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Footwear — Test methods for uppers, lining and insoles — Colour migration

*Chaussures — Méthodes d'essai des tiges, de la doublure et des
premières de propreté — Migration de la couleur*



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Foreword

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

ISO 17701 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 309, *Footwear*, in collaboration with ISO Technical Committee TC 216, *Footwear*, in accordance with the arrangement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 17701:2003), which has been technically revised.

Footwear — Test methods for uppers, lining and insoles — Colour migration

1 Scope

This International Standard specifies a test method for determining the propensity of a material to cause discolouration of another material when stored in close contact. This method is applicable to all materials which are used in intimate contact to adhesives which are used to bond them.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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

ISO 105-A03, *Textiles — Tests for colour fastness — Part A03: Grey scale for assessing staining*

ISO 18454, *Footwear — Standard atmospheres for conditioning and testing of footwear and components for footwear*

ISO 19952, *Footwear — Vocabulary*

CIE 15, *Colorimetry*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 19952 and the following apply.

3.1

colour migration

discolouration caused by movement of colour from one material to another

4 Apparatus and material

The following apparatus and material shall be used:

4.1 Knife to cut the test specimen.

4.2 Two smooth and even glass plates at least 70 mm × 70 mm and a mass of 50 g ± 5 g.

4.3 Mass of sufficient size that when combined with the mass of the glass plate will exert a pressure of 5,2 kPa ± 0,5 kPa.

NOTE The necessary mass depends of the area of the test specimen to get the same pressure.

EXAMPLE

Area of test specimen = 30 mm × 20 mm = 600 mm²

Mass = pressure × area

$$\text{Mass} = 5,2 \text{ kPa} \times 600 \text{ mm}^2 = 5\,200 \text{ Pa} \times 600 \text{ mm}^2 = 5\,200 \text{ kg} \times \text{m}^{-1} \times \text{s}^{-2} \times 6 \times 10^{-4} \text{ m}^{-2}$$

$$\text{Mass} = 3,12 \text{ kg} \times \text{m} \times \text{s}^{-2} = 3,12 \text{ N}$$

A mass of 3,12 N (these are 0,318 kg) is necessary to get a pressure of 5,2 kPa.

Please note that the mass of one glass plate has to be subtracted: $\text{mass} = 318 \text{ g} - 50 \text{ g} = 268 \text{ g}$.

If the area of the test specimen is 50 mm × 40 mm, a mass of 1,060 kg is necessary to get the same pressure. Please note that the mass of one glass plate has to be subtracted: $\text{mass} = 1\,060 \text{ g} - 50 \text{ g} = 1\,010 \text{ g}$.

4.4 Oven, without a door or glass window, heated to 60 °C ± 2 °C.

4.5 Colorimeter to measure the colour of the test specimen and the reference specimen to convert the results in CIE colour values and to calculate automatically the CIELAB colour differences in accordance with CIE 15.

The colorimeter has to be calibrated with a white standard (normal light D 65, normal observer 10°, measure geometry d18°).

4.6 Grey scales with half step rating for assessing change in colour and degree of staining complying with ISO 105-A02 and ISO 105-A03, respectively.

4.7 Artificial lighting conditions as specified in ISO 105-A01 or north daylight.

5 Sampling and conditioning

Store the test materials in a conditioned standard atmosphere as specified in ISO 18454 for a minimum of 24 h prior to testing.

5.1 Testing for colour migration between materials

Cut two test specimens from each material, the dark-coloured material and the light-coloured material with a size of 30 mm × 20 mm (±2 mm) as minimum. One of each type of test specimen is the reference sample.

If there are insufficient materials, smaller samples may be used and a proportionally lower mass than 1 000 g ± 10 g to maintain the same contact pressure.

5.2 Testing for the effect of adhesives

Cut two samples of the test material with a size of (50 ± 2) mm × (50 ± 2) mm. One of the test specimens is the reference sample.

Coat the centre of the surface, to which the adhesive would be applied in production with the adhesive under test, so that the coating covers approximately 75 % of the area of the test specimen. Use a quantity of adhesive that is judged to be representative of that to be used in production. Allow the adhesive to dry at room temperature.

