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Test Method for Flex Durability of Flexible Packaging Material

柔性包装材料耐揉搓性能的测试方法

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Test Method for Flex Durability of Flexible Packaging Material

1 Scope

This Document specifies a method for testing the flex durability of flexible packaging materials.

This Document applies to the testing of flex durability of flexible packaging materials.

2 Normative References

The provisions in following documents become the essential provisions of this Document through reference in this Document. For the dated documents, only the versions with the dates indicated are applicable to this Document; for the undated documents, only the latest version (including all the amendments) is applicable to this Document.

GB/T 2918-2018 Plastics - Standard Atmospheres for Conditioning and Testing

3 Terms and Definitions

For the purposes of this Document, the following terms and definitions apply.

3.1 Pinhole

Completely penetrates the flexible packaging material, and form the penetrating small holes without fixed shape and size.

3.2 Flex durability

The ability of flex durability of flexible packaging materials.

NOTE: It is usually characterized by the change in the number of pinholes or gas barrier properties of the material before and after flexing, such as oxygen, air, carbon dioxide, water vapor and other gases.

4 Principle

The packaging material is reciprocating rotation and compression according to a certain frequency and stroke to simulate the possible flexing of the packaging material during actual use; and is characterized by the change in the number of pinholes or the gas permeability (rate) before and after the flexing of the packaging material.

5.1.3 The support arm is used to fix the specimen with a width of $13\text{mm}\pm 1\text{mm}$.

5.1.4 The instrument can set the flexing frequency, and the fluctuation of the frequency is ± 1 time/min.

5.1.5 The instrument can realize long-stroke flexing and short-stroke flexing.

- a) Long-stroke flexing: During the linear motion of the first 90mm stroke of the linear axis, the rotation axis simultaneously completes a rotation motion with an angle of $440^\circ\pm 4^\circ$; and then only the linear motion axis continues to move linearly for 65mm . When completing a long-stroke flexing, the distance between the linear axis and the rotation axis shall be $25\text{mm}\pm 1\text{mm}$.
- b) Short-stroke flexing: The linear motion axis moves 80mm linearly in the distance between the two axes of 180mm ; and the rotation axis simultaneously completes the rotation motion with an angle of 400° .

5.2 Reagents

5.2.1 Turpentine oil: Chemically pure; the density at 15°C is $0.860\text{g/mL}\sim 0.875\text{g/mL}$.

5.2.2 Add 5.0g anhydrous calcium chloride (CaCl_2) and 1.0g of oil-soluble red dye to the container containing 100mL turpentine oil. Close the container and shake well; let stand for at least 10h . Filter with dry filter paper at $23^\circ\text{C}\pm 2^\circ\text{C}$. The filtrate is dyed turpentine oil, which shall be stored in a sealed bottle for later-use, and shall be shaken evenly before use.

5.2.3 If the dyed turpentine oil deteriorates or the smearing effect is not good during use, it shall be re-formulated. When using turpentine oil, appropriate protective measures shall be taken to avoid inhalation or contact with the skin; and keep away from heat or ignition sources to prevent ignition.

6 Specimens

6.1 The specimen shall be representative, flat, uniform and free of contamination; and shall not have holes, pinholes, creases, scratches and other defects.

6.2 According to the test requirements, cut 12 flat specimens of $(280\pm 2)\text{mm} \times (200\pm 2)\text{mm}$ according to the fixed test direction; and the width direction is parallel to the direction to be tested.

6.3 There are 3 specimens for the pinhole counting method and gas barrier test before and after flexing; and the other 6 specimens are not subjected to the flexing test, but are only used for the comparison test between pinhole counting method or gas barrier of the unflexed specimens.

(200±2) mm at the center position; and take samples from this area for pinhole counting method and gas barrier test method.

8.2 Evaluation of flex durability

8.2.1 Pinhole counting method

8.2.1.1 Spread the 3 flexed specimens on three uncoated white background papers respectively; fix them with double-sided pressure-sensitive tape; and avoid the test area when pasting.

8.2.1.2 Use a paintbrush to fully apply the dyed turpentine oil to the test area of each specimen; and place the specimen for 1min.

8.2.1.3 Use a tissue to wipe off the dyed turpentine oil; and squeeze the specimen and the white background paper when wiping.

8.2.1.4 Remove the specimen from the white background paper; and count the number of pinholes in each specimen in the (150±2) mm × (200±2) mm test area. Each red bleed-through on the paper is counted as a pinhole; if there are obviously different center marks at the overlap of the color spots, they are counted according to the number of the center marks, respectively; regardless of the size of the bleed-through, which are counted as pinholes.

8.2.1.5 Use the same test method to obtain the number of pinholes in the unflexed specimen.

8.2.1.6 If no pinholes are detected in at least one specimen after flexing, the gas barrier property test method shall be further used to verify the flex durability of the specimen.

8.2.2 Test method of gas barrier property

8.2.2.1 If there is no penetrating pinhole visible to the naked eye or no pinhole is detected by the pinhole counting method after flexing, the gas permeability of the specimen before and after flexing can be tested respectively.

8.2.2.2 According to the requirements of 8.1.5, cut out 3 pieces of specimens after flexing, which are used as the specimen for the gas barrier property test.

8.2.2.3 Determine which gas barrier property to be tested according to the actual situation, and the test procedures follow the adopted gas barrier property test method standard.

8.2.2.4 According to the same gas barrier test method standard, complete the gas barrier test of the specimens before and after flexing on the same test equipment with good performance.

9 Test Results

Count the total number of pinholes in the specimens before and after flexing, calculate the average number of pinholes in the test area of each specimen; and keep the results to an integer.

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