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Textiles — Tests for colour fastness —

Part G04:
Colour fastness to Nitric Oxide in the atmosphere at high humidities

Textiles — Essais de solidité des teintures —

Partie G04: Solidité des teintures aux oxydes d'azote en atmosphère à taux d'humidite kleves

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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 105_G04 was prepared by Technical Committee ISO/TC 38, *Textiles*, Subcommittee SC 1, *Tests for coloured textiles and colorants*.

This second/third/... edition cancels and replaces the first/second/... edition (ISO nnn_n:19xx), [clause(s) / subclause(s) / table(s) / figure(s) / annex(es)] of which [has / have] been technically revised.

Introduction

This method is based on a test (AATCC 164-1987), developed by AATCC in response to a specific need in the USA for the determination of fading in the presence of nitric oxide at high relative humidities. Such conditions are prevalent along the Gulf of Mexico coast of the USA and in Southern California. Fading of some dyes on certain man-made fibres, particularly on carpets, was observed to be quite severe under such conditions. The development of this test method enabled dye manufacturers, fibre Producers and textile manufacturers to select dye/fibre combinations which were resistant to fading in the presence of nitric oxide at high relative humidities. The same fabrics when tested at low humidities showed little or no fading.

Textiles — Tests for colour fastness —

Part G04:
Colour fastness to Nitric Oxide in the atmosphere at high humidities

1 Scope

This part of ISO 105 specifies a method for determining the resistance of the colour of textiles to the action of **nitric oxide** in the atmosphere at elevated temperatures and high relative humidities.

For testing at lower humidities, see ISO 105-G01:1978.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 105. At the time of publication, the editions indicated were valid. All standards are subject to revision, and Parties to agreements based on this part of ISO 105 are encouraged to investigate the possibility of applying the most recent editions of the Standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

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

ISO 105-C10:2006, *Textiles — Tests for colour fastness — Part C10: Colour fastness to washing with soap or soap and soda*

ISO 105-D01:2010, *Textiles — Tests for colour fastness — Part D01: Colour fastness to drycleaning using perchloroethylene solvent*

ISO 105-G01:1993, *Textiles — Tests for colour fastness — Part G01: Colour fastness to nitrogen oxides*

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

3 Principle

A test specimen and a piece of control fabric are simultaneously exposed to nitric oxide in an atmosphere which is maintained at 87,5 % ± 2,5 % relative humidity and a temperature of 40 °C ± 1 °C until the control fabric shows a colour Change-corresponding to that of a reference of fading.

The exposure/measurement cycle is repeated until the specimen shows a definite colour change or for a prescribed number of cycles.

4 Apparatus and reagents

4.1 Exposure chamber (See Annex A)

4.2 Test-control fabric

4.2.1 Test-control fabric dyed with Disperse Blue 3

Prepared as follows: Acetate is uniformly dyed in an open-width dyeing machine with 0,4 % (on mass of fabric) Cl Celliton FFRN (Disperse Blue 3, Colour Index, 3rd Edition) in a dye-bath containing 1 g/l of a neutral non-ionic dispersing agent at a liquor ratio of 10:1.

The dyeing begins at 40 °C and the temperature is raised to 80 °C within 30 min. The dyeing is continued for a further 60 min. The fabric is rinsed in cold water and dried.

The colour coordinates of this dyeing are x = 0,198 , y = 0,190 4, Y = 23,20, using Illuminant C.

The tolerance may be 2,2 CIELAB units maximum. Test-control fabric can be obtained from national standards organizations.

4.2.2 Test-control fabric dyed with Disperse Blue 56

Prepared as follows: Acetate is uniformly dyed in an open-width dyeing machine with 0,8 % (on mass of fabric) Disperse Blue 56 (K/P BLUE EBL-E) supplied by Nippon Kayaku in a dye-bath containing 0.5 ml/l of a neutral non-ionic dispersing agent at a liquor ratio of 42:1.

The dyeing was done at 90 °C for 60 min. The fabric is rinsed in cold water and dried.

The colour coordinates of this dyeing are x = 0,204, y = 0,210, Y = 21,17, using Illuminant D65 /10 degree.

