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Textiles — Quantitative chemical analysis —

Part 2:
Ternary fibre mixtures

Textiles — Analyses chimiques quantitatives —

Partie 2: Mélanges ternaires de fibres

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 1833-2 was prepared by Technical Committee ISO/TC 38, *Textiles*.

This first edition cancels and replaces ISO 5088:1976, which has been withdrawn.

ISO 1833 consists of the following parts, under the general title *Textiles — Quantitative chemical analysis*:

- *Part 1: General principles of testing*
- *Part 2: Ternary fibre mixtures*
- *Part 3: Mixtures of acetate and certain other fibres (method using acetone)*
- *Part 4: Mixtures of certain protein and certain other fibres (method using hypochlorite)*
- *Part 5: Mixtures of viscose, cupro or modal and cotton fibres (method using sodium zincate)*
- *Part 7: Mixtures of polyamide and certain other fibres (method using formic acid)*
- *Part 8: Mixtures of acetate and triacetate fibres (method using acetone)*
- *Part 9: Mixtures of acetate and triacetate fibres (method using benzyl alcohol)*
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- *Part 11: Mixtures of cellulose and polyester fibres (method using sulfuric acid)*
- *Part 12: Mixtures of acrylic, certain modacrylics, certain chlorofibres, certain elastanes and certain other fibres (method using dimethylformamide)*
- *Part 13: Mixtures of certain chlorofibres and certain other fibres (method using carbon disulfide /acetone)*
- *Part 14: Mixtures of acetate and certain chlorofibres (method using acetic acid)*
- *Part 15: Mixtures of jute and certain animal fibres (method by determining nitrogen content)*

- *Part 16: Mixtures of polypropylene fibres and certain other fibres (method using xylene)*

- *Part 17: Mixtures of chlorofibres (homopolymers of vinyl chloride) and certain other fibres (method using sulfuric acid)*

- *Part 18: Mixtures of silk and wool or hair (method using sulfuric acid)*

- *Part 19: Mixtures of cellulose fibres and asbestos (method by heating)*

- *Part 21: Mixtures of chlorofibres, certain modacrylics, certain elastanes, acetates, triacetates and certain other fibres (method using cyclohexanone)*

The following parts are under preparation:

- *Part 6: Mixtures of viscose or certain types of cupro or modal or lyocell and cotton fibres (method using formic acid and zinc chloride)*

- *Part 20: Mixtures of elastane and certain other fibres (method using dimethylacetamide)*

- *Part 22: Mixtures of viscose or certain types of cupro or modal or lyocell and flax fibres (method using formic acid and zinc chlorate)*

- *Part 23: Mixtures of polyethylene and polypropylene (method using cyclohexanone)*

- *Part 24: Mixtures of polyester and some other fibres (method using phenol and tetrachloroethane)*

Introduction

The methods of quantitative analysis of mixtures of textile fibres are based on two processes: the manual separation and the chemical separation of fibre types.

The method of manual separation should be used whenever possible, since it generally gives more accurate results than the chemical method. It can be used for all textiles whose component fibres do not form an intimate mixture, as, for example, in the case of yarns composed of several elements each of which is made up of one type of fibre, or fabrics in which the warp is of a different type of fibre from the weft, or knitted fabrics capable of being unravelled and made up of yarns of different types.

In general, the methods for quantitative chemical analysis of ternary fibre mixtures are based on the selective solution of the individual components of the mixture. Four variants of this procedure are possible.

- Variant 1: Using two different test specimens, component (a) is dissolved from the first test specimen and component (b) from the second test specimen. The insoluble residues of each test specimen are weighed and the percentage of each soluble component is calculated from the respective losses in mass. The percentage of the third component (c) is calculated by difference.
- Variant 2: Using two different test specimens, a component (a) is dissolved from the first test specimen, and two components (a and b) from the second test specimen. The insoluble residue of the first test specimen is weighed and the percentage of the component (a) is calculated from the loss in mass. The insoluble residue of the second test specimen is weighed: it corresponds to component (c). The percentage of the third component (b) is calculated by difference.
- Variant 3: Using two different test specimens, two components (a and b) are dissolved from the first test specimen and two components (b and c) from the second test specimen. The insoluble residues correspond to the two components (c) and (a) respectively. The percentage of the third component (b) is calculated by difference.
- Variant 4: Using only one test specimen, one of the components is removed, after which the insoluble residue formed by the two other fibres is weighed and the percentage of the soluble component is calculated from the loss in mass. One of the two fibres of the residue is dissolved, the insoluble component is weighed and the percentage of the second soluble component is calculated from the loss in mass.

