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Paper, board and pulps - Determination of weight factor in fibre furnish analysis

纸、纸板和纸浆 纤维组成分析中质量因子的测定

(ISO 9184-7:1994, Paper, board and pulps - Fibre furnish analysis - Part 7: Determination of weight factor, MOD)

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WARNING -- Persons using this document shall have practical experience with formal laboratory work. This document does not address all possible safety issues. It is the user's responsibility to take appropriate safety and health measures and to ensure compliance with the conditions stipulated by relevant national regulations.

1 Scope

This document specifies the methods to determine the weight factor when analyzing fiber composition of paper, board and pulp, including comparison method and fiber coarseness method.

This document applies to paper, board and pulp composed of pure-bred fibers.

NOTE: Pure-bred fiber refers to a single type of fiber with a significant difference in weight factor of no more than 5% of other fibers.

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 4688, *Paper, board and pulp - Analysis of fiber furnish* (GB/T 4688-2020, ISO 9184-1:1990; ISO 9184-2:1990; ISO 9184-3:1990; ISO 9184-4:1990; ISO 9184-5:1990, MOD)

GB/T 18829.6-2002, *Determination of fiber coarseness* (eqv ISO 9184-6:1994)

GB/T 24324, Pulps - *Preparation of laboratory sheets for physical testing - Conventional sheet-former method* (GB/T 24324-2009, ISO 5269-1:2005, MOD)

3 Terms and definitions

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

3.1 fiber coarseness

The mass per unit length of a particular fiber (absolutely dry).

NOTE: The unit is milligrams per meter (mg/m).

[Source: GB/T 18829.6-2002, Chapter 3]

3.2 weight factor

The ratio of the fiber coarseness of a specific fiber to the coarseness of a standard (designated) fiber.

NOTE: Designate cotton fiber as standard fiber (that is reference fiber). All other fibers are compared to this standard fiber. The fiber coarseness of cotton fiber is 0.180mg/m (define the weight factor of cotton fiber as 1.00).

[Source: GB/T 4688-2020, 2.2, modified]

4 Principle

4.1 Comparison method

Mix the sample to be tested with the reference pulp in a known mass ratio to form a homogeneous mixture. Count or measure the number or length of two fibers under a microscope. Then calculate the weight factor.

NOTE: The reference pulp can be any pulping method and type of pulp, such as kraft softwood pulp (mechanical pulp and beaten pulp are not applicable). The weight factor of the reference pulp is known or determined from the fiber thickness (see 9.2).

4.2 Fiber coarseness method

Evenly distribute a certain mass of fibers within a known range. Use a fiber analyzer to determine the total length of all fibers in the range. Calculate the fiber thickness ρ_i. The weight factor is then calculated from the fiber coarseness (see 9.2).

5 Reagents and instruments

5.1 Reagents

Unless otherwise stated, it shall only use the confirmed analytically-pure reagents AND distilled water OR deionized water or equivalent-pure water.

5.1.1 Dyeing agent: Aqueous solution for fiber dyeing. The selection of dyeing agents and the dyeing method are carried out in accordance with the provisions of GB/T 4688.

5.1.2 Sodium hydroxide (NaOH) solution: The mass fraction is about 1%. Each liter of

6 Specimen preparation

6.1 Air-dried pulp

Take about 5g of the sample to be tested and the reference pulp, respectively. Tear into small pieces. Store in different glass petri dishes for later use.

6.2 Wet pulp

Filter the wet pulp with a glass filter (5.2.5.1) to obtain a wet pulp sheet. The wet pulp sheet is air-dried and treated as the sample to be tested according to 6.1.

7 Preparation of fiber slides

7.1 Configuration of test mixing solution

Put the sample to be tested and the reference pulp in different glass petri dishes for no less than 4h until equilibrium. Prepare four specimen mixing solutions, containing 20%, 40%, 60% and 80% of the sample to be tested, respectively. The rest are reference pulp.

7.2 Preparation of fiber slides

According to the provisions of GB/T 4688, disperse, mix well and prepare fiber slides. Two fiber slides are prepared for each specimen mixing solution (see 7.1), for a total of 8. According to the dyeing guide of GB/T 4688, use an appropriate stain (5.1.1) to stain., so as to distinguish the reference pulp fiber and the test pulp fiber.

8 Test steps

8.1 Comparison method

8.1.1 Root method

8.1.1.1 General

The fiber weight factor can be determined by the root method with a microscope (5.2.1) or a fiber analyzer (5.2.2). When measuring with a microscope, a counter is required (5.2.11) to assist the operator in sorting and counting the fibers measured. The fiber analyzer can play the role of computer, to automatically count and report the measurement results.

8.1.1.2 Determination of microscope

8.1.1.2.1 Place the test piece on the stage of the microscope. Move the test piece with the aid of the stage so that the center of the field of view falls on the top of the cover

glass and is 3mm~5mm away from the edge. Then move the test piece regularly in the horizontal or vertical direction, so that the entire test piece can be observed. Count the number of various fibers according to the following method.

8.1.1.2.2 Move the test piece. When the fiber passes through the center of the eyepiece cross micrometer, use the counter. Record the number of each fiber or fiber fragment. If a fiber passes through this center point multiple times, count a number for each pass. If a fiber always moves along the center of the field of view, only one count is required. Fiber fragments smaller than 0.1mm are negligible. However, the fiber fragments with larger longitudinal cracks shall be counted. When the same type of fiber fragments is observed on the same observation line, according to fragment size, two or three are counted as one number. If the content of parenchyma and other small cells is very low, it can be ignored. Each fiber in the fiber bundle shall be counted. If it is difficult to count the number of fibers of each type once the fibers pass through the field of view, repeat until all fibers are recorded. In the process of continuous counting, it shall not return to the original row position to repeat the counting.

8.1.1.2.3 After counting the number of fibers on an observation line, the test piece shall be moved parallel about 5mm to another observation line. Count each fiber on this line according to 8.1.2.2. Two or more test pieces shall be measured. Make sure to count more than 600 fibers.

8.1.1.2.4 After the determination, count the total number of test pieces of each fiber on the counter. Calculate the weight factor of the sample to be tested according to formula (1).

8.1.1.3 Determination of fiber analyzer

8.1.1.3.1 Place the test piece on the microscope stage. Move the test piece with the aid of the stage. Make the center of the field of view 3mm~5mm above the cover glass from the edge. Then move the test piece regularly in the horizontal or vertical direction. Enable the entire test piece to be observed. Count the number of various fibers according to the following method.

8.1.1.3.2 Select determination mode of the root method. Two counted cross lines intersecting the fibers appear on the instrument display. Along one of the straight lines, count the number of each fiber according to the provisions of 8.1.2.2.

8.1.1.3.3 After recording the fibers on an observation line, move the test piece parallel about 5mm to another observation line. Respectively record the number of each fiber according to 8.1.2.2. Two or more test pieces shall be determined. Make sure to count more than 600 fibers.

8.1.1.3.4 After the determination, the instrument automatically counts the total measured number of each fiber. Then calculate the weight factor of the sample to be tested according to formula (1).

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