5.3 Testing for the effect of adhesives in laminate

Cut two samples from each material to be laminated together with a size of (50 ± 2) mm × (50 ± 2) mm, when testing for the effect of an adhesive within a laminate. One of each type of test specimen is the reference sample.

5.3.1 When testing for the effect of adhesives within a laminate, where a wet bond is used in production, place the two materials together and press by hand to form a bonded assembly and allow the adhesive to dry at room temperature.

5.3.2 When testing for the effect of adhesives within a laminate where the bond is formed with dry adhesive films, join the two materials using a technique similar to that used in production.

5.4 Testing components such as soling

5.4.1 Prepare by suitable means, a test specimen of uniform thickness from the sole or other component.

5.4.2 Cut a test specimen from the material and two pieces of the second test material ([5.1](#), one as reference sample).

NOTE Specimens can be taken either from materials likely to be used for uppers or from made up uppers or finished footwear.

6 Test method

6.1 Principle

Either two dissimilar materials are placed in intimate contact, or a single piece of material, coated with a product such as an adhesive, or laminated materials are placed between glass plates. The assembly is stored in the dark for a prescribed period at an elevated temperature. The test specimens are then examined for any discolouration compared with unexposed reference samples. Discolouration indicates that the materials are likely to discolour under normal service conditions.

6.2 Procedure

The CIE values of the colour of all test specimens have to be measured with the colorimeter (including the reference samples). Store the reference samples darkly in standard conditioned atmosphere as specified in ISO 18454.

6.2.1 For assemblies of two materials not joined together with adhesive.

6.2.1.1 Place the first test specimen centrally on a glass plate (see [4.2](#)) with its contact face uppermost.

6.2.1.2 Place the other test specimen with its contact face lowermost on the first specimen.

6.2.1.3 Place the remaining glass plate (see [4.2](#)) centrally on top of the specimens.

6.2.2 For adhesive coated single materials and laminates, place the test specimen between the two glass plates.

6.2.3 Place the mass (see [4.3](#)) symmetrically on the top glass plate (see [4.2](#)).

6.2.4 Place the assembly (see [6.2.1](#) or [6.2.2](#)) in the dark test environment at $(60 \pm 2) ^\circ\text{C}$ (see [4.4](#)).

6.2.5 After 24 h, remove the assembly from the test environment.

6.2.6 For assemblies of two not joined materials, separate the two materials and compare their contact faces to the reference samples. Assess in accordance with [6.2.8](#).

6.2.7 For adhesive coated single materials and laminates, remove the test specimen and compare the face not coated with adhesive to unexposed material. Assess in accordance with [6.2.8](#).

6.2.8 Measure the CIE values (in accordance with CIE 15) of the colour with the colorimeter (see 4.5). The use of the artificial lighting or north daylight is another method (4.7). Assess any loss of colour by comparing the contrast in colour between tested and non-tested material with the ratings on the grey scale.

6.2.8.1 Measure any loss of colour by comparing the colour between tested and non-tested material for assessing the change in colour.

6.2.8.2 Measure any transfer of colour by comparing the colour between tested and non-tested material for assessing the staining.

6.2.8.3 In all cases, assess the area showing the most marked contrast.

6.2.8.4 Record a description of the loss of colour or transfer of colour alongside the numerical ratings obtained in 6.2.8.1 and 6.2.8.2 in terms of colour, intensity and uniformity of the change.

6.2.9 Repeat the procedure from 6.2.1 to 6.2.8. Remove the assembly from the test environments after every $24\text{ h} \pm 1\text{ h}$ until a total exposure time of 7 d has been reached.

7 Test report

The test report shall include the following information:

- a) for each inspection carried out, a description of any loss of colour or transfer of colour of each test specimen as determined in 6.2.8 and the corresponding cumulative contact time;
- b) the method used for the measurement of colour changes;
- c) the description of the materials or samples that were tested, including commercial references (style codes, etc.);
- d) a reference to this International Standard, i.e. ISO 17701:2016;
- e) the date of testing;
- f) the date of analysis;
- g) any deviation from this test method.

