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**Textiles — Tests for colour fastness —**

Part C09:

**Colour fastness to domestic and  
commercial laundering — Oxidative bleach  
response using a non-phosphate reference  
detergent incorporating a low temperature  
bleach activator**

*Textiles — Essais de solidité des teintures —*

*Partie C09: Solidité des teintures aux lavages domestiques et industriels —  
Blanchiment par oxydation utilisant un détergent de référence sans  
phosphate comprenant un activateur de blanchiment à basse température*



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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 3.

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 part of ISO 105 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 105-C09 was prepared by Technical Committee ISO/TC 38, *Textiles*, Subcommittee SC 1, *Tests for coloured textiles and colorants*.

ISO 105 was previously published in thirteen "parts", each designated by a letter (e.g., "Part A"), with publication dates between 1978 and 1985. Each part contained a series of "sections", each designated by the respective part letter and by a two-digit serial number (e.g. "Section A02"). These sections are now being republished as separate documents, themselves designated "parts" but retaining their earlier alphanumeric designations. A complete list of these parts is given in ISO 105-A01.

Annex A forms a normative part of this part of ISO 105.

## Introduction

The test method in this section of ISO 105 is intended to reflect the effect of multicycle laundering using an activated bleach detergent by domestic and commercial laundering procedures. The washes are carried out in a similar manner to the ISO 105-C06 tests using an activated oxygen bleach and reference detergent at 60 °C.

A paper describing the development of this method has been published in the *Journal of the Society of Dyers & Colourists*, Vol. 112, No.10, Oct. 1996, p. 287-292.

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# Textiles — Tests for colour fastness —

Part C09:

## Colour fastness to domestic and commercial laundering — Oxidative bleach response using a non-phosphate reference detergent incorporating a low temperature bleach activator

### 1 Scope

This part of ISO 105 specifies a method for determining the consumer relevant shade change of textiles, of all kinds, (excluding silk and wool) and in all forms, to domestic/commercial laundering procedures in which a bleach activator (oxygen bleaching system) is used.

The colour fastness resulting from oxygen bleaching in this test provides an indication of the shade change behaviour observed after multiple domestic/commercial launderings.

This part of ISO 105 is not applicable for the assessment of the dye staining of adjacent fabrics, where suitable methods are described in ISO 105-A04.

This part of ISO 105 does not reflect the contribution of optical brighteners, which are present in some commercial washing products, to shade change.

This part of ISO 105 specifies a procedure incorporating the use of ECE<sup>1)</sup> non-phosphate reference detergent, sodium perborate tetrahydrate, and the bleach activator tetra-acetylenediamine (TAED). An alternative test procedure using the AATCC 1993 zero phosphate reference detergent (without optical brightener), and incorporating sodium perborate monohydrate and the bleach activator sodium nonanoyloxybenzene sulphonate (SNOBS) is currently under development.

### 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 105. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 105 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 105-A01:1994, *Textiles — Tests for colour fastness — Part A01: General principles of testing*

ISO 105-A02:1993, *Textiles — Tests for colour fastness — Part A02: Grey scale for assessing change in colour*

ISO 105-A05:1996, *Textiles — Tests for colour fastness — Part A05: Instrumental assessment of change in colour for determination of grey scale rating*

ISO 105-J01:1997, *Textiles — Tests for colour fastness — Part J01: General principles for measurement of surface colour*

1) European Colourfastness Establishment (ECE), BAM, Unter den Eichen 87, D-12203, Berlin, Germany.

ISO 105-J03:1995, *Textiles — Tests for colour fastness — Part J03: Calculation of colour differences*

ISO 3696:1987, *Water for analytical laboratory use — Specification and test methods*

### 3 Principle

A specimen of the textile is laundered, rinsed and dried. Specimens are laundered under specified conditions of temperature, alkalinity and bleach concentration such that a fading result which correlates with a multicycle machine washing is obtained in a conveniently short time. The change in colour of the specimen is assessed with reference to the original fabric, either with the grey scale or instrumentally.

### 4 Reagents and materials

#### 4.1 Reference detergent.

##### 4.1.1 ECE non-phosphate reference detergent base powder (1998 formulation).

##### 4.1.2 Bleach activator, tetra-acetylenediamine, TAED.

##### 4.1.3 Sodium perborate tetrahydrate.

#### 4.2 Grade 3 water, complying with ISO 3696.

#### 4.3 Grey scale, for assessing change in colour complying with ISO 105-A02 or a spectrophotometer for assessing change in colour complying with ISO 105-J01.

#### 4.4 Filter papers.

### 5 Apparatus

**5.1 Suitable mechanical laundering device**, consisting of a water bath containing a rotatable shaft which supports, radially, stainless steel containers (75 mm  $\pm$  5 mm diameter  $\times$  125 mm  $\pm$  10 mm high) of capacity (550  $\pm$  50) ml, the bottom of the containers being (45  $\pm$  10) mm from the centre of the shaft. The shaft/container assembly is rotated at a frequency of (40  $\pm$  2) min<sup>-1</sup>. The temperature of the water bath is thermostatically controlled to maintain the test solution at the prescribed temperature  $\pm$  2 °C.

Other mechanical devices may be used for this test, provided that the results are identical with those obtained by the apparatus described in 5.1.

**5.2 Balance**, accurate to  $\pm$  0,01g (see ISO 105-A01).

**5.3 Mechanical Stirrer**, minimum 16,667 s<sup>-1</sup> (1 000 rpm) to ensure thorough dispersion and prevent settling.

