INTERNATIONAL STANDARD

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Imaging materials — Processed imaging materials — Photographic activity test for enclosure materials

Matériaux pour l'image — Matériaux pour l'image traités — Essai d'activité photographique pour les matériaux de fermeture

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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 18916 was prepared by Technical Committee ISO/TC 42, *Photography*.

This first edition cancels and replaces ISO 14523:1999, which has been technically revised.

This corrected version incorporates corrections to 4.2.2 and 4.2.3, which in this corrected version have been combined into 4.2.2 because there is only one stain detector required for testing, not two.

Introduction

The use of photographic materials for the storage of records having a long-term value has necessitated the development of International Standards to specify important considerations in this field. The important elements affecting the useful life of imaging materials are as follows:

a) humidity and temperature of the storage environment;

b) hazards of fire, water, and light exposure;

c) fungal growth;

d) contact with certain chemicals in solid, liquid or gaseous form;

e) physical damage;

f) proper processing;

g) enclosures and containers in contact with the imaging material.

International Standards have been published which specify the material requirements for silver-gelatin type film (ISO 18901), diazo film (ISO 18905), and vesicular film (ISO 18912). Specifications for proper processing are also included in these documents. ISO 18918, ISO 18911, and ISO 18920 specify the storage conditions for photographic plates, films, and paper prints, respectively.

In addition to the storage conditions, the filing materials used are extremely important. Processed photographic materials in archival collections require a high degree of individual packaging to protect them from atmospheric influences, dust, and handling damage, and also to keep them from contaminating each other. For this purpose, a wide variety of paper and plastic materials is commercially available, fabricated into albums, boxes, sleeves, envelopes, folders, mat boards, and interleaving tissues. However, it is absolutely essential that these storage enclosures not cause harm to the photographic image. For optimum stability, it is necessary that storage enclosures and their components meet the requirements in ISO 18902, which includes passing the criteria of the photographic activity test.

The photographic activity test described in this International Standard is a predictive test of interactions between the storage enclosure and the photographic image. It can also be used to evaluate possible photographic activity caused by components of enclosures such as adhesives, inks, paints, labels, and tape.

Imaging materials — Processed imaging materials — Photographic activity test for enclosure materials

1 Scope

This International Standard specifies the procedure for the photographic activity and dye coupler reactivity tests.

This International Standard is applicable to general photographic enclosure materials such as paper, tissue, cardboard, mat board and plastics. It is also applicable to components of photographic enclosure materials such as adhesives, inks, paints, labels, and tape.

This International Standard evaluates possible chemical interactions between enclosures with processed silver-gelatin, colour (dye-gelatin), inkjet prints made with dye-based and pigment-based inks, thermal dye diffusion transfer ("dye sub") prints, digitally printed dye-diffusion-transfer prints, liquid- and dry-toner xerographic prints, liquid-toner electrostatic prints, and diazo images after long-term storage. It does not pertain to harmful physical interactions such as blocking (sticking together), dye bleed, adhesive migration, or plasticizer exudation. It does not pertain to important criteria of enclosures such as their inherent chemical stability, physical integrity, and workmanship. Passing the photographic activity test (PAT) does not indicate that a material is archival. This term has no clear definition and is not used in this standard. Photo-safe, storage enclosures and their components are covered in ISO 18902, which includes passing the criteria of the photographic activity test.

If a particular brand of commercially made enclosure materials is found to be safe for long-term storage purposes, there is no assurance that subsequent batches will contain the same ingredients of the same purity, chemical inertness, concentrations, or sound and sturdy construction. For this reason, materials are tested annually or upon each formulation or supplier change. For materials which are manufactured in a variety of colours, such as papers and inks, each colour is evaluated and reported separately.

For enclosures intended for use with any of the above imaging processes, only the black-and-white PAT described in Clauses 4 to 7 are applicable. The dye coupler reactivity test is optional as the results are valid only for the specific colour print product being investigated. Different colour print products can have different staining sensitivities.

For enclosures intended for use with diazo images, only the diazo PAT described in 8.5 is applicable.

