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Mazdoor Kisan Shakti Sangathan
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Jawaharlal Nehru
“Step Out From the Old to the New”

IS 3416 (1988): Method for quantitative chemical analysis of mixtures of polyester fibres with cotton or regenerated cellulose [TXD 5: Chemical Methods of Test]
Indian Standard

METHOD FOR QUANTITATIVE CHEMICAL ANALYSIS OF BINARY MIXTURES OF POLYESTER FIBRE WITH COTTON OR REGENERATED CELLULOSE

(Second Revision)

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NEW DELHI 110002

February 1989
FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards on 30 September 1988, after the draft finalized by the Chemical Methods of Test Sectional Committee had been approved by the Textile Division Council.

This standard was published in 1966 and first revised in 1982. It has again been revised to incorporate calculations of percentage of insoluble component on the basis of clean dry mass with percentage additions for moisture and non-fibrous matter. Further, the test method has been modified on the recommendations of Textiles Committee, Bombay for more precise results.

The use of different fibre blends in textiles has necessitated the formulation of standard methods for identification and quantitative estimation of respective fibres. The quantitative analysis of textile fibres in mixtures is of considerable importance to the textile technologists, traders and consumers.

While preparing this standard, considerable assistance has been derived from ISO 1833: 1977 'Textiles — Binary fibre mixtures — Quantitative chemical analysis', issued by the International Organization for Standardization (ISO).

In revising this standard, due weightage has been given to the test method developed by the Central Testing Laboratory of Textiles Committee, Bombay, based on extensive experiments carried out by them.

In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2: 1960 'Rules for rounding off numerical values (revised)'.

Chemical Methods of Test Sectional Committee, TDC 5
Indian Standard

METHOD FOR QUANTITATIVE CHEMICAL ANALYSIS OF BINARY MIXTURES OF POLYESTER FIBRE WITH COTTON OR REGENERATED CELLULOSE

(Second Revision)

1 SCOPE

1.1 This standard prescribes a method for quantitative chemical analysis of binary mixtures of polyester fibres and cotton or regenerated cellulose fibre in any form, such as fibre, yarn or fabric.

NOTE — Before conducting an analysis according to this standard, the fibres present in the mixture should be identified [see IS 667:1981 Methods for identification of textile fibres (first revision)] and the sample to be analyzed should be free from all non-fibrous matter (see IS 9068:1979 Recommended methods for the removal of non-fibrous matter prior to quantitative analysis of fibre mixtures). Dye in the dyed fibres is considered to be an integral part of the fibre and is not to be removed.

2 REFERENCES

2.1 The following Indian Standards are necessary adjunct to this standard.

3 PRINCIPLE

IS No. IS 1070:1977 Specification for water for general laboratory use (second revision)

IS 9068:1979 Recommended methods for the removal of non-fibrous matter prior to quantitative analysis of fibre mixtures.

3.1 A sample of the mixture is dried and weighed. The cotton or regenerated cellulose fibres are dissolved in 75 percent (m/m) sulphuric acid solution. The residue of polyester fibres is collected, washed, dried and weighed. From the mass of the residue of polyester and the dry mass of the sample, the proportion of polyester fibres in the specimen is calculated. The percentage of cellulose fibre is found by difference.

4 SAMPLING

4.1 Lot

The quantity of textile material of one definite type and quality delivered to a buyer against one despatch-note shall constitute a lot.

4.1.1 If the textile material is fibre or yarn and the lot consists of more than 200 kg of fibre or yarn, it shall be divided into sub-lots, each weighing 200 kg or less.

4.1.2 Each sub-lot shall be tested separately.

4.2 Sampling for Fibre and Yarn

From a sub-lot, 15 increments, each weighing approximately 10 g, shall be taken from different parts and mixed thoroughly. This shall constitute a test sample.

4.3 Sampling for Fabrics

4.3.1 The number of pieces to be selected shall be in accordance with Table 1. The pieces thus selected shall constitute a gross sample.