Where a choice is possible, it is advisable to use one of the first three variants. Where chemical analysis is used, take care to choose methods prescribing solvents which dissolve only the required fibre or fibres, and leave undissolved the other fibre or fibres.

By way of example, Annex B contains a certain number of ternary mixtures, together with methods for analysing binary mixtures which can, in principle, be used for analysing these ternary mixtures.

In order to reduce the possibility of error to a minimum, it is recommended that, whenever possible, chemical analysis using at least two of the four above-mentioned variants should be made.

Mixtures of fibres used during processing and, to a lesser extent, in finished textiles may contain non-fibrous matter such as fats, waxes or dressings, or water-soluble matter either occurring naturally or added to facilitate processing. Non-fibrous matter should be removed before analysis. A method of pre-treatment for removing oils, fats, waxes and water-soluble matter is given in ISO 1833-1:2006, Annex A.

In addition, textiles may contain resins or other matter added to confer special properties. Such matter, including dyestuffs in exceptional cases, may interfere with the action of the reagent on the soluble components and/or it may be partially or completely removed by the reagents.

This type of added matter may thus cause errors and should be removed before the sample is analysed. If it is impossible to remove such added matter, the methods for quantitative chemical analysis given in Annex B are no longer applicable.

Dye in dyed fibre is considered to be an integral part of the fibre and is not removed.

Analyses are conducted on the basis of dry mass and a procedure is given for its determination.

The result is expressed by reference to the dry mass or by reference to this mass after application of the conventional recovery rate.

Before proceeding with any analysis, all the fibres present in the mixture should be identified. In some chemical methods, the insoluble components of a mixture may be partially dissolved in the reagent used to dissolve the soluble component or components. Whenever possible, reagents have been chosen that have little or no effect on the insoluble fibres. If a loss in mass is known to occur during the analysis, the result should be corrected; correction factors are given for this purpose. These factors have been determined in several laboratories by treating, with the appropriate reagent as specified in the method of analysis, fibres cleaned by the pre-treatment. These correction factors apply only to undegraded fibres and different correction factors may be necessary if the fibres have been degraded before or during processing. If the fourth variant, in which a textile fibre is subjected to the successive action of two different solvents, should be used, correction factors should be applied for possible losses in mass undergone by the fibre in the two treatments.

At least two determinations should be made, both in the case of manual separation and in the case of chemical separation.

Textiles — Quantitative chemical analysis —

Part 2:
Ternary fibre mixtures

1 Scope

This part of ISO 1833 specifies methods of quantitative chemical analysis of various ternary mixtures of fibres.

The field of application of each method for analysing binary mixtures, specified in the parts of ISO 1833, indicates the fibres to which the method is applicable.

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.

ISO 1833-1:2006, *Textiles — Quantitative chemical analysis — Part 1: General principles of testing*

3 Principle

After identification of the components of a mixture, the non-fibrous matter is removed by a suitable pre-treatment, and then one or more of the four variants of the process of selective solution described in the Introduction is applied.

Except where this presents technical difficulties, it is preferable to dissolve the major fibre component so as to obtain the minor fibre component as the final residue.

4 Reagents and apparatus

Use the apparatus and reagents described in ISO 1833-1.

5 Conditioning and testing atmosphere

See ISO 1833-1.

6 Sampling and pre-treatment of sample

See ISO 1833-1.

7 Procedure

See ISO 1833-1.

8 Calculation and expression of results

8.1 General

Express the mass of each component as a percentage of the total mass of fibre present in the mixture. Calculate the result on the basis of clean dry mass, to which is applied firstly the agreed conventional recovery rate and secondly the correction factor necessary to take account of loss of matter during pre-treatment and analysis.

