BRITISH STANDARD

BS 3424 :
Part 25 : 1993

Testing coated fabrics

Part 25. Method 28. Method for determination of the coating thickness and thickness of any expanded layer

IMPORTANT NOTE. It is recommended that this Part be read in conjunction with the information in Part 0 'Foreword and general introduction'.

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Foreword

This Part of BS 3424 has been prepared under the direction of the Plastics and Rubber Standards Policy Committee.

The present method is intended for use as a check-test on coating thickness and is not intended for use as quality test against which specifications could be attributed. Also, because of the small specimen size, the sampling procedure and some statistical analysis of results is advisable. In this regard attention is drawn to BS 600 and BS 2846.

It is hoped that in the future a non-destructive method of determining coating thickness, at least on single-faced coated fabrics, will be available.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Introduction

The thickness of the polymer coating applied to a textile substrate is of critical importance, as it determines, all else being equal, how that coated fabric will perform in use. It is not however a factor that is commonly measured, as it is the actual performance characteristics of the coated fabric that are important. If the coating thickness is insufficient or too great, then the coated fabric will fail to perform in one or more of its physical attributes or during fabrication.

However, for research, production planning or production cost control purposes, the coating thickness is a feature that may be required to be measured. It is included here for that purpose, but it is recommended that the method is not cited in any specification for coated fabrics.

The difficulties encountered in measuring the coating thickness depend upon the composition and colour of the coating polymer, textile substrate, whether there is an expanded layer included, the method of applying the coating polymer and the thickness of the coating.

Various methods of measuring the coating thickness are available. These include:

a) sectioning techniques using a microtome or other sectioning device and direct measurement under a microscope with a calibrated eyepiece graticule;

b) the use of a scanning electron microscope which may provide additional information for particular circumstances.

Methods employing embedding techniques such as those specified in method 28B of BS 3424 : 1973 introduce chemical elements that may cause damage or swelling of the coating polymer and are therefore unreliable for universal application.

1 Scope

This Part of BS 3424 describes a method for determining the thickness of the polymer coating and of an expanded layer, if present, of a coated fabric.

2 References

2.1 Normative reference

This Part of BS 3424 incorporates, by reference, provisions from a specific edition of another publication. This normative reference is cited at the appropriate point in the text and the publication is given on the inside back cover. Subsequent amendments to, or revisions of, this publication apply to this Part of BS 3424 only when incorporated in it by updating or revision.

2.2 Informative references

This Part of BS 3424 refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on the inside back cover, but reference should be made to the latest editions.

3 Principle

Either, a cut perpendicular to the finished surface of the coated fabric is made through a specimen, or a microscopic section is cut using a simple hand microtome. The cut or section is then examined by means of a binocular microscope using a stage micrometer and the thickness of the coating is measured.

4 Apparatus

4.1 *Binocular microscope*, giving a magnification of at least X 15, (the preferred magnification being X 50), incorporating an eye-piece graticule graduated in divisions of 0.01 mm or line profilometer and top lit stage for surface illumination.

4.2 *Stage micrometer*, to calibrate the eye-piece graticule at the magnification used.

4.3 *Hand microtome*, or other means of sectioning or cutting through the coated fabric without using an embedding technique whilst ensuring that the cut is normal to the surface of the coated fabric.

4.4 *Stand*, for supporting the section of the coated fabric under the microscope objective.

4.5 *One black and one white contrast background*, to provide opposing shade contrasts to the coatings.

5 Preparation of test specimens

Prepare five test specimens, one from each of five subsamples, evenly spaced diagonally across the full width of the sample as follows:

Cut a section perpendicular to the finished surface of the coated fabric using either the microtome (**4.3**) or a sharp scalpel or blade. After sectioning the coated fabric allow the test pieces to recover from any induced strain for 24 h in an atmosphere conforming to BS 3424 : Part 2 : 1993.

NOTE. In order to render the boundary between the coating and the substrate more distinguishable, it has been found helpful to apply a light dusting of fine powder in a contrasting colour to the edge being viewed. Excess powder may be wiped off so that the smoother edge of the cut surface is left clean.

