INTERNATIONAL STANDARD

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Textiles — Determination of resistance of cellulose-containing textiles to micro-organisms — Soil burial test —

Part 1: Assessment of rot-retardant finishing

Textiles — Détermination de la résistance aux micro-organismes des textiles contenant de la cellulose — Essai d'enfouissement —

Partie 1: Évaluation d'un traitement d'imputrescibilité

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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 3.

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 member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO 11721 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 11721-1 was prepared by the European Committee for Standardization (CEN) in collaboration with ISO Technical Committee TC 38, *Textiles*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Throughout the text of this standard, read "...this European Standard..." to mean "...this International Standard...".

ISO 11721 consists of the following parts, under the general title *Textiles — Determination of resistance of cellulose-containing textiles to micro-organisms — Soil burial test*:

— *Part 1: Assessment of rot-retardant finishing*

— *Part 2: Attack by micro-organisms/mixed culture*

— *Part 3: Toxicity of textile materials and finishing agents*

— *Part 4: Saturated atmosphere test (mildew)*

Annex A forms a normative part of this part of ISO 11721.

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Foreword

The text of EN ISO 11721-1:2001 has been prepared by Technical Committee CEN/TC 248 "Textiles and textile products", the secretariat of which is held by BSI, in collaboration with Technical Committee ISO/TC 38 "Textiles".

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2001, and conflicting national standards shall be withdrawn at the latest by July 2001.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

Cellulose-containing textiles are considered resistant to attack by micro-organisms present in soil if their structure, appearance and tensile strength are not essentially altered after a soil burial test. The resistance to deterioration is assessed by measuring the relative reduction in tensile strength between buried and unburied specimens.

If an assessment of long term resistance is required, the procedure described in ISO 11721-2 (in preparation) is applicable.

Due to the biological nature of the soil burial test, and the fact that the test soil cannot be precisely standardized, this standard is only intended to assess the resistance of a fabric to micro-organisms after comparing the performance of specimens with and without a finish.

1 Scope

This standard specifies a method for determination of the resistance of chemically-pretreated textiles to the action of micro-organisms present in soil in comparison with untreated textiles.

This method is applicable to flat textiles made of cellulosic-containing yarns (tentage, tarpaulins, webbing and tapes) that will typically come into contact with soil during use.

Due to the inherent resistance of most synthetic fibres to attack by micro-organisms, fabrics containing a high proportion of synthetic fibres can only be judged by these methods for changes in structure and appearance.

Although this method allows good reproducibility of results, it is intended to show comparative performance rather than provide absolute values.

NOTE Heavy tarpaulin fabrics and webbing may be of such a structure that samples without finish are resistant within a 14 days soil burial period. Also in such cases the decay rate of the untreated sample determines the length of the burial period.

2 Normative references

This International Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this International Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

ISO 139, *Textiles — Standard atmospheres for conditioning and testing*

ISO 7218, *Microbiology of food and animal feeding stuffs — General rules for microbiological examinations*

ISO 8022, *Surface active agents — Determination of wetting power by immersion*

ISO 13934-1, *Textiles — Tensile properties of fabrics — Part 1: Determination of maximum force and elongation at maximum force using the strip method*

3 Safety precautions

This method requires the use of viable mould propagules and ambient conditions which promote mould and bacterial growth. Any safety precautions and personal hygiene for microbiological examinations shall be followed (e.g. ISO 7218).

4 Principle

Cellulose-containing textiles are considered resistant to attack by micro-organisms present in soil if their structure, appearance and tensile strength remain essentially unaltered during a soil burial test. This method compares the relative reduction in tensile strength of specimens before and after soil burial.

The method is used to compare finished and unfinished specimens of the same quality. The specimens are buried in a test soil of controlled water-holding capacity and optimum water content for microbial activity. The finished and unfinished specimens are buried for a period of up to nine days,

when the specimens without a finish show a reduction in tensile strength of approximately 80 %. At this stage the tensile strength loss of the finished and unfinished specimens are determined.

The limitation of the soil burial test to a maximum nine days for the unfinished specimens to lose 80 % of their initial tensile strength serves as validation of the microbial activity of the test soil and the test system.

NOTE 1 The duration of the test will vary depending on the activity of the soil. It is important to note that the reduction in strength between specimens with and without an applied finish is the critical factor, and not the duration of the test. A soil of lower activity will produce the same result as one of higher activity, but the test will take longer.