8.2 Calculation of percentages of mass of clean dry fibres, disregarding loss of fibre mass during pre-treatment

NOTE Some examples of calculations are given in Annex A.

8.2.1 Variant 1

Formulae to be applied where a component of the mixture is removed from one specimen and another component from a second specimen:

$$P_1 = \left[\frac{d_2}{d_1} - d_2 \times \frac{r_1}{m_1} + \frac{r_2}{m_2} \times \left(1 - \frac{d_2}{d_1} \right) \right] \times 100$$

$$P_2 = \left[\frac{d_4}{d_3} - d_4 \times \frac{r_2}{m_2} + \frac{r_1}{m_1} \times \left(1 - \frac{d_4}{d_3} \right) \right] \times 100$$

$$P_3 = 100 - \left(P_1 + P_2 \right)$$

where

P_1 is the percentage of the first clean dry component (component in the first specimen dissolved in the first reagent);

P_2 is the percentage of the second clean dry component (component in the second specimen dissolved in the second reagent);

P_3 is the percentage of the third clean dry component (component undissolved in both specimens);

m_1 is the dry mass of the first specimen after pre-treatment;

m_2 is the dry mass of the second specimen after pre-treatment;

r_1 is the dry mass of the residue after removal of the first component from the first specimen in the first reagent;

r_2 is the dry mass of the residue after removal of the second component from the second specimen in the second reagent;

d_1 is the correction factor for loss in mass, in the first reagent, of the second component undissolved in the first specimen 1);

d_2 is the correction factor for loss in mass, in the first reagent, of the third component undissolved in the first specimen 1);

d_3 is the correction factor for loss in mass, in the second reagent, of the first component undissolved in the second specimen 1);

d_4 is the correction factor for loss in mass, in the second reagent, of the third component undissolved in the second specimen 1).

8.2.2 Variant 2

Formulae to be applied in the case where a component (a) is removed from the first test specimen, leaving as residue, the other two components (b + c), and the two components (a + b) are removed from the second test specimen, leaving as residue the third component (c):

$$P_1 = 100 - \left(P_2 + P_3\right)$$

$$P_2 = 100 \times \frac{d_1 r_1}{m_1} - \frac{d_1}{d_2} \times P_3$$

$$P_3 = \frac{d_4 r_2}{m_2} \times 100$$

where

P_1 is the percentage of the first clean dry component (component of the first specimen soluble in the first reagent);

P_2 is the percentage of the second clean dry component (component soluble, at the same time as the first component of the second specimen, in the second reagent);

P_3 is the percentage of the third clean dry component (component insoluble in both specimens);

m_1 is the dry mass of the first specimen after pre-treatment;

m_2 is the dry mass of the second specimen after pre-treatment;

r_1 is the dry mass of the residue after removal of the first component from the first specimen in the first reagent;

r_2 is the dry mass of the residue after removal of the first and second components from the second specimen in the second reagent;

d_1 is the correction factor for loss in mass in the first reagent, of the second component undissolved in the first specimen 1);

d_2 is the correction factor for loss in mass, in the first reagent, of the third component undissolved in the first specimen 1);

d_4 is the correction factor for loss in mass, in the second reagent, of the third component undissolved in the second specimen 1).

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1) The values of d are indicated in the relevant parts of ISO 1833.

8.2.3 Variant 3

Formulae to be applied where two components (a + b) are removed from a specimen, leaving as residue the third component (c), then two components (b + c) are removed from another specimen leaving as residue, the first component (a):

$$P_1 = \frac{d_3 r_2}{m_2} \times 100$$

$$P_2 = 100 - \left(P_1 + P_3\right)$$

$$P_3 = \frac{d_2 r_1}{m_1} \times 100$$

where

P_1 is the percentage of the first clean dry component (component dissolved in the first specimen in the first reagent);

P_2 is the percentage of the second clean dry component (component dissolved in the first specimen in the first reagent and in the second specimen in the second reagent);

P_3 is the percentage of the third clean dry component (component dissolved in the second specimen in the second reagent);

m_1 is the dry mass of the first specimen after pre-treatment;

m_2 is the dry mass of the second specimen after pre-treatment;

r_1 is the dry mass of the residue after removal of the first and second components from the first specimen with the first reagent;

r_2 is the dry mass of the residue after removal of the second and third components from the second specimen with the second reagent;

d_2 is the correction factor for loss in mass with the first reagent, of the third component undissolved in the first specimen [1];

d_3 is the correction factor for loss in mass, with the second reagent, of the first component undissolved in the second specimen [1].