### 6 Test specimen

**6.1** If the textile to be tested is fabric, cut a 50 mm  $\times$  100 mm piece.

**6.2** Yarn may be knitted into fabric of dimensions 50 mm  $\times$  100 mm, and tested in this form. Alternatively, for yarns and threads, form a wick of parallel lengths 100 mm long and about 5 mm in diameter. Determine the mass of the specimen and either tie both ends or sew on to a piece of polypropylene backing cloth (50 mm  $\times$  100 mm) as support. In the latter case, only the mass of yarns and threads are taken to determine the liquor ratio volumes.

**6.3** Determine the mass, in grams, of the specimen using the balance (5.2), to aid accurate liquor ratio volumes.

## 7 Procedure

Provision is made in annex A for a washing procedure using a bleach activator and reference detergent.

## 8 Test report

The test report shall include the following information:

- a) reference to this part of ISO 105 i.e. ISO 105-C09;
- b) all details necessary for complete identification of the sample tested;
- c) the numerical grey scale rating and/or instrumental assessment for the change in colour of the specimen;
- d) the reference detergent and bleach activator.

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## Annex A (normative)

### ECE non-phosphate reference detergent / TAED procedure

**A.1** The reference detergent is supplied in three separate parts as given in Table A.1.

- a) ECE non-phosphate reference detergent base powder (1998 Formulation).
- b) Bleach activator, tetra-acetylenediamine (TAED).
- c) Sodium perborate tetrahydrate ( $\text{NaBO}_3 \cdot 4\text{H}_2\text{O}$ ).

For details of sources of supply apply to: The Society of Dyers and Colourists, PO Box 244, 82 Grattan Road, Bradford BD1 2JB England or Deutsche Echtheitskommission, Institutweg 1, 85435 Erding, Germany.

**Table A.1 — ECE 1998 non-phosphate reference detergent (without optical brightener)**

<b>a) Base detergent</b>	%
Linear sodium alkyl benzene sulphonate (mean length of alkane chain $\text{C}_{11,5}$ )	9,7
Ethoxylated fatty alcohol $\text{C}_{12-18}$ (7EO)	5,2
Sodium soap, chain length $\text{C}_{12-17}$ 46 % : $\text{C}_{18-20}$ 54 %	3,6
Foam Inhibitor, DC2 - 4245	4,5
Sodium aluminium silicate (zeolite 4A)	32,5
Sodium carbonate	11,8
Sodium salt of a copolymer from acrylic and maleic acid	5,2
Sodium silicate ( $\text{SiO}_2:\text{Na}_2\text{O} = 3,3:1$ )	3,4
Carboxymethylcellulose (CMC)	1,3
Diethylene triamine penta(methylene phosphonic acid)	0,8
Sodium sulfate	9,8
Water	12,2
<b>b) Tetra-acetylenediamine (TAED)</b> 100 % active <sup>a</sup>	As separate addition
<b>c) Sodium perborate tetrahydrate</b>	As separate addition
<sup>a</sup> The activity of the supplied TAED will be specified and is likely to be less than 100 %. The required amount (g) of TAED per litre of wash liquor is calculated: $\frac{1,8 \times 100}{\% \text{ activity}}$	

**A.2** Prepare the wash liquor by dispersing 10 g of the ECE non-phosphate reference detergent base powder [A.1 a)] plus 1,8 g TAED [A.1 b)] (at 100 % activity) (see Table A.1 for details of calculation where the activity of the TAED is less than 100 %) and 12 g sodium perborate tetrahydrate [A.1 c) per litre of grade 3 water (4.2).

A minimum of 1 l detergent solution (A.2) should be prepared immediately prior to each laundering run.

**A.3** Vigorously disperse the ECE base detergent powder, TAED and the sodium perborate tetrahydrate in the amounts specified in A.2 using the mixer at a minimum speed of  $16,667 \text{ s}^{-1}$  (1 000 rpm) in grade 3 water (4.2) at  $(25 \pm 5) \text{ }^\circ\text{C}$  and stir for  $(10 \pm 1)$  min.

**A.4** Place the specimen in one of the containers of the laundering device (5.1). Add to the container the appropriate volume of wash liquor to provide a liquor:specimen ratio of 100:1. Check that the solution is at the initial temperature  $(25 \pm 5) \text{ }^\circ\text{C}$ . Close the container, place in the laundering device (5.1) and commence rotation.

**A.5** Raise the temperature at a rate of  $(1,5 \pm 0,5) \text{ }^\circ\text{C}$  per min to the required temperature of  $(60 \pm 2) \text{ }^\circ\text{C}$  and continue to run the test for a further  $(30 \pm 1)$  min at this temperature.

**A.6** Remove the specimen at the end of the wash and place in a 4 l beaker half filled with grade 3 water (4.2) at ambient temperature. Gently agitate, rinse for 1 min and then place the beaker under a cold running tap for 10 min.

**A.7** Squeeze the test specimen by hand to remove the excess water.

**A.8** Dry the specimen by pressing flat between filter papers to remove excess water. Then air dry at a temperature not exceeding  $60 \text{ }^\circ\text{C}$ .

**A.9** Assess the change in colour of the specimen using grey scale or instrumentally with reference to the original fabric (4.3). (See also ISO 105-A02; ISO 105-A05; ISO 105-J01, ISO 105-J03.)

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