 **Implemented on: October 01, 2021**

Issued by: State Administration for Market Regulation;

Standardization Administration of the People's Republic of China.

Table of Contents

Foreword

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

This Standard replaces GB/T 15331-1994 “Test method for water vapor transmission of pressure-sensitive tapes”. Compared with GB/T 15331-1994, 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 that the test method is divided into test method for vertical water vapor transmission rate (see Clause 5 of this Edition) and test method for section water vapor transmission rate (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 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 5.2.5 of this Edition);
- added solvents required to use and requirements in instruments and equipment (see 5.2.7, 6.2.7 of this Edition);
- added weights required to use and requirements in instruments and equipment (see 5.2.8, 6.2.8 of this Edition);
- added edge sealing material in instruments and equipment (see 5.2.9 of this Edition);
- added sampling requirements (see 5.3 of this Edition);
- added requirements for standard test environment (see 5.4 of this Edition);
- deleted weighing conditions (see Clause 6 of Edition 1994);
- added preparation of test piece (see 5.6 of this Edition, Clause 5 of Edition 1994);

Test method for water vapor transmission rate of pressure-sensitive tapes

1 Scope

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

This Standard includes test methods for vertical water vapor transmission rate and section water vapor transmission rate. The test method for vertical water vapor transmission rate is applicable to single-sided or double-sided pressure-sensitive tape. The test method for section water vapor transmission rate 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 vertical water vapor transmission rate; $WVTR_{vertical}$

under certain conditions, the mass per unit area of water vapor passing through the tape perpendicular to the direction of the adhesive surface per unit time

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

3.2 section water vapor transmission rate; $WVTR_{cross\text{-}section}$

under certain conditions, the mass per unit length of water vapor permeating

the tape in the 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 water vapor passing through the pressure-sensitive tape, the test method for water vapor transmission rate of pressure-sensitive tape is divided into test method for vertical water vapor transmission rate ($WVTR_{vertical}$) and test method for section water vapor transmission rate ($WVTR_{cross\text{-}section}$).

5 Method One: Test of vertical water vapor transmission rate ($WVTR_{vertical}$)

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 exposed to an environment with controlled temperature and humidity. Weigh the mass of the test piece at regular intervals. When the weight gain of the test piece reaches equilibrium, use the mass increase per unit time and unit area of the tape to express the vertical water vapor transmission rate.

5.2 Instruments and equipment and material

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.

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 edge 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.

For single-sided tape, when bonding as above, it needs to borrow other double-sided tapes. Conduct auxiliary bonding of ring 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. It is recommended to use PET double-sided tape for auxiliary bonding.

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

5.6.5 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.

5.6.6 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

5.7.1 Put all test pieces into an oven at (49±1)°C and heat for 30min.

Δ_i - The mass change of the test piece of the i^{th} test T time interval, 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 vertical water vapor transmission rate ($WVTR_{vertical}$) of each specimen, to the nearest of 0.01g/(m^2·d).

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

Where,

$WVTR_{vertical}$ - The vertical water vapor transmission rate, 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 - The test time of the test piece in the test environment, in hours (h);

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

6 Method Two - Test of section water vapor transmission rate ($WVTR_{cross\text{-}section}$)

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.

The test piece is exposed to a controlled environment. Weigh the mass of the

This is an excerpt of the PDF (Some pages are marked off intentionally)

------ The End ------