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Textiles — Tests for colour fastness —

Part Z03:
Intercompatibility of basic dyes for acrylic fibres

Textiles — Essais de solidité des teintures —

Partie Z03: Intercompatibilité des colorants basiques pour fibres acryliques

Reference number
ISO 105-Z03:1996(E)

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.

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.

International Standard ISO 105-Z03 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 A01"). 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.

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Textiles — Tests for colour fastness —

Part Z03:
Intercompatibility of basic dyes for acrylic fibres

1 Scope

This International Standard specifies a method for determining the behaviour of a basic dye in relation to its compatibility with other basic dyes when applied to acrylic fibres in the presence of those basic dyes.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this part of ISO 105. At the time of publication, the edition indicated was 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 edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

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

3 Principle

In the dyeing of acrylic fibres with basic dyes, the classic parameters, e.g. the time of half-dyeing, of individual dyes do not give a true indication of their dyeing behaviour in admixture with other basic dyes. Since, under normal dyeing conditions, basic dyes show virtually no migration in acrylic fibres, compatibility is of major importance in selecting dye combinations with optimum, level, dyeing behaviour.

Compatibility is assessed against one of two defined five-step scales: a yellow scale and a blue scale. The assessments are made using the scale showing the greatest difference in hue from that of the dye under test.

The compatibility value of the dye is assessed by determining its dyeing behaviour in combination with each of a series of reference dyes in the relevant scale.

NOTE — The recommended reference dyes have been chosen because

a) they form two series encompassing the compatibility behaviour of nearly all basic dyes recommended for acrylic fibres;

b) the dyes in a series are spaced to produce approximately equal visual effects;

c) the corresponding reference dyes from both scales are compatible.

4 Safety precautions

NOTE — These safety precautions are for information purposes only. The precautions are ancillary to the test procedures and are not intended to be all-inclusive. It is the user's responsibility to use safe and proper techniques in handling materials in this test method. Consult manufacturers for specific details such as material safety data sheets and other recommendations.

4.1 Follow good laboratory practice. Wear safety glasses in all laboratory areas and a single-use dust respirator while handling powder dyes.

4.2 Handle all chemicals with care.

4.3 Use chemical goggles or a face shield, impervious gloves and an impervious apron during handling of concentrated acetic acid.

4.4 Ensure that an eyewash/safety shower is located nearby and an organic-vapour respirator with full facepiece is readily available for emergency use.

4.5 The basic dyes listed in this method belong to the following classes:

Dye	Class
CI Basic Orange 42	Azo-methine-azo
CI Basic Yellow 29	Methine
CI Basic Yellow 28	Monoazo
CI Basic Yellow 15	Monoazo
CI Basic Orange 48	Azo
CI Basic Blue 69	Methine
CI Basic Blue 45	Anthraquinone
CI Basic Blue 47	Anthraquinone
CI Basic Blue 22	Anthraquinone
CI Basic Blue 77	Triarylmethane

4.6 Any national and local safety regulations should also be complied with.

5 Apparatus and materials

During the test, use only reagents of recognized analytical grade and only grade 3 water as defined in ISO 3696.

5.1 Apparatus for dyeing at a 40:1 liquor:goods ratio at the required constant temperature.

5.2 Reference dyes[1].

The constitution of the scales, and the recommended amounts of reference dyes to be used in the test, are shown in table 1.

The percentages given produce dyeings approximately 1/2 of 1/1 standard depth on most acrylic fibres.

NOTE — For ease of visual assessment, it is recommended that the dyes under test and the reference dyes be used in a concentration which produces approximately 1/2 of 1/1 standard depth when dyed on most acrylic fibres. It should be understood, however, that it is not critical that the compatibility is assessed at standard depth, since identical values are obtained at other depths and in other ratios of reference and test dyes.

5.3 Acetic acid, glacial.

5.4 Sodium acetate crystals ($CH_3COONa{\cdot}3H_2O$).

6 Procedure

6.1 Prepare 20 to 30 specimens (four to six for each dyebath), all of equal mass, each specimen consisting of one piece or skein of the acrylic fibre used for the test.

6.2 Pretreat the specimens of material to be used in the test for 10 min at approximately 95 °C in an aqueous solution containing 1 % (omf) of glacial acetic acid (5.3) and 1 % (omf) of sodium acetate crystals (5.4) (to give a pH-value of 4,5 ± 0,2) at a liquor:goods ratio of 40:1. Then lightly squeeze the material out and keep it wet ready for use.

