International Standard 105/X

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Textiles — Tests for colour fastness — Part X : Tests not included in parts A to S or part Z

Textiles — Essais de solidité des teintures — Partie X : Solidité des teintures à des agents autres que ceux spécifiés dans les parties A à S et Z

Second edition — 1984-10-01

UDC 677.016.47 **Ref. No. ISO 105/X-1984 (E)**

Descriptors : textiles, dyes, tests, colour fastness, carbonizing tests, chemical tests, mercerizing tests, solvent resistance tests, boiling temperature tests, dyeing tests, tests to domestic products, thermal tests, ironing tests, friction tests, steam heating, wool, cotton, wool fabrics, fabrics coated with plastics, polyvinyl chloride, aluminium chloride, sulphuric acid, sodium sulphite, hydrochloric acid, sodium hypochlorite, sodium carbonate, soaps, formaldehyde, migration, plasticizers, chlorination.

Price based on 29 pages

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. Every 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 105/X was prepared by Technical Committee ISO/TC 38, *Textiles.*

ISO 105/B was first published in 1978. This second edition cancels and replaces the first edition, section X12 of which has been technically revised and to which section X14 has been added.

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X01 Colour fastness to carbonizing : Aluminium chloride

1 SCOPE AND FIELD OF APPLICATION

This method is intended for determining the resistance of the colour of textiles in all forms to the manufacturing operation designed to remove vegetable impurities by a treatment with aluminium chloride at high temperatures. It is mainly applicable to wool and textiles containing wool, particularly those containing also acetate or polyamide fibres.

2 PRINCIPLE

A specimen containing aluminium chloride solution is dried, baked, rinsed and neutralized. The changes in colour after rinsing, neutralizing and drying are assessed with the grey scale.

3 REFERENCES

ISO 105 :

Section A01, *General principles of testing.*

Section A02, *Grey scale for assessing change in colour.*

4 APPARATUS AND REAGENTS

4.1 Oven for drying specimens in air at 60 ± 2 °C and baking in air at 115 ± 2 °C.

4.2 Aluminium chloride solution (relative density 1,037) containing 51,4 g of $AlCl_3.6H_2O$ per litre.

4.3 Ammonium hydroxide solution containing 2 ml of 20 % NH_4OH per litre.

4.4 Test control : a dyeing of CI Mordant Red 3 (Colour Index, 3rd Edition) treated with potassium dichromate (see clause 8).

4.5 Grey scale for assessing change in colour (see clause 3).

5 TEST SPECIMEN

5.1 If the textile to be tested is fabric, use a specimen 10 cm × 4 cm.

5.2 If the textile to be tested is yarn, knit it into fabric and use a specimen 10 cm × 4 cm or make a wick of parallel lengths 10 cm long and about 0,5 cm diameter, tied near both ends.

5.3 If the textile to be tested is loose fibre, comb and compress enough of it to form a sheet 10 cm × 4 cm.

6 PROCEDURE

6.1 Carry out the operations described in 6.2 to 6.5 with the specimen and the test-control specimen in parallel in separate baths.

6.2 Immerse the specimen in the aluminium chloride solution (4.2) for 15 min at room temperature (liquor ratio 20 : 1). Squeeze it to leave in 80 % of its own mass of solution.

6.3 Dry the specimen by hanging it in an oven for 30 min, or longer if necessary, at 60 ± 2 °C. Then bake it by heating for 15 min at 115 ± 2 °C.

6.4 Rinse the specimen for 5 min in cold running tap-water and then divide it into two equal parts. Dry one half by hanging it in air at a temperature not exceeding 60 °C.

6.5 Agitate the other half for 30 min at room temperature in the ammonium hydroxide solution (4.3) (liquor ratio 40 : 1). Then rinse it for 5 min in cold running tap-water and dry it by hanging it in air at a temperature not exceeding 60 °C.

6.6 Assess the effect on the unneutralized test-control specimen with the grey scale (see clause 8). If the change

in colour is not equal to the rating 4-5 yellower on the appropriate scale, the test has not been carried out correctly, and the operations described in 6.1 to 6.5 inclusive should be repeated with a fresh specimen and a fresh test-control specimen.

6.7 Assess the change in colour of each half of the specimen with the grey scale.

7 TEST REPORT

Report the numerical ratings for changes in colour for both the rinsed and the neutralized portions of the specimen.

8 NOTE

Test control. A well wetted-out pattern of wool cloth is entered at 40 °C into a dye-bath containing 1 % CI Mordant Red 3 (Colour Index, 3rd Edition), 10 % sodium sulphate decahydrate ($Na_2SO_4.10H_2O$) and 3 % acetic acid (300 g/l), all percentages being calculated on the mass of the pattern, at a liquor ratio of 40 : 1. .

