IS 667 (1981): Methods for Identification of Textile Fibres
[TXD 5: Chemical Methods of Test]

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Indian Standard

METHODS FOR IDENTIFICATION OF TEXTILE FIBRES

(First Revision)

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Indian Standard

METHODS FOR IDENTIFICATION OF TEXTILE FIBRES

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 14 August 1981, after the draft finalized by the Chemical Methods of Test Sectional Committee had been approved by the Textile Division Council.

0.2 The original standard was published in 1955. The committee responsible for the preparation of this standard decided that the scope of IS : 667-1955 be enlarged to include various synthetic fibres used commercially in India. Microscopic analysis has been included in this revised version as many of the important natural fibres, such as wool, silk, cotton and bast fibres are identified with certainty in the longitudinal view. More information is gained from a cross-section which is especially valuable for the differentiation of the man-made fibres. In a few cases purely microscopic test may fail to give differentiation due to morphological similarity. This applies particularly to a group of almost structureless man-made fibres with round cross-section and to some extent also to the striated fibres For identification of all such fibres which do not give definite information by microscopic examination, chemical and staining methods are of great value. A considerable number of chemical reactions and staining tests have been incorporated for practically every specific case of fibre differentiation.

0.2.1 Microphotographs are being published separately, till that time photographs available in the references given in **0.4** should be used.

0.3 Producers of man-made fibres intentionally modify the appearance of cross-sections in several ways such as by including varied amounts of delusterants which appear as black specks in a photomicrograph, by making filaments of uniform for varied sizes in a same yarn, by producing modified shapes by the use of irregular shaped spinnerated holes or modified processing techniques. As a consequence fibres of one generic type may be found with more than one typical cross-section and this may change from time to time. It should be noted also that generic types are marketed in varieties showing radically different dyeing characteristics but having the same cross-section; conversely, a difference in cross-section does not necessarily imply any distinct difference in dyeing or other important chemical or physical characteristics.

0.4 Considerable assistance has been derived from the following publications:

LUNIAK (B). The identification of textile fibres. 1953. Sir Isaac Pitman and Sons Ltd, London.

Identification of textile materials. 1977. 8 Ed. The Textile Institute, Manchester.

ASTM Designation : D276-62 Methods for identification of fibres in textiles. American Society for Testing and Materials.

AATCC Test Method 20-1973 Fibres in Textiles: Identification, AATCC Technical Manual 1975. American Association of Textile Chemists and Colourists.

1. SCOPE

1.1 This standard prescribes methods of tests for identification of textile fibres. Some of them which are included in this standard are listed below:

Group 1 — Natural Fibres

a) Vegetable Fibres

1) Seed Fibres — Cotton, Akund and Kapok

2) Bast Fibres:

i) Low Lignin Content — Linen or Flax (raw and bleached) — Ramie

ii) High Lignin Content — Jute, Mesta, Rosella, True Hemp and Sunn Hemp

3) Leaf Fibres — Manila Hemp and Sisal

4) Fruit or Nut Fibres — Coir

b) Animal Fibres (Natural Protein Fibres)

1) Wool and Chlorinated Wool

2) Silk

i) Cultivated Silk — raw, degummed and weighted

ii) Tasar or Tussah Silk

c) Mineral Fibres
   1) Asbestos

Group 2 — Man-Made Fibres

a) Regenerated Fibres
   1) Cellulosic — Viscose, Cuprammonium, Cellulose Acetate (secondary and triacetate), Polynosic, High-Wet Modulus Fibres (HWM)
   2) Protein — Casein, Groundnut Fibre, Zein

b) Synthetic Fibres
   1) Polyamides — Nylon 66, Nylon 610, Nylon 6, etc
   2) Polyester — Terylene, Terene, Dacron, etc
   3) Polyvinyl Derivatives
      i) Polyvinyl Chloride — Pe Ce, Rhovyl, etc
      ii) Polyvinyl Chloride Acetate — Vinyon ST, Vinyon HH
      iii) Polyvinyl Chloride — Acrylonitrile — Vinyon N, Dynel
      iv) Polyvinylonitrile (Acrylic fibres) — Orlon, Acrilan
      v) Polyvinyl Alcohol — Vinylon, Kuralon
      vi) Polystyrene and Copolymers — Styroflex, Polyfil, etc
      vii) Polyvinylidene Chloride and Copolymers — Saran, Velon
   4) Polyolefins
      i) Polyethylene — Polythene
      ii) Polypropylene — Reevon

Group 3 — Inorganic Fibres

a) Glass
b) Metal

2. PREPARATION OF TEST SPECIMEN

2.1 If the sample consists of more than one kind of fibres, separate by dissection the different kinds, teasing them apart by dissecting needles.