NOTE 2 A fixed-time soil burial test may allow an undefined attack on the cellulosic material. The reproducibility of results for reduction of tensile strength of finished and unfinished test specimens is the critical factor.

5 Apparatus and reagents

5.1 *Containers*, of unglazed pottery or reinforced cement (asbestos substitute materials), at least 150 mm deep.

Containers with more than 150 mm filling height shall have holes at the base for exchange of air.

5.2 *Test soil*, commercial grade compost or compost-containing garden soil as purchased in the manufacturer's original packing may be used. Fresh compost shall be mixed with compost previously used for soil burial testing or with soil previously acclimatized at equilibrium moisture to (95 to 99) % relative humidity and thoroughly mixed before use.

The test soil shall be sufficient to fill all the containers used in a series of tests, and shall be fine-grained, free-flowing and not sticky or lumpy. The water-holding capacity (WHC) (or maximum moisture retention capacity) of the test soil shall be determined and the water content (WC) shall be (60 ± 5) % of the WHC.

The pH of the test soil shall be between 4,0 and 7,5.

Prepare the test soil of known WHC for moisture content determination before commencing the test. If the soil is too moist, let it air dry. If the soil is too dry, overspray it to a WC of (60 ± 5) % of the WHC.

NOTE 1 See annex A for a suitable method.

NOTE 2 60 % of WHC guarantees best microbial activity and optimum water activity for microbial growth. The water content necessary for one soil is therefore always prescribed as approximately 60 % of WHC of the sample. Lower humidity slows down or prevents rotting; higher humidity may lead to unevenness of results and anaerobic processes.

NOTE 3 Soil blends with high clay or loam contents are unsuitable because of low air permeability and insufficient moisture distribution.

5.3 *Incubator*, for incubation of the soil burial containers during the entire test at (95 to 100) % relative humidity of the air at (29 ± 1) °C.

5.4 *Balance*, for determining WC and WHC of the test soil.

5.5 *Oven*, for drying soil samples at (104 ± 2) °C and for drying specimens at (45 ± 5) °C.

5.6 *Ethanol/water (70 %/30 % volume fraction) solution*, for cleaning the buried specimens before tensile strength determination.

5.7 *Microscope (x30 to x40 magnification)*, for visual examination of the buried specimens.

6 Test specimens

6.1 Preparation

Prepare test specimens from the middle of the laboratory samples by cutting the specimens lengthwise from the warp direction of the fabric.

With blended fabrics and/or if agreed between the interested parties, test specimens may be taken from the weft direction.

Blended fabrics containing 100 % cellulose fibres in the warp or weft direction shall be sampled by taking the test specimens from the 100 % cellulose direction only.

Cut test specimens 300 mm long and 30 mm wide and then fray down both sides to give a central width of 20 mm (see ISO 13934-1).

For fabrics that are too narrow to allow the specified specimen width, carry out the test at full fabric width.

NOTE An effective width of 20 mm and distance between the jaws of 100 mm is used due to the large quantities of untreated fabrics required and the capacity of the soil containers.

6.2 Number of specimens

For each test prepare 20 test specimens, 10 for testing without burial and 10 for testing after soil burial.

For determination of the soil burial duration, i.e. time at which there is an 80 % reduction in strength in the control specimens without applied finish, prepare at least 20 control specimens of the unfinished test sample. These control specimens shall be of the same fabric quality, i.e. same yarn(s), mass per unit area. construction/weave, preparation and dyeing with no additional applied finish such as a water repellent, softener or biocide.

NOTE For blends with synthetic fibres, see 8.3.

7 Leaching procedure

Unless otherwise agreed between the interested parties, subject all the finished and unfinished test specimens (i.e. those for testing without soil burial and those for testing after soil burial) to the following leaching procedure. Exclude the control specimens from the leaching procedure.

Hold the test specimens under fresh running tap water at (20 ± 5) °C for 24 h in a container large enough that the specimens do not touch each other. The flow rate shall be (10 ± 2)l/h.

After leaching, drain the test specimens, and oven dry (5.5) at (45 ± 5) °C. Condition the test specimens as specified in ISO 139.

Treat test specimens, both leached and unleached in parallel.

NOTE 1 Leaching at higher temperature is possible if agreed between the interested parties.

NOTE 2 Other treatments such as weathering and exposure to light may be carried out, if agreed between the interested parties.