The tolerance may be 2,2 CIELAB units maximum. Test-control fabric can be obtained from the Association of Japan Industrial Standard.

4.3 Standard of fading

4.3.1 Standard of fading for test-control fabric dyed with Disperse Blue 3

This is a fabric of similar appearance to the test-control fabric (4.2.1), dyed to match a faded specimen of the test control. The standard of fading can be obtained from national standards organizations.

4.3.2 Standard of fading for test-control fabric dyed with Disperse Blue 56

It is considered that the standard of fading is completed when a faded specimen of the test control is observed to have a contrast equal to grade 3-4 on the grey scale.

4.4 Grey scale for assessing change of colour

Complying with ISO 105-A02.

4.5 Nitric Oxide

Use bottled gas which contains approximately 1 % nitrogen dioxide in nitrogen, in cylinders equipped with the proper reducing valves. For safety, chain the cylinders to a wall so that they cannot fall or be knocked down.

WARNING — Nitric oxide in high concentrations are injurious to health and should be exhausted to the atmosphere or trapped in water and neutralized with a 10 % (*m/m*) solution of sodium hydroxide or sodium hydrogen carbonate. The maximum concentration in a work area should not exceed 5 ppm (*V/V*).

In order to achieve good interlaboratory correlation in test results, close control of temperature and relative humidity is required.

4.6 Urea after treatment

The use of this treatment is optional.

Experience has shown that colour change after removal of specimens from the exposure chamber is negligible. The Urea treatment itself will often cause a colour change in specimens. Therefore, if this procedure is used, it is essential that both the exposed and unexposed control specimens be treated in an identical manner.

Use Urea Solution containing 10 g of Urea per litre of water, buffered to pH 7 by addition of 0,4 g of sodium dihydrogen orthophosphate, 2,5 g of disodium orthophosphate and 0,l g or less of a rapid-wetting surface-active agent (for example, sodium dioctyl sulfosuccinate).

5 Conditioning

The standard temperate atmosphere for testing textiles (see ISO 139), i.e. a relative humidity of (65 ± 4) % and temperature of 20 °C ± 2°C, shall be used for conditioning.

6 Test specimens

Cut out test specimens measuring at least 60 mm × 60 mm. For subsequent colour comparison, the unexposed sample shall be kept in an airtight Container away from light to avoid further colour changes

If the test involves the effect of nitric oxide (oxides of nitrogen) on laundered or dry-cleaned material, use laundered or dry-cleaned material for both the control and test exposure. For the preparation of specimens for testing after laundering or dry cleaning, follow the procedures described in Parts C10 and/or part D01 of ISO 105. T

7 Procedure

7.1 Suspend the test specimens and piece of control fabric (4.2) in the exposure chamber (4.1) which should produce a cycle of fade within 5 h to 15 h of exposure.

7.2 Examine the control fabric periodically until its colour corresponds to that of the reference of fading. This constitutes one cycle. An alternative method of determining one cycle of fade is to terminate the exposure cycle when the control fabric exhibits a colour change of (16,5 ± 1,5) CIELAB units (see ISO 105-J01).

7.3 Remove those specimens which exhibit a noticeable colour change at the end of one cycle. One cycle will generally produce a measurable colour change in samples which are sensitive to nitric oxide.

7.4 Suspend a fresh piece of control fabric (4.2) for each additional cycle of fade until the required number of cycles has been completed.

Specimens exposed to nitric oxide (oxides of nitrogen) may continue to change colour after removal from the test chamber. The colour may be stabilized by plunging them into a buffered Urea solution (see 7.4) for 5 min, squeezing them out, thoroughly rinsing them in clean water, and drying them in air at a temperature not above 60 °C . DO NOT treat with the Urea Solution any specimen that is to be returned to the test chamber for additional exposure.

7.5 At the end of each cycle, immediately assess the change in colour of the specimen using the grey scale for assessing change in colour (4.4).

7.6 Classify the effect on colour of test specimens after the specified number of cycles, using the grey scale for assessing change in colour (4.4).