2.2 In order to avoid interference with proper identification of fibres, remove the non-fibrous matter by following the procedures recommended in IS : 9068-1979*.

3. APPARATUS

3.1 The apparatus for microscopic examination shall consist of a compound microscope, dissecting needles, glass slides, cover glasses and a cross-sectioning device. The microscope should be equipped to permit examination from 100X to 500X.

4. REAGENTS

4.0 Quality of Reagents — Unless specified otherwise, pure chemicals shall be employed in tests and distilled water (*see* IS : 1070-1977*) shall be used where the use of water or distilled water as a reagent is intended.

NOTE — ' Pure chemicals ' shall mean chemicals that do not contain impurities which affect the experimental results.

4.1 Zinc Chlor-iodide Solution — Dissolve 20 g of zinc chloride in 10 ml of water. To this solution, add a solution of 2·1 g of potassium iodide and 0·1 g iodine in 5 ml of water. Filter or decant the mixture when settled and add a crystal of iodine before storing the mixture in a dark bottle.

4.2 Phloroglucinol and Hydrochloric Acid Solution — Dissolve 2 g of phloroglucinol in 100 ml of alcohol. When required for use, mix with equal volume of concentrated hydrochloric acid.

4.3 Cuprammonium Hydroxide Solution

4.3.1 *Solution* A — Dissolve 502 g of copper sulphate (analytical quality) in 1 000 ml of hot distilled water and cool the solution until crystallization begins. Add 250 g of ice and 450 ml of ammonia of specific gravity 0·880. Make up the volume to 2 700 ml.

4.3.2 *Solution* B — Prepare a solution of 7·5 ml of 76° TW caustic soda solution free from carbonate and 72·5 ml of ammonia of specific gravity, 0·880.

4.3.3 When required for use, mix 150 ml of Solution A and Solution B.

4.4 Alkaline Lead Acetate Solution — Dissolve 2 g of sodium hydroxide in 30 ml of water and add this to a solution of 2 g of lead acetate in 50 ml of water. Boil the mixture until it becomes clear, cool, make up the volume to 100 ml and filter, if necessary.

4.5 Sulphuric Acid — 80 percent (*m/m*).

4.6 Sodium Hydroxide — (i) 5 percent (*m/m*), (ii) 15 percent (*m/m*).

4.7 Nitric Acid — (i) concentrated, (ii) 5 percent (*m/m*), (iii) 25 percent (*m/m*).

4.8 Hydrochloric Acid — concentrated.

4.9 Acetone

4.10 Phenol — 90 percent (*m/m*).

4.11 *m*-Cresol

*Recommended methods for removal of non-fibrous matter prior to quantitative analysis of fibre mixtures.

*Specification for water for general laboratory use (*second revision*).

4.12 Carbondisulphide

4.13 Tetrahydrofurane

4.14 Dimethylformamide

4.15 Benzene

4.16 Cyclohexanone

4.17 Hydrofluoric Acid

4.18 Calcium Hypochlorite Solution — 3·5 g/l available chlorine.

4.19 Alcohol Solution — 92 percent ethyl alcohol solution (*m/m*).

4.20 Ammonia Solution

4.21 Methyl Salicylate

4.22 Iodine-Potassium Iodide Solution — prepared by dissolving 20 g iodine in 100 ml of saturated potassium iodide solution (about 150 g of potassium iodide in 100 ml of distilled water).