2 Normative references

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

ISO 5-2:2001, *Photography — Density measurements — Part 2: Geometric conditions for transmission density*

ISO 5-3:1995, *Photography — Density measurements — Part 3: Spectral conditions*

ISO 5-4:1995, *Photography — Density measurements — Part 4: Geometric conditions for reflection density*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
image interaction
measurable density change in the image interaction

3.2
mottle
localized non-uniform visual density variation in the image interaction detector

3.3
stain
measurable density increase in the stain detector

3.4
blocking
sticking together of similar or dissimilar materials in physical contact

4 Test conditions

4.1 Principle

The photographic activity test applies to processed silver-gelatin, colour (dye-gelatin), inkjet prints made with dye-based and pigment-based inks, thermal dye diffusion transfer ("dye sub") prints, digitally printed dye-diffusion-transfer prints, liquid- and dry-toner xerographic prints, liquid-toner electrostatic prints, and diazo images. The test consists of incubating the enclosure material or its component against the surfaces of two sensitive detectors [1]. The photographic density of these detectors is measured both before and after incubation and the density changes compared with those obtained when the detectors are incubated against a filter paper control. Three criteria are used to evaluate an enclosure, i.e. its tendencies to cause image interaction, stain, and mottle on the detectors. Specific details for each property are given in Clauses 5 to 7. The test conditions described in Clauses 4 to 7 pertain to paper and plastic enclosures. Modifications of the photographic activity test for enclosure components or interactions with diazo images or the residual dye couplers in colour photographic prints are given in Clause 8.

4.2 Apparatus and materials

4.2.1 Image interaction detector, consisting of unprocessed colloidal silver (i.e. Carey Lea silver) in gelatin on a polyester base [1)].

4.2.2 Stain detector, consisting of a conventional non-resin-coated premium-grade black-and-white photographic paper having a relatively thick emulsion layer, processed to minimum density (D_{min}) according to the manufacturer's instructions. (A warm-tone paper base shall not be used.) The paper shall be processed without development, using a fix, wash, hypo-clearing agent and wash stages.

4.2.3 Fix solution, consisting of 240 g of sodium thiosulfate pentahydrate and 15 g of anhydrous sodium sulfite added to 1 l of water at 50 °C.

1) The sensitivity of the colloidal silver detector is dependent upon the silver grain size and the degree of hardness. To ensure test sensitivity and reliability, the colloidal silver detector can be obtained from the Image Permanence Institute, Rochester Institute of Technology, 70 Lomb Memorial Dr., Rochester, NY 14623-5604, USA, or equivalent. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.

4.2.4 Hypo-clearing agent, consisting of 5 g of anhydrous sodium sulfite and 26 g of sodium hydrogen sulfite per litre of water.

It is recommended that the final washing be for 0,5 h with good agitation. This will avoid uneven leaching of brightener.

NOTE Longer wash times can cause physical distortion. The uniformity of the fluorescent brightener can be checked by examination using a UV lamp.

4.3 Incubation

Subject sandwiches of the detectors and enclosure material to an accelerated ageing test of 70 °C ± 1 °C and 86 % RH ± 3 % RH for 15 days. Exposure to these temperature and humidity conditions may be provided by means of a conditioned air cabinet that provides 70 °C ± 1 °C and 86 % RH ± 3 % RH relative humidity.

To minimize moisture condensation when placing the sandwiches in the oven, put the sandwiches in the oven when it is at 70 °C ± 1 °C and 40 % RH ± 3 % RH. After the samples have equilibrated to test temperature (approximately one hour) the humidity can then be brought to 86 % RH ± 3 % RH.

Pull the sandwiches apart immediately after they are removed from the humidity chamber. Failure to do so may result in the adhering of adjacent layers and detectors.

4.4 Measurement

Measure the Status A blue diffuse density of the detector strips both before and after incubation at four locations for each strip. Make the after-incubation measurements at approximately the same locations as the before-incubation measurements. Measurements shall not be made at the edges of the strip. After incubation of highly mottled or unevenly stained samples, it may be necessary to take density readings at different locations on the same detector than the readings taken before incubation to ensure the reacted areas on the detector are measured. Use a densitometer having spectral conformance to ISO 5-3, and geometric conformance to ISO 5-2 and ISO 5-4 for the measurements. Determine the transmission density on the colloidal silver detector and reflection density on the photographic paper stain detector.