8.2.4 Variant 4

Formulae to be applied where two components are successively removed from the mixture using the same test specimen:

$$P_1 = 100 - \left(P_2 + P_3\right)$$

$$P_2 = 100 \times \frac{d_1 r_1}{m} - \frac{d_1}{d_2} \times P_3$$

$$P_3 = \frac{d_3 r_2}{m} \times 100$$

where

P_1 is the percentage of the first clean dry component (first soluble component);

P_2 is the percentage of the second clean dry component (second soluble component);

P_3 is the percentage of the third clean dry component (insoluble component);

m is the dry mass of the test specimen after pre-treatment;

r_1 is the dry mass of the residue after removal of the first component by the first reagent;

r_2 is the dry mass of the residue after removal of the first and second components by the first and second reagents;

d_1 is the correction factor for loss in mass of the second component in the first reagent [1];

d_2 is the correction factor for loss in mass of the third component in the first reagent [1];

d_3 is the correction factor for loss in mass of the third component in the first and second reagents [2].

8.3 Calculation of the percentage of each component with adjustment by conventional recovery rates and, where appropriate, by correction factors for losses in mass during pre-treatment operations

$$A = 1 + \frac{a_1 + b_1}{100} \qquad B = 1 + \frac{a_2 + b_2}{100} \qquad C = 1 + \frac{a_3 + b_3}{100}$$

hence

$$P_{1A} = \frac{P_1 A}{P_1 A + P_2 B + P_3 C} \times 100$$

$$P_{2A} = \frac{P_2 A}{P_1 A + P_2 B + P_3 C} \times 100$$

$$P_{3A} = \frac{P_3 A}{P_1 A + P_2 B + P_3 C} \times 100$$

where

P_{1A} is the percentage of the first clean dry component, including moisture content and loss in mass during pre-treatment;

P_{2A} is the percentage of the second clean dry component, including moisture content and loss in mass during pre-treatment;

P_{3A} is the percentage of the third clean dry component, including moisture content and loss in mass during pre-treatment;

P_1 is the percentage of the first clean dry component obtained by one of the formulae given in 8.2;

P_2 is the percentage of the second clean dry component obtained by one of the formulae given in 8.2;

P_3 is the percentage of the third clean dry component obtained by one of the formulae given in 8.2;

a_1 is the conventional recovery rate of the first component;

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[2] Wherever possible, d_3 should be determined in advance by experimental methods.

a_2 is the conventional recovery rate of the second component;

a_3 is the conventional recovery rate of the third component;

b_1 is the percentage of loss in mass during pre-treatment of the first component;

b_2 is the percentage of loss in mass during pre-treatment of the second component;

b_3 is the percentage of loss in mass during pre-treatment of the third component.

Where a special pre-treatment is used, the values of b_1, b_2 and b_3 should be determined if possible, by submitting each of the pure fibre constituents to the pre-treatment applied in the analysis. Pure fibres are those free from all non-fibrous material except that which they normally contain (either naturally or because of the manufacturing process) in the state (unbleached, bleached) in which they are found in the material to be analysed.

Where no clean separate constituent fibres used in the manufacture of the material to be analysed are available, average values of b_1, b_2 and b_3 as obtained from tests performed on clean fibres similar to those in the mixture under examination should be used. If normal pre-treatment by extraction with light petroleum and water is applied, correction factors b_1, b_2 and b_3 may generally be ignored except in the case of unbleached cotton, unbleached flax and unbleached hemp where the loss due to pre-treatment is usually accepted as 4 % and in the case of polypropylene where 1 % is admitted.

In the case of other fibres, by convention, no allowance is made in the calculation for the loss during normal pre-treatment.

NOTE Some examples of calculations are given in Annex A.