4.23 Sodium Hypochlorite — 5·25 percent.

4.24 Formic Acid — concentrated.

4.25 Methylene Chloride

4.26 Chlorobenzene

4.27 Toluene

4.28 Glacial Acetic Acid

4.29 Decalin

5. TESTS

5.1 Burning Test — A small tuft of fibres is held by forceps in the frame of a micro-burner for about 10 seconds and is then removed. It is noted whether the tuft burns or not; whether it forms any bead or whether the ash skeleton is retained; the type of smell emitted during burning is also noted. The test is carried out in daylight.

NOTE — The burner should be set up away from draughts as far as possible, but no elaborate screening of the flame is necessary.

5.2 Twist on Drying — One end of a single fibre is held between the fingers and the free end is directed towards the observer. This free end is then moistened and the direction of twist during drying is noted, that is, whether movement is in a clockwise or counter clockwise direction.

5.3 Floatation Test — A small sample of the fibre after degreasing in benzene-methanol mixture (3:2) is placed in the test liquid and pushed below the surface by means of a glass rod. The liquid should be illuminated transversely and viewed against a black background to observe whether the sample floats on the surface or sinks.

5.4 Swett's Test — The sample is degreased and immersed in nascent chlorine water for 30 seconds, washed in water and alcohol, and then exposed to fumes from strong ammonia; the colour developed is noted.

5.5 Microscopic Analysis

5.5.1 *For Longitudinal Examination* — Place a small number of fibres on a glass slide in a suitable mounting medium, cover the fibres with a covering glass. Examine the fibres at a specified magnification under microscope (*see* Fig.*).

5.5.2 *For Cross-Section Examination* — Take a tuft of fibres and prepare the specimen with the cross-sectioning device, place it on a glass slide in a suitable mounting medium and cover it with a covering glass. Examine the fibres at a specified magnification under microscope (*see* Fig.*).

5.6 Staining Test — Dye a small of fibre with a mixture of dyestuffs (for example, Shirlastain A, Detex, Fibre Stain, etc) for 3 to 5 minutes and wash thoroughly. The colour developed may be viewed carefully or compared with the known dyed samples.

NOTE 1 — The sample is immersed in Detex for about 5 minutes at room temperature with occasional stirring. It is then rinsed several times in water at 50°C until the water remains clear.

NOTE 2 — The sample is thoroughly wetted and washed free from wetting agent, if any and then immersed in Shrilastain A at room temperature for one minute. It is then thoroughly washed in cold water.

NOTE 3 — The sample is wetted in alcohol, washed and immersed in Neocarmine W for 3 to 5 minutes at room temperature. It is then thoroughly rinsed in running water, immersed in dilute ammonia and rinsed again.

NOTE 4 — Various staining agents are marketed by various manufacturers. A list of few suppliers of staining agents is given separately in Appendix E. For the colours produced by the staining agents on various fibres the literature given by the manufacturers should be seen. The list given in Appendix E is for information and guidance only.

6. PROCEDURE

6.1 For preliminary identification of fibres, follow the scheme given in Appendix A. Also examine the sample for staple length to distinguish continuous filament silk and rayon from staple fibres such as viscose staple fibre.

6.2 For confirmation of the indication given by tests as prescribed under **6.1**, follow the scheme prescribed for individual fibre in Appendices B, C or D.

6.3 For ultimate identification of the fibre under test, repeat the relevant tests, side by side, on both, its specimen and on authentic specimen of the fibre indicated by **6.1** and **6.2**.

NOTE — It is necessary that before concluding the final identity of the fibres, the inferences given on various tests should be considered.

*Figures of microphotographs for Longitudinal Sections and Cross-Sections of various fibres are under preparation. Till such time figures available in various books mentioned in **0.4** may be used.

