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Test method for short fiber content of wadding fiber products

絮用纤维制品短纤维含量测试方法

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1 Scope

The document describes the methods for determining the short fibre content of wadding fibre products using the roller method and the photoelectric method.

It applies to the determination of the short fibre content of wadding fibre products for daily life; the roller method is used for the determination of the short fibre content of pure cotton wadding fibre products and of blended wadding fibre products, and the photoelectric method is used for the determination of the short fibre content of pure cotton wadding fibre products.

2 Normative references

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

Six documents are listed: GB/T 5705 Textiles-Terms of cotton textile products; GB/T 6529 Textiles-Standard atmospheres for conditioning and testing; GB/T 8170 Rules of rounding off for numerical values and expression and judgement of limiting values; GB 18383 General technical requirements for wadding fibre products; GB/T 35261 Quilt wadding; and GB/T 35932 Carded cotton wadding.

3 Terms and definitions

The terms and definitions given in GB/T 5705, GB/T 35261, GB/T 35932 and GB 18383, together with the following, apply to the document.

3.1 products with pure cotton filling materials: wadding fibre products using 100 % cotton fibre as filling and padding.

3.2 13 mm short fiber content by mass: the percentage of the mass of fibres of 13 mm and below in the specimen relative to the mass of the specimen.

4 Batch sampling and laboratory sampling

Batch sampling is carried out in accordance with GB 18383. The samples taken are mixed by the quartering method to form two laboratory samples, each laboratory sample being not less than 200 g.

5 Test methods

5.1.1 Principle of the roller method. The specimen is arranged into a fibre bundle with one aligned end; the roller nip controls the long and short fibres and divides the fibres into two groups, of 13 mm and below and of above 13 mm, which are weighed separately so that the 13 mm short fibre content index is calculated.

5.1.2 Apparatus and equipment. A roller type length analyser comprising the analyser and the extender; a No. 1 clamp with a straight jaw and no gap, a No. 2 clamp with velvet free from wear or baldness and a spring pressure of 2 N, a coarse comb of 10 needles per centimetre, a fine comb of 20 needles per centimetre, a limiter velvet board and a levelling wood block; and a balance with a range of at least 200 g and a division value of 0.1 mg.

5.1.3 Conditioning and standard testing atmosphere. Conditioning of the specimen and the standard atmosphere for testing are to comply with GB/T 6529.

5.1.4 Taking and preparation of the specimen. The two laboratory samples are torn loose and mixed separately and spread flat on the workbench so that they form a fibre layer of even thickness; specimens are taken at random from many points, 32 points, on both faces, three specimens being taken from each laboratory sample for a total of six specimens, each of a mass of (30 ± 1) mg. In preparing the specimen, the fibres are made into a fairly straight bundle with one aligned end and free from impurities, using hand drawing and combing. The aligned end of the fibre bundle is held, the jaw of the No. 1 clamp is pressed against one group of limiters, and the fibres are clamped layer by layer from long to short and arranged on the limiter velvet board, the aligned end being made to extend 2 mm beyond the preceding group of limiters; this is repeated twice, forming a fibre bundle 32 mm wide with one end aligned and straight, of even thickness and with distinct layers. During the arranging, the untidy end of the fibre bundle can be combed lightly a few times with the coarse comb; the free fibres combed out are still to be arranged and put back into the cotton bundle, and no fibre is to be discarded during the making of the fibre bundle.

5.1.5 Test procedure. The distance from the inner edge of the slide plate of the roller type length analyser to the centre of the output groove roller is (9.5 ± 0.1) mm; after the analyser is covered, the pressure exerted by the spring on the leather roller is (70 ± 7) N; when the analyser pointer is at the 16th division of the turbine scale, the peach-shaped eccentric wheel is to begin to touch the slide plate. The cover of the analyser is lifted and the handle turned so that the 9th division of the turbine coincides with the pointer. The fibre bundle is picked up from the limiter velvet board with the No. 1 clamp and moved to the groove roller of the analyser; during the transfer the baffle beneath the No. 1 clamp is pressed against the slide plate and the clamp is supported with the levelling wood block so that the fibre bundle is horizontal; the cover with the pressure roller is lowered, the clamp is removed, the aligned end of the fibres is to be level with the inner edge of the slide plate, and the spring is latched. The pointer of the analyser is turned until it coincides with the 13th division of the turbine, after which the fibres not held are taken repeatedly with the No. 2 clamp until no free fibre remains. The fibres are divided into the two groups of 13 mm and below and of above 13 mm and weighed separately to 0.1 mg. The above steps are repeated until all specimens have been tested.