8.4 Calculation of the analysis by manual separation

8.4.1 General

Express the mass of each component fibre as a percentage of the total mass of the fibre in the mixture. Calculate the result on the basis of clean dry mass to which are applied the conventional recovery rate and the correction factor necessary to take account of loss of mass during pre-treatment operations.

8.4.2 Calculation of the percentage mass of clean dry fibre disregarding loss in fibre mass during pre-treatment

$$P_1 = \frac{100 m_1}{m_1 + m_2 + m_3} = \frac{100}{1 + \dfrac{m_2 + m_3}{m_1}}$$

$$P_2 = \frac{100 m_2}{m_1 + m_2 + m_3} = \frac{100}{1 + \dfrac{m_1 + m_3}{m_2}}$$

$$P_3 = 100 - \left(P_1 + P_2\right)$$

where

P_1 is the percentage of the first clean dry component;

P_2 is the percentage of the second clean dry component;

P_3 is the percentage of the third clean dry component;

m_1 is the clean dry mass of the first component;

m_2 is the clean dry mass of the second component;

m_3 is the clean dry mass of the third component.

8.4.3 Calculation of the percentage of each component with adjustment by conventional recovery rates and, where appropriate, by correction factors for losses in mass during pre-treatment

See 8.3.

9 Method of analysis by a combination of manual separation and chemical means

Wherever possible, manual separation (as described in ISO 1833-1:2006, Annex B) should be used taking account of the proportions of components separated before proceeding to any chemical treatment of each of the separated components.

10 Precision of methods

The precision indicated in each method of analysis of binary mixtures relates to the reproducibility (see ISO 1833-1:2006, Clause 11). This refers to the reliability, that is to say the closeness of agreement between experimental values obtained by operators in different laboratories or at different times using the same method and on specimens of an identical consistent mixture. Reproducibility is expressed by confidence limits of the results for a confidence level of 95 %.

By this is meant that the difference between two results of a series of analyses made in different laboratories would, given a normal and correct application of the method to an identical and homogeneous mixture, be exceeded only in 5 cases out of 100.

To determine the precision of analysis of a ternary mixture, the values indicated in the methods for analysis of binary mixtures which have been used to analyse the ternary mixture are applied in the usual way.

Given that, in the four variants of the quantitative chemical analysis of ternary mixtures, provision is made for two dissolutions (using two separate specimens for the first three variants and a single specimen for the fourth variant) and, assuming that E_1 and E_2 denote the respective precisions of the two methods for analysing binary mixtures, the precision of the results for each component is shown in Table 1.

Table 1

Component fibres	Variants		
	1	2 and 3	4
a	E_1	E_1	E_1
b	E_2	$E_1 + E_2$	$E_1 + E_2$
c	$E_1 + E_2$	E_2	$E_1 + E_2$

If the fourth variant is used, the precision may be found to be lower than that calculated by the method indicated above, owing to possible action of the first reagent on the residue consisting of components (b) and (c), which would be difficult to evaluate.

11 Test report

The test report shall be in accordance with ISO 1833-1:2006, Clause 11.

Annex A
(informative)

Examples of the calculation of percentages of the components of certain ternary mixtures using some of the variants described in 8.2

A.1 Variant 1

A.1.1 General

Consider the case of a fibre mixture which, when qualitatively analysed, gave the following components: carded wool, polyamide, unbleached cotton.

Suppose that, using this variant, i.e. using two different specimens and removing one component (a = wool) by dissolution from the first test specimen and a second component (b = polyamide) from the second test specimen, the following results are obtained

1) Dry mass of the first specimen after pre-treatment: m_1 = 1,600 0 g

2) Dry mass of the residue after treatment with alkaline sodium hypochlorite (polyamide + cotton): r_1 = 1,416 6 g

3) Dry mass of the second specimen after pre-treatment: m_2 =1,800 0 g

4) Dry mass of the residue after treatment with formic acid (wool + cotton): r_2 = 0,900 0 g

Treatment with alkaline sodium hypochlorite does not entail any loss in mass of polyamide, while bleached cotton loses 3 %, therefore d_1 = 1,00 and d_2 = 1,03.