The dye-bath is raised to the boil in 30 min and boiled for a further 30 min. If necessary, the dye-bath is exhausted by careful addition of 1 to 3 % acetic acid (300 g/l) or 1 % sulphuric acid (relative density 1,84), well diluted with water. The bath is boiled for a further 15 min after addition of the acid. The dye-bath is cooled down by addition of cold water, and 0,5 % potassium dichromate dissolved in water is added. The dye-bath is raised to the boil and boiled for 30 min. The pattern is then removed, rinsed in cold running tap-water and dried.

X02 Colour fastness to carbonizing : Sulphuric acid

1 SCOPE AND FIELD OF APPLICATION

This method is intended for determining the resistance of the colour of textiles in all forms to the manufacturing operation designed to remove vegetable impurities by a treatment with sulphuric acid at high temperatures. It is mainly applicable to wool and textiles containing wool.

2 PRINCIPLE

A specimen containing the sulphuric acid solution is dried, baked, rinsed and neutralized. The changes in colour after rinsing, neutralizing and drying are assessed with the grey scale.

3 REFERENCES

ISO 105 :

Section A01, *General principles of testing.*

Section A02, *Grey scale for assessing change in colour.*

4 APPARATUS AND REAGENTS

4.1 Oven for drying specimens in air at 60 ± 2 °C and baking in air at 105 ± 2 °C.

4.2 Sulphuric acid solution containing 50 g of concentrated sulphuric acid (relative density 1,84) per litre.

4.3 Sodium carbonate solution containing 2 g of anhydrous sodium carbonate per litre.

4.4 Test control : a dyeing of CI Mordant Red 3 (Colour Index, 3rd Edition), treated with potassium dichromate (see clause 8).

4.5 Grey scale for assessing change in colour (see clause 3).

5 TEST SPECIMEN

5.1 If the textile to be tested is fabric, use a specimen 10 cm × 4 cm.

5.2 If the textile to be tested is yarn, knit it into fabric and use a specimen 10 cm × 4 cm or make a wick of parallel lengths 10 cm long and about 0,5 cm diameter, tied near both ends.

5.3 If the textile to be tested is loose fibre, comb and compress enough of it to form a sheet 10 cm × 4 cm.

6 PROCEDURE

6.1 Carry out the operations described in 6.2 to 6.5 with the specimen and test-control specimen in parallel, in separate baths.

6.2 Immerse the specimen in the sulphuric acid solution (4.2) for 15 min at room temperature (liquor ratio 20 : 1). Squeeze it to leave in 80 % of its own mass of solution.

6.3 Dry the specimen by hanging it in an oven for 30 min, or longer if necessary, at 60 ± 2 °C. Then bake it by heating for 15 min at 105 ± 2 °C.

6.4 Rinse the specimen for 5 min in cold running tap-water and then divide it into two equal parts. Dry one half by hanging it in air at a temperature not exceeding 60 °C.

6.5 Agitate the other half for 30 min at room temperature in the sodium carbonate solution (4.3) (liquor ratio 40 : 1). Then rinse it for 5 min in cold running tap-water and dry it by hanging it in air at a temperature not exceeding 60 °C.

6.6 Assess the effect on the unneutralized test-control specimen with the grey scale (see clause 8). If the change in

colour is not equal to the rating 2 yellower on the appropriate scale, the test has not been carried out correctly and the operations described in 6.1 to 6.5 inclusive should be repeated with a fresh specimen and a fresh test-control specimen.

6.7 Assess the change in colour of each half of the specimen with the grey scale.

7 TEST REPORT

Report the numerical ratings for changes in colour for both the rinsed and the neutralized portions of the specimen.

8 NOTE

Test control. A well wetted-out pattern of wool cloth is entered at 40 °C into a dye-bath containing 1 % of CI Mordant Red 3 Powder (Colour Index, 3rd Edition), 10 % of sodium sulphate decahydrate ($Na_2SO_4.10H_2O$) and 3 % of acetic acid (300 g/l), all percentages being calculated on the mass of the pattern, at a liquor ratio of 40 : 1.

The dye-bath is raised to the boil in 30 min and boiled for a further 30 min. If necessary, the dye-bath is exhausted by careful addition of 1 to 3 % of acetic acid (300 g/l) or 1 % of sulphuric acid (relative density 1,84), well diluted with water. The bath is boiled for a further 15 min after addition of the acid. The dye-bath is cooled down by addition of cold water, and 0,5 % of potassium dichromate dissolved in water is added. The dye-bath is raised to the boil and boiled for 30 min. The pattern is then removed, rinsed in cold running tap-water and dried.

