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Para-aramid filament yarns

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Para-aramid filament yarns

1 Scope

This document specifies the technical requirements for para-aramid filament yarns, describes the corresponding test methods, specifies inspection rules, marking, packaging, transportation, storage, etc., and also provides product classification and identification.

This document applies to para-aramid filament yarns with nominal linear density of 55 dtex ~ 9990 dtex, monofilament linear density of 0.55 dtex ~ 3.33 dtex, and circular cross-section.

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 2828.1-2012 Sampling procedures for inspection by attributes - Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection

GB/T 4146 (all parts) Textiles - Man-made fibres

GB/T 6502 Sampling method of man-made filament yarns

GB/T 6503 Man-made fibres - Test method of moisture regain

GB/T 6504 Man-made fiber - Test method for oil content

GB/T 14343 Testing method for linear density of man-made filament yarns

GB/T 14344 Man-made fibre - Test method for tensile properties of filament yarns

3 Terms and definitions

For the purpose of this document, the terms and definitions defined in GB/T 4146 (all parts) and the following apply.

3.1

para-aramid fibre

poly(p-phenylene terephthalamide) fibre

aramid 1414

Fibers that are made from linear macromolecules composed of amide groups interconnecting the para positions of benzene rings, in which at least 85 % of the amide bonds are directly connected between the para positions of two benzene rings.

4 Classification and identification

4.1 Product classification

According to the tensile properties of the products, they are divided into three categories.

- High strength type: the breaking strength is not less than 22.0c N/dtex.
- High modulus type: the initial modulus is not less than 105 GPa or the chord modulus is not less than 95 GPa.
- Conventional type.

4.2 Product identification

4.2.1 Product specifications are expressed in linear density and quantity of filaments. The unit of linear density is decitex (dtex), and the quantity of filaments is expressed by the quantity of holes f.

Example: 1110 dtex/667 f.

4.2.2 Product identification shall include information such as product specification, product name, and batch number.

5 Technical requirements

5.1 Product grading

Products are divided into premium products and qualified products.

5.2 Performance items and indicators

The performance items and indicators of para-aramid filament yarns shall comply with the provisions of Table 1.

T_1 - the upper strength value on the tensile curve, in centinewton per decitex (cN/dtex);

T_2 - the lower strength value on the tensile curve, in centinewton per decitex (cN/dtex);

L_0 - the starting length, in millimeters (mm);

E_1 - the elongation value corresponding to the upper strength value, in millimeters (mm);

E_2 - the elongation value corresponding to the lower strength value, in millimeters (mm).

6.5 Constant elongation strength

Based on the tensile curve obtained from the determination of 6.3, directly read the strength value at the specified elongation. Or the instrument is equipped with a special device to measure the strength value when the elongation is specified. The constant elongation strength is calculated from this. The constant elongation should be 0.3 %, 0.5 %, or 1.0 %.

The constant elongation strength is calculated according to formula (2):

$$\sigma_d = \frac{F_d}{\rho_1} \qquad \cdots\cdots (2)$$

where:

σ_d - the constant elongation strength, in centinewton per decitex (cN/dtex);

F_d - the strength at specified elongation of the sample, in centinewton (cN);

ρ_1 - the average linear density determined from the same laboratory sample, in decitex (dtex).

6.6 Oil content

It is implemented in accordance with the provisions of GB/T 6504.

6.7 Appearance inspection

6.7.1 Equipment and light sources

It may use mobile light sources, fixed light sources or grading tables to carry out appearance inspection.

7.2.2 Batch grouping regulations

Periodic sampling is used within a certain range to form inspection batch numbers. A production batch can consist of one inspection batch or multiple inspection batches.

7.2.3 Sampling

7.2.3.1 Laboratory samples of performance items shall be sampled in accordance with the provisions of GB/T 6502.

7.2.3.2 Samples of appearance items are taken roll by roll.

7.2.4 Grade assessment

7.2.4.1 Compare the measured or calculated values of the performance items (see 5.2) with the limit values of the performance indicators in Table 1 to assess the grade.

7.2.4.2 Appearance inspection shall be carried out in accordance with the provisions of 5.4, and the grade shall be assessed roll by roll.

7.2.4.3 For the assessment of the comprehensive grade of the product, the grade of the lowest performance item and appearance item in the inspection batch is determined as the grade of the batch of products.

7.3 Acceptance inspection

7.3.1 General

The demand party shall promptly check whether the outer packaging, quantity, and quality of the batch product packages are consistent with the manifest. Within one month after a batch of products arrives at the demand party, if there are any objections to the product quality, it can submit for re-inspection. Re-inspection can be carried out by any party agreed by both parties. If necessary, an arbitration inspection agency can be requested to sample, inspect, and arbitrate in accordance with the requirements of this document.

7.3.2 Inspection items

Same as 7.2.1.1.

7.3.3 Batch grouping rules

Group the batch according to the original production batch number.

7.3.4 Sampling

7.3.4.1 Laboratory samples of performance items shall be sampled in accordance with the provisions of GB/T 6502.

7.3.4.2 Appearance is subject to sampling inspection. Determine the sample size (character code) according to the batch range and the provisions of general inspection level II in Table 1 of GB/T 2828.1-2012.

7.3.5 Grade assessment

7.3.5.1 Compare the measured or calculated values of the performance items (see 5.2) with the limit values of the performance indicators in Table 1 to evaluate the grade.

7.3.5.2 For the appearance items, base on the sample size in 7.3.4.2, take the acceptance quality limit (AQL) value of the normal inspection one-time sampling plan in Table 2-A of GB/T 2828.1-2012 as 4.0, determine the acceptance number Ac and rejection number Re, and then assess according to the requirements of 5.4. When the number of unqualified roll packages is less than or equal to Ac, it is judged to be in compliance with the original grade; when the number of unqualified roll packages is greater than or equal to Re, it is judged to be incompatible with the original grade.

7.3.5.3 The comprehensive grade of the product is assessed according to 7.2.4.3. If it is higher than or equal to the original grade, it will be judged as compliant, and if it is lower than the original grade, it will be judged as non-compliant.

7.3.6 Official mass acceptance

Obtain the measured moisture regain according to the provisions of GB/T 6503, and calculate the official mass according to formula (3).

$$m = m_1 \times \frac{1 + R_0}{1 + R} \qquad \cdots\cdots (3)$$

where:

m - the official mass of a batch product package, in kilograms (kg);

m_1 - the net mass of a batch product package, in kilograms (kg);

R_0 - the official moisture regain of para-aramid, its value is 7.0 % for conventional and high strength types, and 3.5 % for high modulus type;

R - the measured moisture regain, %.

8 Marking, packaging, transportation, and storage

8.1 Marking

The packaging box shall be marked with relevant information such as product name, specification, grade, batch number, net weight, gross weight, quantity of roll packages,

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