Treatment in formic acid does not entail any loss in mass of wool or unbleached cotton, therefore d_2 = 1,00 and d_3 = 1,00.

A.1.2 Dry masses

If the values obtained by chemical analysis and the correction factors are substituted in the formula indicated in 8.2.1, the following result is obtained:

$$P_1(\text{wool}) = \left[\frac{1{,}03}{1{,}00} - 1{,}03 \times \frac{1{,}416\,6}{1{,}600\,0} + \frac{0{,}900\,0}{1{,}800\,0} \times \left(1 - \frac{1{,}03}{1{,}00}\right)\right] \times 100 = 10{,}30$$

$$P_2(\text{polyamide}) = \left[\frac{1{,}00}{1{,}00} - 1{,}00 \times \frac{0{,}900\,0}{1{,}800\,0} + \frac{1{,}416\,6}{1{,}600\,0} \times \left(1 - \frac{1{,}00}{1{,}00}\right)\right] \times 100 = 50{,}00$$

$$P_3(\text{cotton}) = 100 - (10{,}30 + 50{,}00) = 39{,}70$$

The percentages of the various clean dry fibres in the mixture are as follows:

polyamide	50,00	%
cotton	39,70	%
wool	10,30	%

A.1.3 Masses after application of allowance for moisture

The percentages have been corrected according to the formulae in 8.3 in order to take account also of the conventional recovery rate and the correction factors for any losses in mass after pre-treatment.

Supposing that the bleached cotton sustains a loss in mass of 4 % after pre-treatment in petroleum ether and water, and that for example the conventional recovery rate to be applied is 17 % for wool, 6,25 % for polyamide and 8,5 % for cotton, the following results are obtained:

$$P_{1A}(\text{wool}) = \frac{10{,}30 \times \left(1 + \frac{17{,}0 + 0{,}0}{100}\right)}{10{,}30 \times \left(1 + \frac{17{,}0 + 0{,}0}{100}\right) + 50{,}00 \times \left(1 + \frac{6{,}25 + 0{,}00}{100}\right) + 39{,}70 \times \left(1 + \frac{8{,}5 + 4{,}0}{100}\right)} \times 100 = 10{,}97\ \%$$

$$P_{2A}(\text{polyamide}) = \frac{50{,}00 \times \left(1 + \frac{6{,}25 + 0{,}00}{100}\right)}{109{,}838\ 5} \times 100 = 48{,}37\ \%$$

$$P_{3A}(\text{cotton}) = 100 - (10{,}97 + 48{,}37) = 40{,}66\ \%$$

The composition of the mixture is thus as follows:

polyamide	48,4	%
cotton	40,6	%
wool	11,0	%
	100,0	%

A.2 Variant 4

A.2.1 General

Consider the case of a fibre mixture which, when qualitatively analysed, gave the following components: carded wool, viscose, unbleached cotton.

Supposing that, using variant 4, i.e. successively removing two components from the mixture of one single test specimen, the following results are obtained:

1) Dry mass of test specimen after pre-treatment: m_1 = 1,600 0 g

2) Dry mass of test specimen after the first treatment with alkaline sodium hypochlorite (viscose + cotton): r_1 = 1,416 6 g

3) Dry mass of residue after the second treatment of the residue r_1 with formic acid/zinc chloride (cotton): r_2 = 0,663 0 g

Treatment with alkaline sodium hypochlorite does not entail any loss of mass in viscose, while unbleached cotton loses 3 %, therefore d_1 = 1,00 and d_2 = 1,03. After treatment in formic acid/zinc chloride, the mass of cotton decreases by 2 % so that d_3 = (1,03 × 1,02) = 1,050 6 rounded to 1,05 (d_3 being the correction factor for the respective loss or increase in mass of the third component in the first and second reagent).