X03 Colour fastness to chlorination

1 SCOPE AND FIELD OF APPLICATION

This method is intended for determining the resistance of the colour of textiles of all kinds and in all forms to the manufacturing operation in which an acid hypochlorite solution is used to prevent wool textiles from shrinking.

2 PRINCIPLE

A specimen of the textile in contact with adjacent fabrics is treated successively with solutions of hydrochloric acid, sodium or lithium hypochlorite and sodium sulphite, rinsed and dried. The change in colour of the specimen and the staining of the adjacent fabrics are assessed with the grey scales. A test-control specimen is used.

3 REFERENCES

ISO 105 :

Section A01, *General principles of testing.*

Section A02, *Grey scale for assessing change in colour.*

Section A03, *Grey scale for assessing staining.*

4 APPARATUS AND REAGENTS

4.1 Yarns of scoured unbleached undyed wool, undyed bleached cotton and other fibres as desired for assessment of staining, if fabrics or yarns are to be tested; comparable **adjacent fabrics** if loose fibres are to be tested.

4.2 Hydrochloric acid solution containing 6 ml of hydrochloric acid (relative density 1,16 at 20 °C) per litre.

4.3 *Either* :

Sodium hypochlorite solution containing 1 g of active chlorine per litre.

To prepare this reagent, use sodium hypochlorite of the following composition :

- active chlorine : 140 to 160 g/l
- sodium chloride (NaCl) : 120 to 170 g/l
- sodium hydroxide (NaOH) : 20 g/l maximum
- sodium carbonate (Na_2CO_3) : 20 g/l maximum
- iron (Fe) : 0,01 g/l maximum

Or :

Lithium hypochlorite (LiOCl) solution containing 1 g of available chlorine per litre.

To prepare this reagent, use solid lithium hypochlorite, which contains approximately 300 g of LiOCl per kilogram. About 5 g of solid lithium hypochlorite dissolved in 1 litre of distilled water yields a solution of the prescribed concentration of 1 g of available chlorine per litre.

4.4 Sodium sulphite solution containing 3 g of $Na_2SO_3.7H_2O$ per litre.

4.5 Test control : dyeing of CI Acid Blue 37 (Colour Index, 3rd Edition) on wool cloth (see clause 8).

4.6 Grey scales for assessing change in colour and staining (see clause 3).

5 TEST SPECIMEN

5.1 If the textile to be tested is fabric, sew stitches of the undyed yarns (4.1) at intervals of approximately 1 cm into a specimen of the fabric 10 cm × 4 cm.

5.2 If the textile to be tested is yarn, knit it into fabric and make a composite specimen from it as in 5.1.

5.3 If the textile is loose fibre, comb and compress enough of it to form a sheet 10 cm × 4 cm, place the sheet between the wool and the cotton adjacent fabrics or other adjacent fabrics and sew the three together with stitching at intervals of 1 cm. The mass of the coloured textile should approximate to that of the wool adjacent fabric.

5.4 Prepare a composite specimen of the test-control specimen (4.5) in the way outlined for fabric in 5.1.

6 PROCEDURE

6.1 Carry out the operations described in 6.2 to 6.5 with the composite specimens and the composite test-control specimen, in parallel, in separate baths.

6.2 Immerse the composite specimen in the hydrochloric acid solution (4.2) at a liquor ratio of 25 : 1 for 10 min at room temperature.

6.3 Add an equal volume of the sodium or lithium hypochlorite solution (4.3) and keep the composite specimen immersed for a further 10 min.

6.4 Rinse the composite specimen thoroughly in cold running tap-water and then immerse it in the sodium sulphite solution (4.4) for 10 min, at 35 to 40 °C at a liquor ratio of 50 : 1.

6.5 Thoroughly rinse the composite specimen in cold running tap-water and dry it by hanging it in air at a temperature not exceeding 60 °C.

6.6 Assess the effect on the test-control specimen with the grey scale (see clause 8). If the change in colour is not equal to rating 3, the test has not been carried out correctly, and the operations described in 6.1 to 6.5 inclusive should be repeated with fresh composite specimens and a fresh composite test-control specimen.

6.7 Assess the change in colour of the specimen and the staining of the adjacent fabrics with the grey scales.

7 TEST REPORT

Report the numerical rating for change in colour and the numerical rating for staining of each kind of undyed fibre used.

8 NOTE

Test control. A well wetted-out specimen of wool cloth is entered at 40 °C into a dye-bath containing 1 % CI Acid Blue 37 (Colour Index, 3rd Edition), 10 % sodium sulphate decahydrate ($Na_2SO_4.10H_2O$) and 3 % sulphuric acid (relative density 1,84), all percentages being calculated on the mass of the specimen, at a liquor ratio of 40 : 1.

