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Textiles —

Tests for colour fastness

Part X14: Colour fastness to acid chlorination of wool : Sodium dichloroisocyanurate

The European Standard EN ISO 105-X14: 1987 has the status of a British Standard.

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Textiles — Tests for colour fastness —

Part X14:

Colour fastness to acid chlorination of wool : Sodium dichloroisocyanurate

1 Scope and field of application

This part of ISO 105 specifies a method for determining the resistance of the colour of wool in all forms to acid chlorination using sodium dichloroisocyanurate[1]. This simulates the manufacturing operation in which a liquid containing or liberating active chlorine under mildly acid conditions is used for imparting shrink-resistant properties to wool in textiles.

2 References

ISO 105, *Textiles — Tests for colour fastness —*

Part A01 : General principles of testing.

Part A02 : Grey scale for assessing change in colour.

ISO 3074, *Wool — Determination of dichloromethane-soluble matter in combed sliver.*

3 Principle

A specimen of the textile is treated in a formic acid buffer solution to which solutions of sodium dichloroisocyanurate and sodium hydrogen sulfite are added successively, and is then rinsed and dried. The change in colour of the specimen is assessed with the grey scale.

4 Apparatus and reagents

4.1 **Deionized water or distilled water,** both for making up solutions and for use by itself.

4.2 A freshly prepared solution containing 3,0 g of anhydrous **sodium formate** per litre and an amount of **sodium dioctylsulfosuccinate** wetting agent equivalent to 0,5 g of the solid per litre (see 8.1), and buffered to pH 4,0 ± 0,2 with formic acid (approximately 1 g of 90 % formic acid is required per litre).

4.3 A freshly prepared solution containing 11,27 g of **sodium dichloroisocyanurate** dihydrate ($C_3N_3O_3Cl_2Na.2H_2O$) per litre (see 8.2).

4.4 A freshly prepared solution of **sodium hydrogen sulfite** containing 3,29 g of $NaHSO_3$ per litre, prepared by dissolving 3,0 g of sodium metabisulfite ($Na_2S_2O_5$) in 1 litre of water.

4.5 **Equipment** ensuring continuous agitation of the test specimen, its complete immersion at a liquor ratio of 47 : 1, no overflow of liquor during agitation at a liquor ratio of 60 : 1, and ready access to the specimen (see 8.4).

4.6 **Electronic pH meter,** preferably, or **narrow-range pH-indicator paper.**

4.7 **Starch-iodide test paper.**

4.8 **Grey scale for assessing change in colour** (see clause 2).

5 Test specimen

5.1 The specimen shall be air dry under laboratory conditions. The content of dichloromethane-extractable matter (see clause 2) shall not exceed 0,5 %, calculated on the original mass of the conditioned specimen (especially if testing to specify dye fastness), or, if testing for suitability for bulk processing, shall be typical, after appropriate pre-treatments, of the bulk to be processed.

5.2 It may be found advantageous for the mass of the test specimen to be a multiple of 0,5 g, i.e. 2,0 g or more.

5.3 The rib section and the body section of a garment shall be tested separately.

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[1] 1,3-dichloro-1,3,5-triazine-2,4,6 (1H, 3H, 5H)-trione sodium salt.

5.4 If the textile to be tested is yarn, knit it into plain fabric, or test it in hank form.

5.5 If the textile to be tested is loose fibre, comb and compress some of it into a sheet. Preferred minimum dimensions of the sheet are 10 cm × 4 cm. Place the sheet on a lightweight undyed polyester fabric of the same size and sew the two together with stitching round the edges. Use a method of agitation (see 4.5 and 8.4) that does not cause the composite specimen to disintegrate or, if this is not possible, use a composite specimen incorporating an additional sheet of lightweight undyed polyester fabric of open structure, with the test specimen sandwiched between the two sheets of polyester fabric.

6 Procedure

6.1 Carry out the operations described below in 6.2 to 6.8 inclusive, treating each specimen in a separate bath.

6.2 Constant stirring or other agitation is required throughout the test and is particularly important immediately after adding the sodium dichloroisocyanurate solution (4.3) and sodium hydrogen sulfite solution (4.4).

6.3 For each gram mass of the specimen, use 47 ml of the formic acid buffer solution (4.2) at pH 4,0 ± 0,2, immerse the specimen at an initial temperature of 25 ± 2 °C, wet out thoroughly (see 8.5), then keep agitated in this solution for at least 10 min.

