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Method of test for

The determination of the cuprammonium fluidity of cotton and certain cellulosic man-made fibres

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- Association of Jute Spinners and Manufacturers
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- British Nonwovens Manufacturers' Association
- British Railways Board
- British Textile Employers' Association*
- Central Council of the Irish Linen Industry
- Consumer Standards Advisory Committee of BSI
- Department of Industry, Chemicals and Textiles
- International Wool Secretariat*
- Knitting Industries Federation Ltd.*
- Manchester Chamber of Commerce and Industry
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- Retail Trading — Standards Association
- Textile Institute*
- Warp Knitters' Association Ltd.

The organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

- British Carpet Manufacturers' Association
- British Polyolefin Textiles Association
- British Textile Confederation
- Department of Industry, Laboratory of the Government Chemist
- Manchester Chamber of Commerce
- Soap and Detergent Industry Association
- Society of Dyers and Colourists
- Textile Research Council
- Wool Textile Delegation

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Foreword

This revision has been prepared under the direction of the Fibres, Yarns and Fabrics Standards Committee to take account of changes in techniques and apparatus, and to provide a procedure for mixtures of cellulosic fibres. It is well known that purified natural cellulose dissolves in cuprammonium hydroxide solution (referred to below as “cuprammonium”) to give a solution that is viscous even at low concentrations. Cellulose that has been partly hydrolyzed or oxidized dissolves to give less viscous (more fluid), solutions at the same concentration. Hydrolytic and oxidative treatments weaken fibres and yarns of cotton, viscose, cupro, modal, deacetylated acetate, acetate or triacetate, and it has been shown that, following a series of such treatments, there is a close, though non-linear, relation between the fall in tensile strength and the fall in viscosity of a solution of given concentration. If, instead of the viscosity of a solution, its reciprocal, termed for the purposes of this standard “cuprammonium fluidity”, is compared with the loss in strength, it is found that, for many chemical treatments that weaken cellulose, the cuprammonium fluidity increases linearly with the percentage fall in strength, over a wide range. For practical purposes, therefore, the cuprammonium fluidity enables a distinction to be made between mechanical and chemical damage, and affords a very convenient measure of the extent of chemical attack that the cellulose has undergone. However, in the special case of damage caused by microorganism enzymes, there is unlikely to be a significant increase in the cuprammonium fluidity.

Cotton fibres even after they have been scoured consist of almost undegraded cellulose, and normal bleaching treatments degrade the cellulose only to a moderate extent. On the other hand, the treatments to which cellulose is subjected during the manufacture of viscose, cupro, modal, deacetylated acetate, acetate or triacetate, are much more severe, and the cuprammonium fluidities of their solutions are very much higher than those of cotton if all are measured in solutions of the same concentration. The differences are so large that it is impracticable to employ the same viscometer to measure the cuprammonium fluidities of cotton, viscose, cupro, modal, deacetylated acetate, acetate or triacetate, at the same concentration. In practice, it is a great convenience to use identical viscometers for all measurements, and this can be done if different standard concentrations are employed for cotton on the one hand and for viscose, cupro, modal, deacetylated acetate, acetate or triacetate on the other. With viscometers of the design employed in this standard suitable concentrations are 0.5 % for cotton and 2.0 % for viscose, cupro, modal, deacetylated acetate, acetate or triacetate.

When mixtures of cellulosic fibres are to be tested, somewhat different considerations apply, depending on the nature of the blend and on the source of the non-cotton component. In this case, it would be more appropriate to estimate the fluidity of the cotton component only, and for this reason, only methods for determination of the fluidity of the cotton component are given. Since the majority of mixtures are prepared before any treatment is applied which is likely to affect the fluidity, it can be assumed that any increase in the fluidity value for the cotton component reflects an increase in the fluidity value for the other component, although it should be noted that these changes may not be proportional.

Because of these considerations three basic methods for calculating test specimen size and test result are given, the first dealing with pure fibre, the second and the third dealing with mixtures of cotton with cellulosic man-made fibres.

NOTE Cuprammonium fluidity is the reciprocal of the dynamic viscosity of a solution of cellulose of prescribed concentration in a cuprammonium solvent of prescribed composition measured under precisely defined conditions. These solutions commonly exhibit non-Newtonian flow behaviour. Cuprammonium fluidity does not, therefore, have absolute physical significance as does the fluidity of a Newtonian liquid, although it has been expressed in reciprocal poises. It is considered that it should be regarded as an empirical quantity and because of this, the results are given in “units of cuprammonium fluidity”.

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Summary of pages

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This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

