INTERNATIONAL STANDARD

ISO 9184-5

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Paper, board and pulps — Fibre furnish analysis —

Part 5:
Lofton-Merritt staining test (modification of Wisbar)

Papier, carton et pâtes — Détermination de la composition fibreuse — Partie 5: Coloration de Lofton-Merritt (modification de Wisbar)

Reference number
ISO 9184-5:1990(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 9184-5 was prepared by Technical Committee ISO/TC 6, *Paper, board and pulps*.

ISO 9184 consists of the following parts, under the general title *Paper, board and pulps — Fibre furnish analysis*:

— *Part 1: General method*

— *Part 2: Staining guide*

— *Part 3: Herzberg staining test*

— *Part 4: Graff "C" staining test*

— *Part 5: Lofton-Merritt staining test (modification of Wisbar)*

— *Part 6: Weight factors by fibre coarseness method*

— *Part 7: Weight factors by comparison method*

Part 1 gives general instructions for the performance of fibre furnish analysis. It should be used in conjunction with the staining guide (see part 2) and the staining tests (see parts 3 to 5).

Additional parts of this International Standard will be published if required by the development of new kinds of fibres or new staining tests.

Annex A of this part of ISO 9184 is for information only.

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Paper, board and pulps — Fibre furnish analysis —

Part 5:
Lofton-Merritt staining test (modification of Wisbar)

1 Scope

This part of ISO 9184 specifies the preparation, use and colour reactions of Lofton-Merritt stain in fibre furnish analysis. It should be used in conjunction with ISO 9184-1 and, if necessary, with other staining tests defined in ISO 9184-2.

The Lofton-Merritt staining test is applicable to the qualitative and quantitative differentiation of the following pulps:

— unbleached and bleached softwood chemical pulps;

— unbleached kraft and sulfite in softwood pulps;

— unbleached semi-chemical kraft and sulfite pulps.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this part of ISO 9184. 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 9184 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 9184-1:1990, *Paper, board and pulps — Fibre furnish analysis — Part 1: General method.*

3 Principle

Fibres are stained with Lofton-Merritt stain and examined under the microscope.

4 Reagents

CAUTION — Some of the components used in preparing this stain are toxic. The stain should be prepared and handled in keeping with safe laboratory practice.

Use only reagents of recognized analytical grade and distilled water or water of equivalent purity.

4.1 Fuchsine, solution, about 1 % (*m*/*m*).

Add 1 g of fuchsine monohydrochloride ($C_{20}H_{20}N_3Cl$) (C.I. 42510 — C.I. basic violet 14) in small portions to 50 ml of boiling water in a 250 ml beaker, with vigorous stirring. Dilute to 100 ml.

4.2 Malachite green, solution, about 2 % (*m*/*m*).

Take 2 g of malachite green ($C_{23}H_{25}N_2Cl$) (C.I. 42000 — C.I. basic green 4) and proceed as described for the fuchsine solution.

4.3 Hydrochloric acid, solution, about 0,5 % (*m*/*m*).

Dilute 5 ml of a 37 % (*m*/*m*) solution of hydrochloric acid (HCl) to 400 ml.

Store in brown reagent bottles. The solutions (4.1 to 4.3) are stable.

4.4 Lofton-Merritt stain.

Mix

4,4 ml of the fuchsine solution (4.1);

2,2 ml of the malachite green solution (4.2);

20,0 ml of the hydrochloric acid solution (4.3).

Pipette the required volume of each solution, given above, into a 100 ml glass cylinder and dilute to 100 ml. Store in a brown reagent bottle and keep in the dark when not in use. Shake before use.

NOTE 1 Adjustment of the stain mixture by the addition of malachite green or fuchsine solution is required to attain the colours given in table 1.

Test the fresh mixture with known samples containing unbleached softwood sulfate and sulfite pulp, and mechanical pulp. If the fibres of unbleached kraft pulp and/or mechanical pulp yield a reddish colour, add malachite green solution. If the fibres of unbleached sulfite pulp exhibit a bluish or greenish colour, add fuchsine solution. The stain mixture is stable. However, it is preferable to check it with known fibres every 2 months. More distinct staining is obtained with a fresh mixture.

5 Procedure

5.1 Staining

Draw a specimen from the moist filtered fibre pad (see ISO 9184-1) into a test tube, add 5 ml to 10 ml of the Lofton-Merritt stain mixture (4.4) and boil from 1 min to 2 min, stirring all the time with a glass rod. Pour the suspension into a sieve or a glass filter, and rinse with small amounts of water until the filtrate is colourless. Draw a small quantity of the stained fibres on to a slide, add 2 or 3 drops of water, and with dissecting needles distribute the fibres into a uniform network. Apply a cover glass, tilt the slide and blot edgewise.

The fibre slide can also be made from a diluted suspension of the stained fibres in accordance with ISO 9184-1, using water instead of stain.

5.2 Determination

Place the stained fibre slide under the microscope and examine using a magnification of × 40 to × 120. Identify and count the fibres in accordance with ISO 9184-1 on the basis of the colours developed by the Lofton-Merritt stain (see table 1).

6 Expression of results and test report

Express and report the results in accordance with ISO 9184-1.

Table 1 — Colour chart for Lofton-Merritt stain

Type of pulp	Colour[1]
Softwood chemical pulp	
Unbleached kraft	Greenish or greyish-blue[2]
Unbleached sulfite	Red-violet[2) 3) 4)]
Bleached kraft and sulfite	Colourless
Semi-bleached kraft	Light pink or colourless
Hardwood chemical pulp	
Unbleached kraft and sulfite	Light greenish or light violet (weak colours or colourless)
Semi-bleached or bleached kraft and sulfite	Mostly colourless
Softwood and hardwood semi-chemical pulp	
Unbleached kraft	Bluish-green
Unbleached sulfite	Dark blue-violet
Mechanical pulp	Bright blue

1) The colours obtained using fuchsine and malachite green from different manufacturers and from different batches, differ slightly from each other. The above-mentioned colours are obtained using basic fuchsine of National Aniline Division and malachite green of Fluka AG. Diamant fuchsine of Merck give about the same colours.

2) The intensity of the colour diminishes with increasing degrees of delignification.

3) In the Lofton-Merritt staining test, the central part of the bordered pits is often stained strong violet. This "eye formation" is most distinct in slightly stained fibres of sulfite pulps. Kraft fibres never display staining of the bordered pits, and consequently such staining can be interpreted as a specific test for unbleached sulfite pulp. This phenomenon is generally encountered when staining fibres with alkaline stains.

4) The pitch content of ray cells is stained bluish-green by Lofton-Merritt stain, which often is an indication of softwood sulfite pulp.

Annex A
(informative)

Bibliography

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