A.2.2 Dry masses

Using the formulae indicated in 8.2.4, the values obtained by chemical analysis and the correction factors are substituted and the following result is obtained:

$$P_2\left(\text{viscose}\right)=\frac{1{,}0\times 1{,}4166}{1{,}6000}\times 100-\frac{1{,}00}{1{,}03}\times 43{,}51=46{,}32\ \%$$

$$P_3\left(\text{cotton}\right)=\frac{1{,}05\times 0{,}6630}{1{,}6000}\times 100=43{,}51\ \%$$

$$P_1\left(\text{wool}\right)=100-\left(46{,}32+43{,}51\right)=10{,}17\ \%$$

A.2.3 Mass after application of conventional recovery rates

As has already been indicated for variant 1, the percentages should be corrected by the formulae in 8.3. Taking the same values as above, then:

$$P_{1A}(\text{wool})=\frac{10{,}17\times\left(1+\dfrac{17{,}0+0{,}0}{100}\right)}{10{,}17\times\left(1+\dfrac{17{,}0+0{,}0}{100}\right)+46{,}32\times\left(1+\dfrac{13{,}0+0{,}0}{100}\right)+43{,}51\times\left(1+\dfrac{8{,}5+4{,}0}{100}\right)}\times 100=10{,}51\ \%$$

$$P_{2A}(\text{viscose})=\frac{46{,}32\times\left(1+\dfrac{13{,}0+0{,}0}{100}\right)}{113{,}21}\times 100=46{,}24\ \%$$

$$P_{3A}(\text{cotton})=100-\left(10{,}51+46{,}24\right)=43{,}25\ \%$$

The composition of the mixture is thus:

viscose	46,2	%
cotton	43,3	%
wool	10,5	%
	100,0	%

Annex B
(informative)

Table of typical ternary mixtures which may be analysed using methods of analysis of binary mixtures specified in the parts of ISO 1833

Table B.1

Mixture	Component fibres (in the order of dissolution)			Variant	Corresponding parts of ISO 1833 (showing reagents used, in the order of dissolution)
	1st component	2nd component	3rd component		
1	wool or hair	viscose, cupro or certain types of modal	cotton	**1** and/or **4**	**Part 4** (alkaline sodium hypochlorite) and **Part 6** (zinc chloride/formic acid)
2	wool or hair	polyamide	cotton, viscose, cupro or modal	**1** and/or **4**	**Part 4** (alkaline sodium hypochlorite) and **Part 7** (formic acid 80 % mass fraction)
3	wool, hair or silk	certain chlorofibres	cotton, viscose, cupro or modal	**1** and/or **4**	**Part 4** (alkaline sodium hypochlorite) and **Part 13** (carbon disulfide/acetone 55,5/44,5 volume fraction)
4	wool or hair	polyamide	polyester, polypropylene, acrylic or glass fibre	**1** and/or **4**	**Part 4** (alkaline sodium hypochlorite) and **Part 7** (formic acid 80 % mass fraction)
5	wool, hair or silk	certain chlorofibres	polyester, acrylic, polyamide or glass fibre	**1** and/or **4**	**Part 4** (alkaline sodium hypochlorite) and **Part 13** (carbon disulfide/acetone 55,5/44,5 volume fraction)
6	silk	wool or hair	polyester	**2**	**Part 18** (sulfuric acid 75 % mass fraction) and **Part 4** (alkaline sodium hypochlorite)
7	polyamide	acrylic	cotton, viscose, cupro or modal	**1** and/or **4**	**Part 7** (formic acid 80 % mass fraction) and **Part 12** (dimethylformamide)
8	certain chlorofibres	polyamide	cotton, viscose, cupro or modal	**1** and/or **4**	**Part 12** (dimethylformamide) and **Part 7** (formic acid 80 % mass fraction) or **Part 13** (carbon disulfide/acetone 55,5/44,5 volume fraction) and **Part 7** (formic acid 80 % mass fraction)
9	acrylic	polyamide	polyester	**1** and/or **4**	**Part 12** (dimethylformamide) and **Part 7** (formic acid 80 % mass fraction)
10	acetate	polyamide	cotton, viscose, cupro or modal	**4**	**Part 3** (acetone) and **Part 7** (formic acid 80 % mass fraction)
11	certain chlorofibres	acrylic	polyamide	**2** and/or **4**	**Part 13** (carbon disulfide/acetone 55,5/44,5 volume fraction) and **Part 12** (dimethylformamide)