Table 1 — Reference dyes

Reference dye	Amount X of reference dye % (omf)[1]	Compatibility value
Yellow scale		
CI Basic Orange 42	0,45	1,0
CI Basic Yellow 29 [200 % (omf)]	0,25	2,0
CI Basic Yellow 28 [200 % (omf)]	0,15	3,0
CI Basic Yellow 15	0,75	4,0
CI Basic Orange 48	0,65	5,0
Blue scale		
CI Basic Blue 69	0,55	1,0
CI Basic Blue 45	2,7	2,0
CI Basic Blue 47 [200 % (omf)]	0,6	3,0
CI Basic Blue 77	0,6	4,0
CI Basic Blue 22 [200 % (omf)]	1,2	5,0

1) "omf" means "on mass of fabric" (i.e. relative to the mass of the fabric).

1) For information on the source of supply of sets of basic dyes (five blue and five yellow) and 1/1 standard depths, apply to the organizations listed in clause 8 of ISO 105-A01:1994, *Textiles — Tests for colour fastness — Part A01: General principles of testing.*

6.3 Set five dyebaths, one for each of the reference dyes, at 95 °C, a liquor:goods ratio of 40:1 and a pH-value of 4,5 ± 0,2 with

X % (omf) of the appropriate reference dye (blue or yellow),

Y % (omf) of the dye under test,

1 % (omf) glacial acetic acid (5.3),

1 % (omf) sodium acetate crystals (5.4),

where *Y* corresponds to the amount of dye under test required to give a dyeing approximately 1/2 of 1/1 standard depth on the acrylic fibre chosen and *X* is as given in table 1.

NOTE — These percentages and the liquor:goods ratio refer to the mass of an individual specimen as defined, i.e. to one skein or piece, and not to the combined mass of the four to six specimens required for each dyebath.

6.4 Four to six specimens of material are needed for each dyebath. Proceed with each of the prepared dyebaths as follows:

Enter the first specimen into the dyebath at the required temperature for the required time at this temperature (see note 1). Remove this specimen of material and dye the second specimen in the same way as the first. Repeat this procedure with the remaining two to four specimens, except that the last specimen shall be dyed to complete exhaustion.

NOTES

1 Acrylic fibres can vary widely in their dyeing characteristics. The test is conducted in such a manner that all available dye is exhausted in approximately equal portions on to each of the five specimens used. In order to accomplish this, it may be necessary to adjust the dyeing temperature within the range 90 °C to 100 °C and/or the dyeing time for each specimen within the range 5 min to 10 min.

2 The test is valid only under the conditions defined. Compatibility values may be affected by the presence of anionic substances — e.g. anionic surfactants or anionic dyes — in the dyebath.

3 The yellow and blue reference dyes of compatibility value 2,0 are not fully compatible when applied in combination. The differences observed are exaggerated if wet-spun acrylic fibres are used.

4 It should be clearly understood that the test is one for compatibility and not a measure of the extent to which incompatibility may lead to unlevelness when combinations of basic dyes are applied to acrylic fibres.

6.5 Rinse in grade 3 water and dry each specimen immediately after it is removed from the dyebath. Mount the specimens in the sequence in which they were dyed.

7 Assessment

7.1 The compatibility value assigned to the dye under test is that of the reference dye with which, through visual assessment, it gives on-tone dyeings throughout the sequence of dyeings obtained from that particular bath.

A typical example of the results obtained in assessing a blue dye is shown in table 2.

Table 2 — Example of results

Compatibility value of yellow reference	Appearance of sequence of dyeings from each bath
1,0	Progressively much bluer
2,0	Progressively bluer
3,0	On-tone
4,0	Progressively yellower
5,0	Progressively much yellower

The compatibility value of the blue dye is 3,0.

7.2 It is possible for the compatibility value of a dye to lie between two adjacent references; e.g. to be 1,5, 2,5, 3,5 or 4,5. In these instances, a series of on-tone dyeings will not be obtained with any of the reference dyes.

7.3 If a dye is found to lie outside the scale as defined, then assign a value of less than 1, or greater than 5, whichever is appropriate.

8 Test report

The test report shall include the following information:

a) the number and year of publication of this part of ISO 105 (i.e. ISO 105-Z03:1996);

b) a full description of the dye under test and the acrylic fibre on which it was tested;

c) the result obtained for the compatibility value of the dye, expressed as in clause 7.

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