Table 1 Sample Size

<table>
<thead>
<tr>
<th>Lot Size (Number of pieces)</th>
<th>Sample Size (Number of pieces)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 100</td>
<td>3</td>
</tr>
<tr>
<td>101 to 300</td>
<td>4</td>
</tr>
<tr>
<td>301 to 500</td>
<td>5</td>
</tr>
<tr>
<td>501 and above</td>
<td>7</td>
</tr>
</tbody>
</table>

4.3.2 From each piece in the gross sample selected as in 4.3.1, cut out small portions from at least two different parts weighing about 25 g. The parts selected shall represent the gross sample as far as possible. In the case of fabrics with a definite repetition in weave pattern, the parts selected shall include all yarns in the complete repeat. Dissect small portions of the fabric thus collected into yarn, and mix them thoroughly.

5 APPARATUS

5.1 Sintered Glass Crucible

It shall be of appropriate capacity with a pore size of 90 to 150 microns (porosity 1) and fitted with ground glass stopper. If the stopper is not available, the crucible should be enclosed in weighing bottle for weighing.
5.2 Ventilated Oven
It shall be capable of maintaining a temperature of 105 ± 3°C.

5.3 Analytical Balance
The balance shall be capable of weighing to an accuracy of 0'000 2 g.

5.4 Conical Flask
It shall be of 250 ml capacity and fitted with ground glass stopper.

5.5 Filter Flask
It shall be provided with connection to filter pump and adaptor to enable the crucible (5.1) to be fitted to it.

5.6 Desiccator
It shall contain self-indicating silica gel or anhydrous calcium chloride.

5.7 Mechanical Shaker

6 REAGENTS

6.1 Quality of Reagents
Unless specified otherwise, pure chemicals shall be employed in tests and distilled water (see IS 1070:1971) shall be used where the use of water as a reagent is intended.

NOTE - 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the test results.

6.2 Sulphuric Acid Solution
Reagent grade, 75 percent (m/m), specific gravity 1.67 at 27°C.

6.3 Ammonia (Dilute Solution)
Prepared by adding 80 ml concentrated ammonia (specific gravity 0'89) and making up to one litre with water.

7 PREPARATION OF TEST SPECIMENS

7.1 From the sample (4.2 or 4.3), after removing size and finishes as recommended in IS 9068:1979, draw a representative sample weighing about 2 to 3g. Cut the yarn into pieces and disset the cloth into yarn pieces of about 10 mm length.

8 PROCEDURE

8.1 Take a test specimen weighing about 1g from the pretreated sample (see 7.1). Dry the specimen kept in a weighing bottle in the drying oven at 105 ± 3°C to constant mass and obtain the oven dry mass of the specimen.

NOTE - The mass shall be taken as constant if the difference between any two successive weighings at an interval of 20 minutes does not exceed 0.1 percent.

9 CALCULATIONS

9.0 Express the mass of insoluble component (polyester) as the percentage of total mass of fibre in the mixture. Calculate the result on clean dry mass basis as in 9.1; or on clean dry mass with percentage additions for moisture as in 9.2; or on clean dry mass with percentage additions for moisture and non-fibrous matter as in 9.3.

9.1 Method Based on Clean Dry Mass
Calculate the percentage, by mass, of polyester fibres in each test specimen by the following formula:

\[ P = \frac{100 \times m_1 \times d}{m_o} \]

where

- \( P \) = percentage, by mass, of polyester fibres in the test specimen on dry-mass basis;
- \( m_1 \) = dry mass of the residue;
- \( d \) = correction factor of variation in the mass of polyester component in the reagent; and
- \( m_o \) = dry mass of the specimen.

NOTE - The value of \( d \) is found to be 1.00.