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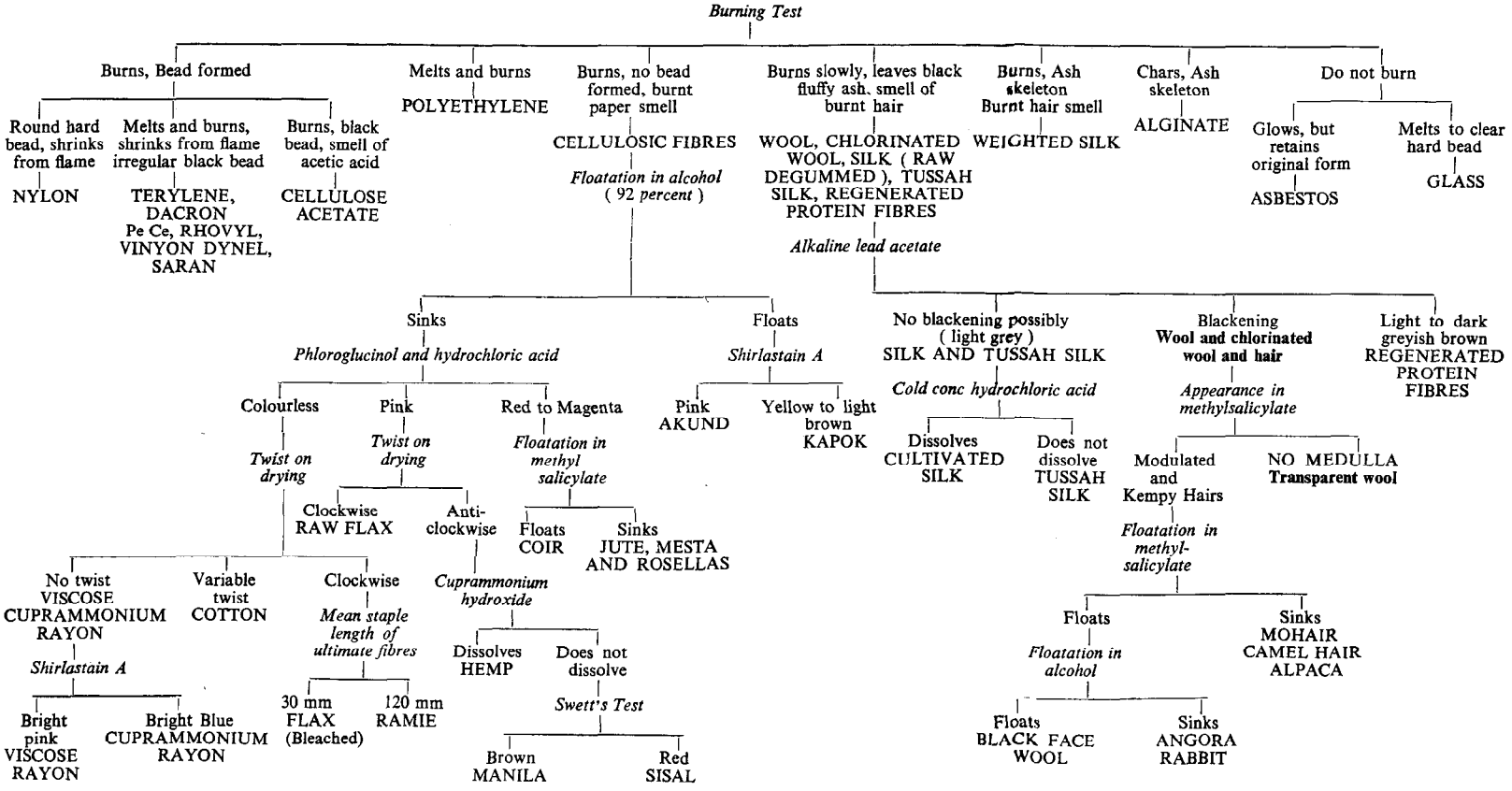
APPENDIX A

(*Clause* 6.1)

PRELIMINARY IDENTIFICATION OF FIBRES



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APPENDIX B

(*Clause* 6.2)