6.4 For each gram mass of the specimen, add 3,0 ml of the sodium dichloroisocyanurate solution (4.3) at 25 ± 2 °C, carefully but rapidly, interrupting agitation as little as possible and minimizing direct contact of the sodium dichloroisocyanurate solution with the specimen; if possible, remove the latter temporarily from the liquid without loss of formic acid buffer solution. Keep the specimen immersed and agitated for a further 30 min. Then check for available chlorine by spotting the solution on to starch-iodide paper. Unless the paper remains colourless or turns only a very faint blue-black, rewarm the solution, if necessary, to a temperature of 25 ± 2 °C and recheck after a further 15 min and again, if necessary, after a further 15 min. If available chlorine is still present at the third check, discard the specimen and repeat the test with a fresh test specimen.

6.5 For each gram mass of the specimen, add 10,0 ml of the sodium hydrogen sulfite solution (4.4) to the test solution and keep the specimen immersed and agitated at a temperature of 25 ± 2 °C for a further 15 min, then discard the test solution.

6.6 Immerse the specimen in water (4.1) at a liquor ratio of 60 : 1 at an initial temperature of 25 ± 2 °C and keep agitated for 5 min. Repeat this process.

6.7 Hydroextract or squeeze the specimen (for example by spinning or passing it through a mangle) within 5 min of its removal from the second rinse bath, and dry at a temperature of 60 ± 5 °C. (It is important not to exceed this temperature.)

6.8 Condition all specimens for at least 2 h at laboratory temperature.

6.9 Assess the change in colour with the grey scale.

7 Test report

7.1 State whether the specimen was submitted as fabric, yarn or loose fibre.

7.2 Give as full details as practicable of any pre-treatment carried out (see 5.1).

7.3 State if the content of dichloromethane-extractable matter is not known or the amount found if it exceeds 0,5 % (see 5.1).

7.4 Report the numerical rating for change in colour of the test specimen (see 8.6).

7.5 Indicate any deviation from the standard procedure.

8 Notes

8.1 To avoid difficulties in dissolving the sodium dioctylsulfosuccinate, either

- pipette 0,83 ml of a 60 % solution (or 8,3 ml of the 60 % solution diluted tenfold) per litre of final volume into the previously prepared solution of formate, made up to approximately 90 % of the final volume; or
- dissolve each 0,5 g of the solid sodium dioctylsulfosuccinate in 100 ml of water by bringing to the boil, then add to the formate solution, previously made up to approximately 80 % of the final volume.

In both cases, after adding the sodium dioctylsulfosuccinate, add formic acid to adjust the pH and make up to final volume. The final solution is often slightly cloudy.

8.2 Sodium dichloroisocyanurate dihydrate with a typical available chlorine content on a mass basis of 55 % should preferably be used; 11,27 g of this is equivalent to 10,0 g of commercial anhydrous product with 62 % available chlorine. The amount of any other sodium dichloroisocyanurate formulation used should be adjusted to be equivalent in terms of available chlorine. Pure sodium dichloroisocyanurate contains 32,24 % chlorine, all of which is hydrolysed to oxidizing hydrochlorous acid, so the available chlorine is twice this, or 64,48 % (unlike the case of chlorine gas, where available chlorine and chlorine content are the same because only half of the molecule is converted to hypochlorous acid).

8.3 If it is desired to evaluate the staining of adjacent white wool, this should be done in a separate test. This additional test would not be valid for change of colour — only for staining, due to the effect on the colour of the wool of chlorine uptake.

8.4 The equipment should permit continuous agitation and immersion of the specimen in the test solution, especially immediately after the sodium dichloroisocyanurate solution is added. Ready access to the specimen is required so that it may be manipulated easily and quickly, for example tamped with a flattened glass rod to help in wetting out, or temporarily raised above the liquor level to prevent direct contact with the concentrated sodium dichloroisocyanurate solution.

Suitable apparatus is

a) a device allowing the specimen to reciprocate in a vertical direction whilst immersed continually in the solution;

b) a device in which the vessel containing the test solution and the specimen is agitated;

c) a hand-stirred device.

8.5 Adequate wetting out is extremely important, especially if the materials have not been scoured previously (see 10.4 of ISO 105-A01, but note that kneading by hand is not suitable for this test).

8.6 Further change in colour could take place on steaming; to assess this, if required, there should be an agreed procedure between the contracting parties.