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**Paper, board and paper products - Determination of
effective-recyclable components**

纸、纸板和纸制品 有效回收组分的测定

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Paper, board and paper products - Determination of effective-recyclable components

1 Scope

This document describes the method for determination of effective-recyclable components in paper, board and paper products.

This document applies to all kinds of paper, board and paper products; as well as paper-based composite materials such as aluminum-foil paper and coated paper.

2 Normative references

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

GB/T 450 Paper and board - Sampling for testing and identification of machine and cross direction, wire side and felt side

GB/T 5399 Pulps - Determination of stock concentration

GB/T 21557-2008 Waste paper - Estimation of stickies

GB/T 22877 Paper, board and pulps - Determination of residue (ash) on ignition at 525 Celsius

3 Terms and definitions

The following terms and definitions apply to this document.

3.1

Disintegration behavior

The process in which the specimen is dissociated and dispersed into a fiber suspension.

3.2

Coarse reject

- 2 - Barrel lid;
- 3 - Rotor;
- 4 - Motor;
- 5 - Discharge valve;
- 6 - Stand.

Figure 1 -- Structural diagram of low-consistency hydraulic pulper

4.2 Coarse-screening equipment

The coarse-screening equipment used in the test is a pulp screen equipped with a sieve plate with a sieve hole diameter of 10 mm. The volume is not less than 12 L. It shall have a vibration or stirring function. For a vibrating pulp screen, the vibration frequency of the vibrating membrane is (700 ± 10) times/min. For a stirring pulp screen, the distance between the edge of stirring blade and the upper surface of sieve plate is 10 mm~20 mm; the blade speed is 200 r/min.

4.3 Stickies screen

For laboratory stickies screen, the average slit width of sieve plate shall be (0.100 ± 0.005) mm. The difference between each slit width and the average slit width shall not be greater than 0.015 mm.

4.4 Fine-screening equipment

The fine-screening equipment used in the test is a vibrating pulp screen equipped with a hole sieve plate with a sieve hole diameter of 0.7 mm AND a slotted sieve plate with a sieve gap of 0.10 mm. The vibration frequency of the vibrating membrane is (700 ± 10) times/min. The amplitude is (3.2 ± 0.1) mm. The water flow velocity is (8.6 ± 0.2) L/min.

4.5 Other apparatus

Other apparatus is detailed in the corresponding method standards, respectively.

5 Specimen processing

The specimens shall not be touched with hands. When handling specimens, it shall wear clean powder-free protective gloves.

Weigh an absolutely dry sample of approximately 480 g (recorded as m_0); cut it into specimens of approximately 100 mm×100 mm size; place them in a barrel. At room temperature, add 40 °C water until the pulp consistency is 4%; soak for 10 min. If the sample is paper and board, it shall be sampled according to the method described in GB/T 450. If the specimen is a packaging paper product (carton, paper cup, paper box,

etc.), it shall try to ensure that the specimen contains all components of an integer sample. When the absolute dry mass of a single sample is greater than 480 g, it shall be ensured that the sample taken is representative and contains all components of the sample.

6 Test procedure

6.1 Disintegration behavior of specimen

Pour the specimen into the low-consistency hydraulic pulper (4.1); disintegrate it for 5 min. After the disintegration behavior is completed, drain all the stock into the barrel.

6.2 Coarse screening

The purpose of coarse screening is to separate coarse reject. Before coarse screening, under the coarse-screening equipment (4.2), place a container with a capacity of at least 30 L. Add the disintegrated specimen to the coarse-screening equipment; start the equipment and start vibrating or stirring; open the outlet valve to start screening. After the stock is drained, add 12 L of water and continue screening. During the coarse screening process, some fibers will adhere to the surface of the sieve plate or equipment. Use 2 L~5 L of water to rinse the sieve reject or the inner wall of the equipment.

Transfer the sieve reject on the sieve plate to a container that can be heated and weighed. Then at 105 °C, dry to constant weight and weigh (recorded as m_c).

6.3 Stock homogenization

The coarsely-screened stock is stirred and homogenized to make the stock composition uniform. After homogenization, obtain a stock with an absolute dry content of at least 70 g, to ensure that there are sufficient specimens for all tests. Then, dilute the stock to a concentration of approximately 1%; stir gently for at least 2 min. According to the method described in GB/T 5399, determine its concentration.

6.4 Determination of ash content

Take the homogenized stock; determine according to the method described in GB/T 22877.

6.5 Determination of stickies area

Take the homogenized stock; use the stickies screen (4.3) to screen; determine according to the image analysis method in GB/T 21557-2008.

6.6 Determination of flake content

After the stock is homogenized, take a stock with an absolute dry content of about 2 g

$$X = \frac{m_x - m_b}{m_1} \times 100 \quad \dots\dots\dots (3)$$

Where:

X - Ash content, %;

m_x - The mass of the crucible containing the residue after ignition, in grams (g);

m_b - The mass of empty crucible after ignition, in grams (g);

m_1 - The absolute dry mass of the specimen, in grams (g).

7.4 Fiber yield

According to formula (4), calculate the fiber yield of the specimen. Keep the result to two decimal places.

$$Y = (1 - X) \times E \quad \dots\dots\dots (4)$$

Where:

Y - Fiber yield, %.

7.5 Stickies area

According to Clause 6 of GB/T 21557-2008, calculate the stickies area.

7.6 Flake content

According to formula (5), calculate the flake content of the specimen. Express the result as the arithmetic mean of 5 determinations. Keep the result to two decimal places.

$$F = \frac{m_f}{m_2} \quad \dots\dots\dots (5)$$

Where:

F - Flake content, %;

m_f - The absolute dry mass of the reject after fine screening with a 0.7 mm hole sieve, in grams (g);

m_2 - The absolute dry mass of the specimen before fine screening with a 0.7 mm hole sieve, in grams (g).

7.7 Reject rate of 0.10 mm fine screen

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