Mount the cut test specimen so that the cut edge is uppermost and place it on the microscope stage so that its coated edge is adjacent to the contrasting surface (**4.5**) of its support.

Focus the microscope on the edge of the test specimen. Rotate either the section or the eyepiece until one of the major graduations is aligned with the bottom surface of the coating or expanded layer, as appropriate. Where the coating/substrate or skin coat/expanded layer interface undulates, the graduation should be positioned so that it lies midway between the peaks and troughs. Measure the thickness of the coating (or expanded layer) in terms of the graduations (i.e. to the nearest 0.01 mm) relative to the bottom surface of the coating. Repeat this procedure in at least three, evenly spaced positions, on each test specimen for both skin coat and expanded layer (if present).

Where the coating is embossed, measure both the maximum and minimum thickness of coating over the upper surface of the textile. If the fibrous or yarn layer of the textile substrate is hairy, report the thickness of the coating from the main body of the textile substrate as the maximum coating thickness and the thickness of coating over the highest fibre layer as the minimum coating thickness. Where the coating is embossed, measure both the maximum and minimum thickness of coating over the upper surface of the textile. If the fibrous or yarn layer of the textile substrate is hairy, report the thickness of the coating from the main body of the textile substrate as the maximum coating thickness and the thickness of coating over the highest fibre layer as the minimum coating thickness.

Calibrate the microscope eyepiece gradations by placing the stage micrometer under the microscope, and record the distance between the graticule marks of the eyepiece.

6 Calculation and expression of results

Record all 15 values and calculate the arithmetic mean to the nearest 0.01 mm of the three measurements made on each test specimen and the arithmetic mean from the five arithmetic means and the 95 % confidence interval of the mean (see BS 2846 : Part 2). Express the results to the nearest 0.01 mm.

7 Test report

The test report shall include the following particulars:

a) the description of the coated fabric;

b) the individual results of the observations of the coating thickness, ($n = 15$), the arithmetic mean of all the results and the confidence interval of the mean;

c) the individual results of the observations of thickness of the expanded layer, if any, ($n = 15$), and the arithmetic mean of the results;

d) reference to this method of test, i.e. method 28 of BS 3424 : Part 25 : 1993;

e) any observations relating to difficulties of measurement, e.g. extremely thin coating embedded in the textile substrate, difficulty of differentiating colours of skin coat from that of the expanded layer or textile substrate, etc;

f) details of any deviations from the standard test procedure.

List of references (see clause 2)

Normative reference

BSI standards publications

BRITISH STANDARDS INSTITUTION, London

BS 3424 :	*Testing coated fabrics*
BS 3424 : Part 2 : 1982	*Method 4. Conditioning and selection of test specimens*

Informative references

BSI standards publications

BRITISH STANDARDS INSTITUTION, London

[1)]BS 600 : 1935	*The application of statistical methods to industrial standardization and quality control*
BS 2846 :	*Guide to statistical interpretation of data*
BS 2846 : Part 2 : 1981	*Estimation of the mean: confidence interval*

[1)] Referred to in the foreword only.

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Information Technology Systems Standards Policy Committee (PRM/-) to Technical Committee PRM/78, upon which the following bodies were represented:

British Nonwovens Manufacturers' Association
British Plastics Federation
British Railways Board
British Resin Manufacturers' Association
British Rubber Manufacturers' Association Ltd.
British Textile Confederation
British Textile Technology Group
Department of Health
Department of the Environment (Building Research Establishment)
Electricity Industry in United Kingdom
Furniture Industry Research Association
Home Office
Industrial Safety (Protective Equipment) Manufacturers' Association
London Regional Transport
Made-up Textiles Association
Ministry of Defence
National Union of Dyers, Bleachers and Textile Workers (NUDBTW)
RAPRA Technology Ltd.
SATRA Footwear Technology Centre
Society of Motor Manufacturers and Traders Ltd.

The following body was also represented in the drafting of the standard, through subcommittees and panels:

Ministry of Defence

This British Standard, having been prepared under the direction of the Plastics and Rubber Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on
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BSI, 2 Park Street, London W1A 2BS **BSI, Linford Wood, Milton Keynes MK14 6LE**