5 Image interaction test

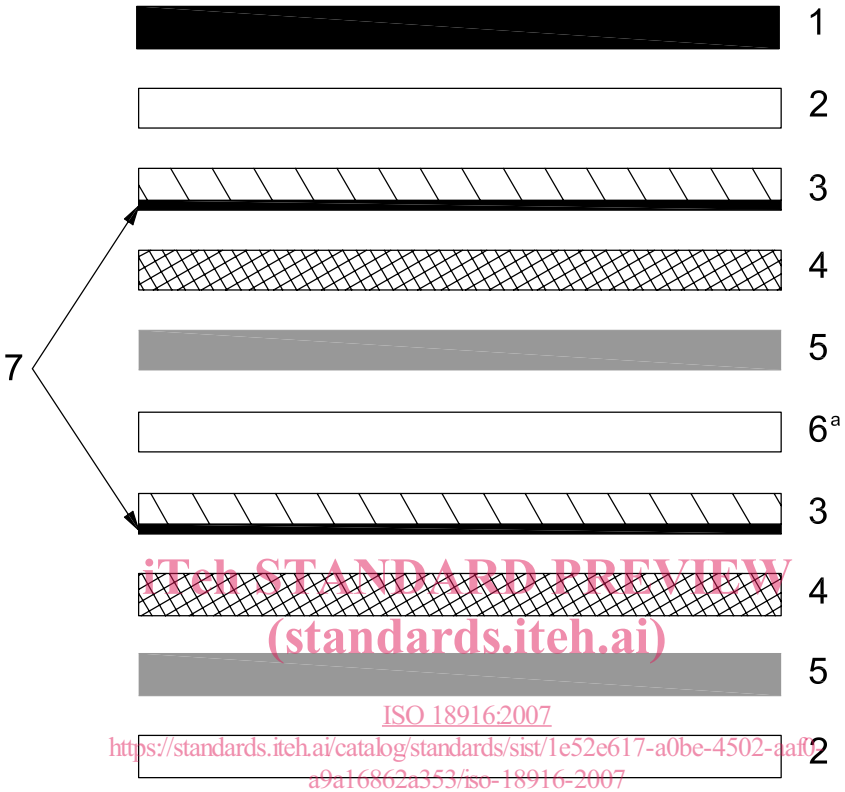
5.1 Procedure

Make a stack of two image interaction test sandwiches of the enclosure material and the colloidal silver image interaction detector. Construct a sandwich so that the emulsion side of each image interaction detector strip faces a filter paper separator as shown in Figure 1. These two sandwiches shall consist of two strips of the image interaction detector, two strips of the enclosure material, two strips of a filter paper separator (see Note), and two pieces of glass. The glass shall be clean and shall be discarded if there are any signs of corrosion. Apply a pressure of 500 Pa to the enclosure materials and detectors in the sandwich (including the mass of glass), which can be obtained by adding weight pieces to the sandwich surface. Cut the enclosure material, filter paper separators, detectors and glass into strips having the same dimension, being at least 30 mm × 20 mm. Sandwich construction is facilitated by using a specimen jig (see Figure 2) to hold the materials in place.

NOTE The filter paper separator is used to prevent any physical interactions between smooth impermeable enclosures and the detector, as well as any fibre transfer, enclosure sticking, ink transfer, or adhesive sticking to the detector surface.

Make two control sandwiches using filter paper [2)] instead of the enclosure material.

Within any single evaluation, use the same batch of materials for the detectors as well as for the filter paper for both the sample and the controls.



Key

1 weight piece to provide 500 Pa (including top glass)
2 glass
3 image interaction or stain detector
4 filter paper separator
5 enclosure material
6 uncoated polyester
7 colloidal silver of D_{min} silver-gelatin layer

[a] Required as an impermeable separator between sandwiches for the stain test only. For the image interaction test, the polyester base of the detector acts as an impermeable separator between sandwiches.

Figure 1 — A stack of two image interaction or stain test sandwiches

2) Whatman Number 1 filter paper has proven suitable. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.

Figure 2 — Specimen jig to hold sandwiches

5.2 Calculation

Calculate the image interaction of the colloidal silver detector by subtracting the final Status A blue diffuse transmission density from the initial blue density for each of the four locations on each of the two image interaction detector strips. Calculate the mean image interaction from these eight density changes. Also calculate the mean of the image interaction values produced by the filter paper controls.

Ignore any fibre pickoff from the filter paper separators or filter paper controls on the detector in the evaluation.

Calculate the density change of the detector in contact with the enclosure material as a percentage of the change shown by the detector in contact with the filter paper control using the following equation:

$$X = \frac{\Delta D_e - \Delta D_f}{\Delta D_f} \times 100$$

where

X is the image interaction difference, expressed as a percentage;

ΔD_e is the density change of the enclosure detector;

ΔD_f is the density change of the filter paper control detector.

5.3 Requirements

The enclosure material shall not produce a percentage image interaction effect in the colloidal silver fade detectors greater than a relative difference of more than ± 20 % compared to the control.

NOTE A large percent image interaction difference indicates a chemical effect of the enclosure (see Annex A).

6 Stain test

6.1 Procedure

Make a stack of two stain test sandwiches of the enclosure materials and the D_{min} processed photographic paper stain detector. Construct a sandwich so that the emulsion side of each stain detector strip faces a filter paper separator as shown in Figure 1. These two sandwiches shall consist of two strips of the stain detector, two strips of the enclosure material, two strips of filter paper separator, one strip of uncoated polyester and two pieces of glass. Use the uncoated polyester strip as shown in Figure 1 to act as an impermeable separator between sandwiches within the stack.