9.1.1 Calculate the average of values obtained in 9.1.

9.2 Method Based on Clean Dry Mass with Percentage Additions for Moisture
Calculate the percentage, by mass, of polyester fibres in the test sample by the following formula:

\[ P_M = \frac{100 \times P \times \left[ 1 + \frac{b}{100} \right]}{P \left[ 1 + \frac{b}{100} \right] + (100-P) \left[ 1 + \frac{a}{100} \right]} \]

8.2 Treat the weighed out sample taken in a conical flask with 100 ml of 75 percent sulphuric acid solution per gram of the specimen at room temperature. Stopper the flask and shake it carefully to wet out the specimen completely. Maintain the flask at room temperature for 30 minutes to dissolve regenerated cellulose or cotton with intermittent stirring. Filter the contents of the flask through a tared sintered glass crucible by suction. Transfer any residual fibres from the flask with little sulphuric acid solution into the crucible. Drain the crucible by applying suction. Wash the residue on the crucible once more with the acid solution. Then wash the residue with distilled water thoroughly. Then wash the residue twice with dilute ammonia solution and finally wash the residue with water thoroughly. After each washing, drain the crucible with the aid of suction. Dry the crucible and the residue to a constant mass in an oven at 105 ± 3°C, cool in a desiccator and weigh them.

8.3 Similarly carry out the test on the other specimen(s).
AMENDMENT NO. 1 FEBRUARY 1992
TO
IS 3416: 1988 METHOD FOR QUANTITATIVE CHEMICAL ANALYSIS OF BINARY MIXTURES OF POLYESTER FIBRES WITH COTTON OR REGENERATED CELLULOSE
(Second Revision)

( This amendment is being issued to remove any ambiguity regarding values of commercial moisture regain of different fibres to be taken into consideration at the time of calculating the test results.)

( Page 3, clause 9.2, Note 1 ) — Substitute the following for the existing Note:

"For the purpose of calculations the commercial moisture regain values for various fibres as specified in IS 13157: 1991 ‘Textiles fibres — Commercial moisture regains — Specification’ shall be used."

(TXD 5)
where

\[ P_M = \text{Percentage, by mass, of clean polyester fibres in the test sample on dry-mass basis plus percentage addition for moisture}; \]
\[ P = \text{percentage of clean dry polyester component (see 9.1)}; \]
\[ a = \text{percentage addition for moisture to the soluble component}; \]
\[ b = \text{percentage addition for moisture to the insoluble component}. \]

**NOTES**

1. The following values for standard moisture regain of various fibres may be considered:

<table>
<thead>
<tr>
<th>Fibre</th>
<th>Standard Moisture Regain (Percent)</th>
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<tbody>
<tr>
<td>Cotton</td>
<td>8.5</td>
</tr>
<tr>
<td>Polyester</td>
<td>0.4</td>
</tr>
<tr>
<td>Viscose rayon (Regenerated cellulose)</td>
<td>13.0</td>
</tr>
</tbody>
</table>

2. The standard moisture regain values are generally accepted as the commercial moisture regain values in the trade.

**9.3 Method Based on Clean Dry Mass with Percentage Additions for Moisture and Non-Fibrous Matter**

Calculate the percentage \( P_A \) of clean insoluble component in the mixture with percentage additions for moisture and non-fibrous matter by the following formula (see also Notes 1 and 2 under 9.2):

\[
P_A = \frac{100 \times P \times \left[ 1 + \frac{a_s + b_s}{100} \right]}{P \times \left[ 1 + \frac{a_s + b_s}{100} \right] + (100 - P) \left[ 1 + \frac{a_1 + b_1}{100} \right]}
\]

where

\[ P = \text{percentage of clean dry insoluble component}, \]
\[ a_1 = \text{percentage addition for moisture to the soluble component}, \]
\[ a_s = \text{percentage addition for moisture to the insoluble component}, \]
\[ b_1 = \text{percentage addition for non-fibrous matter to the soluble component}, \]
\[ b_s = \text{percentage addition for non-fibrous matter to the insoluble component}. \]

**NOTE** — The percentage additions for non-fibrous matter may be as agreed to between the buyer and the seller.

**9.4** Find out the percentage of second component in each method given is 9.1 or 9.2 or 9.3 by difference.

**10 REPORT**

10.1 The report shall include the following information:

a) Type of material,

b) Percentage of component fibres in the mixture (individual and average),

c) Method of calculation used (see 9.1, 9.2 and 9.3), and

d) Number of specimens tested.
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Doc: No. TDC 5 (2442)

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