The dye-bath is raised to the boil in 15 min and boiled for a further 45 min. The specimen is then removed, rinsed in cold running tap-water and dried.

X04 Colour fastness to mercerizing

1 SCOPE AND FIELD OF APPLICATION

This method is intended for determining the resistance of the colour of textiles to the action of concentrated solutions of sodium hydroxide used in mercerizing. It is mainly applicable to cotton and to mixtures containing cotton.

2 PRINCIPLE

2.1 A specimen of the textile in contact with specified adjacent fabric is treated with sodium hydroxide solution, rinsed, acidified, again rinsed and dried. The change in colour of the specimen and the staining of the adjacent fabric are assessed with the grey scales.

2.2 As completely resistant specimens may show an apparent increase in depth of colour, these would not be rated 5 by the normal method of assessment. In such cases, therefore, only the changes in hue and brightness should be assessed using the grey scale, without consideration of the increase in depth, and such assessments should be marked with an asterisk (*). The meaning of the asterisk has to be explained in a foot-note.

Examples

5 * : Increase in depth (not considered); no change in hue and brightness.

3-4 redder * : Increase in depth (not considered); the hue became redder matching grey scale 3-4.

2 bluer, duller * : Increase in depth (not considered); the shade changed in hue and brightness according to grey scale 2.

2.3 Specimens which do not increase in depth shall be assessed in the normal manner and the results shall not be marked with an asterisk.

Example

2 weaker, bluer, duller : Loss in depth (considered) and change in both hue and brightness according to grey scale 2.

3 REFERENCES

ISO 105 :

Section A01, *General principles of testing.*

Section A02, *Grey scale for assessing change in colour.*

Section A03, *Grey scale for assessing staining.*

4 APPARATUS AND REAGENTS

4.1 Cotton adjacent fabric at least 10 cm × 10 cm, for evaluating staining.

4.2 Frame for holding specimen (see clause 8).

4.3 Sodium hydroxide (NaOH) solution, 300 g/l.

4.4 Sulphuric acid solution containing 5 ml of concentrated sulphuric acid (relative density 1,84) per litre.

4.5 Acetic acid solution containing 10 ml of glacial acetic acid per litre.

4.6 Grey scales for assessing change in colour and staining (see clause 3).

5 TEST SPECIMEN

5.1 If the textile to be tested is fabric, sew a specimen of it at least 10 cm × 10 cm to an equal sized piece of the adjacent fabric (4.1) around all four sides. Fasten this composite specimen to a frame firmly, but without excessive tension.

5.2 If the textile to be tested is yarn or thread, wind an amount of it equal to the mass of adjacent fabric on a rigid

frame firmly, but without excessive tension, with the strands close together and parallel to provide an area at least 10 cm × 10 cm. Sew an equal sized piece of the adjacent fabric (4.1) to this area along the two sides across the strands.

6 PROCEDURE

6.1 Immerse the composite specimen with the coloured material uppermost in the sodium hydroxide solution (4.3) at 20 ± 2 °C for 5 min. Rinse the composite specimen in the frame by pouring on 1 litre of water at 70 ± 2 °C over a period of 1 min and then rinsing in cold running tap-water for 5 min.

6.2 Remove the composite specimen from the frame and immerse it in the sulphuric acid solution (4.4) or in the acetic acid solution (4.5) for 5 min, at a liquor ratio of 50 : 1. Rinse the specimen in cold running tap-water until neutral.

6.3 Remove the stitching along three sides of the specimen (one side for yarns and threads) and dry it by hanging it in air at a temperature not exceeding 60 °C, taking care that the adjacent fabric and the coloured material are kept apart except at the remaining stitching.

6.4 If the specimen shows increased depth of colour, assess the change in hue and/or brightness only, using the appropriate grey scale (see clause 3). Assess the staining of the adjacent fabric with the appropriate grey scale (see clause 3).

6.5 If the specimen does not show increased depth of colour, assess the change as an overall contrast (see 2.3) and the staining of the adjacent fabric with the grey scales.

7 TEST REPORT

7.1 In the case of assessments in accordance with 6.4, report and mark with an asterisk any changes in hue and/or brightness of the specimen and report the numerical rating for staining of the cotton adjacent fabric.

7.2 In the case of assessments in accordance with 6.5, report the numerical rating for change in colour of the specimen and the numerical rating for staining of the cotton adjacent fabric.

8 NOTE

For the test, a metal frame is suitable which consists of two folding wings which in closed position can be locked by a wing-nut. The two wings have fitting open squares of about 8 cm × 8 cm. All four sides of the frame are corrugated or contain needle bars in order to fix the composite specimen during the treatment. The rigid frame for yarns and threads should be a little larger than the corrugated frame or the needle bar and fits into the metal frame.