5.1.6 Calculation of test results and rounding. The 13 mm short fibre content of a single specimen is calculated by Formula (1) as the ratio of the mass of the fibres of 13 mm and below to the sum of the two masses, multiplied by 100; the legend gives the 13 mm short fibre content of the specimen as a percentage, the mass of the fibres of 13 mm and below in milligrams, and the mass of the fibres above 13 mm in milligrams. The test result of a single specimen keeps two decimal places; the final test result is the mean of the six test results, kept to one decimal place and rounded in accordance with GB/T 8170.

5.1.7 Precision. The precision of this test method is given in Annex A.

5.2.1 Principle of the photoelectric method. The specimen is formed into a sliver by the sliver-making device; the sliver is transferred to the needle bed and, after repeated sampling by the sampler, a fibre specimen with one aligned end is obtained, which is scanned by a photoelectric imaging sensor to give a fibre length distribution diagram, from which the short fibre content index of the specimen is obtained.

5.2.2 Apparatus and tools. A short fibre content tester and sliver-making device, comprising the sliver-making device, the carding mechanism, the needle bed, the sampler, the brush and the imaging sensor; and a balance with a range of at least 200 g and a division value of 0.01 g.

5.2.3 Conditioning and standard testing atmosphere. Conditioning of the specimen and the standard atmosphere for testing are to comply with GB/T 6529.

5.2.4 Taking and preparation of the specimen. The two laboratory samples are torn loose and mixed and spread flat on the workbench so that they form a fibre layer of even thickness; specimens are taken at random from many points, 32 points, on both faces, three

specimens in total, the mass of each specimen being as required by the short fibre content tester.

5.2.5 Test procedure. The instrument is calibrated according to its operating requirements. The three specimens are each made into a sliver by the sliver-making device. The prepared sliver is pressed into the needle bed and the test is started. After repeated sampling by the sampler, a fibre specimen with one aligned end is obtained. Scanning by the photoelectric imaging sensor gives the fibre length distribution diagram and hence the short fibre content index of the specimen. Each sliver is tested twice. The second and third specimens are tested, giving six test data in all.

5.2.6 Calculation and rounding of results. The test index is the 13 mm short fibre content; a single test result keeps two decimal places, and the final test result is the mean of the six test results, kept to one decimal place and rounded in accordance with GB/T 8170.

5.2.7 Precision. The precision of this test method is given in Annex A.

6 Test report

The test report is to include the following: a) the number of the document; b) a description of the sample; c) the personnel carrying out the test and the date; d) the test method and the results; e) any details deviating from the document.

A Annex A (informative) Precision of the test methods

A.1 The precision of the roller method is given in Table A.1. The table covers pure cotton wadding fibre products and has six data columns, sample 1, sample 2 and sample 3, each split into a specimen a and a specimen b. Reading the columns in that order, the 13 mm short fibre content, as a percentage, is 13.4, 14.3, 15.8, 16.9, 40.5 and 42.0; the repeatability standard deviation is 0.98, 0.74, 1.04, 0.89, 2.03 and 1.57; the reproducibility standard deviation is 1.11, 1.17, 1.46, 1.43, 2.17 and 1.82; the repeatability critical difference at the 0.95 level, with both numbers of tests equal to six, is 1.12, 0.85, 1.19, 1.02, 2.32 and 1.79; and the reproducibility critical difference at the 0.95 level, with both numbers of tests equal to six, is 1.83, 2.69, 3.08, 3.28, 3.14 and 3.15.

A.2 The precision of the photoelectric method is given in Table A.2. The table covers pure cotton wadding fibre products and has two data columns, sample 1 and sample 2. The mean value, as a percentage, is 15.0 and 19.3; the repeatability standard deviation is 0.69 and 0.88; the reproducibility standard deviation is 0.97 and 1.38; the repeatability critical difference at the 0.95 level, with both numbers of tests equal to six, is 0.79 and 1.00; and the reproducibility critical difference at the 0.95 level, with both numbers of tests equal to six, is 2.08 and 3.15.