NATURAL FIBRES

Staining Test					Microscopical Examination		Solubility Test			Miscellaneous
kaline ead :etate	Detex	Shirlastain A	Neocarmine W	Texchrome	Longitudinal	Cross-Section	Sulphuric Acid 80%	Cuprammonium Hydroxide	Sodium Hydroxide (5 Percent)	
(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
–	Raw : Grey Bleached : Slight greenish grey Bleached and Mercerized : Blue	Pale purple to purple	Raw : Light blue Bleached and/or Mercerized : Deep blue	Very pale blue	*Raw & Bleached* : Ribbon like with frequent convolutions, sometimes changing direction; distinct but small lumen (immature fibres, very thin cell wall & few convolutions) *Mercerized* : For greater part cylindrical smooth, ribbon like fibres and fibres regions more or less in frequent (depending on degree of mercerization) lumen very small or disappeared	*Raw & Bleached* : Kidney bean shaped seldom round or oval: lumen as a line or oval *Mercerized* : Most fibres round or oval (depending) on degree of mercerization) very small or no lumen.	Dissolves	Dissolves	Swells	With iodine-potassium iodide solution 1) Raw-brownish shades 2) Mercerized-blue to black
–	Red	Java : Golden yellow Indian : Yellow	Dull yellow	Pale blue	Cylindrical, smooth and structureless, thin walled containing air bubbles	Thin walled, round, some flattened	Java — Finally dissolves India — Does not dissolve	Does not dissolve	—	Iodine — sulphuric acid and glycerine-yellow
–	—	Pink	—	Yellowish green	Cylindrical, smooth structureless; very thin wall often with transverse bends but no twist; very broad lumen containing air additional netlike thickening	Round, partly flattened very thin wall	Dissolves leaving yellow residue	do	—	
–	Yellowish red to bordeaux	Golden brown	Olive brown	Pinkish violet	Fibre bundles but no marking	Polygonal with defined angles	Dissolves partly	Marked swelling without dissolution	—	1) With hot dilute nitric acid — becomes brownish yellow 2) With iodine potassium iodide solution — yellow to brown (1) and (2) same as jute
–	—	do	Violet blue with red dots	—	do	do	do	Mostly dissolves occasionally leaves a small residue		
–	Specky red violet	Dark purplish grey	Specky violet	—	Fibre bundles with cross markings nodes, fissures but otherwise smooth	Mainly sharply polygonal with narrow, round or ovallumen-lumen, often as a mere line and indistinct	Dissolves partly and slowly	Mostly dissolves occasionally leaves a small residue	—	1) With hot dilute nitric acid — brownish 2) With iodine potassium iodide solution — light to dark grey brown
–	Reddish blue	Violet blue	Dull deep blue	—	Fibre bundles with cross marking similar to flax	Polygonal but not so sharp as jute, walls laminated	Dissolves almost completely	Dissolves almost completely	—	
–	Raw : Reddish blue grey Bleached; dull greenish blue	Brownish purple	Bluish grey	—	Fibre bundles with cross markings or dislocation marks often in form of a cross	Mainly sharply polygonal with narrow, round or oval lumen, also rounded oblong forms of lumen	do	do	—	1) With hot dilute nitric acid — yellowish 2) With iodine potassium iodide solution — light to dark grey brown
–	Reddish violet	Lavender	Blue to bluish violet	—	Large single fibres with cross markings and many with longitudinal striations	Large thick walled, flattened tubes often laminated	Dissolves	Dissolves slowly	Swells	

(*Continued*)

Staining Test					Microscopical Examination		Solubility Test			Miscellaneous
Alkaline Lead Acetate	Detex	Shirlastain A	Neocarmine W	Texchrome	Longitudinal	Cross-Section	Sulphuric Acid 80%	Cuprammonium Hydroxide	Sodium Hydroxide (5 Percent)	
(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
—	Pink	Brown	—	—	Smooth cross marking rare but possible fibre ends pointed or rounded tips	Roundish slightly indented, also round to elliptical ultimate fibre — polygonal cell wall medium to thicksome cells with thin curved walls				The oil free fibres are boiled with nitric acid (5 percent) for two minutes and treated with calcium hypochlorite (3·5 g available chlorine/l) manila fibre — deep orange, sisal fibres-lemon yellow
—	Light scarlet	Golden brown	Greenish yellow with blue markings	—	Fibre bundles, thin walled on markings with occasional peculiar spiral vessel	Polygonal in outline with round edges	Does not dissolve	Does not dissolve	—	do
—	—	Brown	Light brown	—	Smooth, fibre ends blunt or rounded	Round, mostly with cavity, ultimate fibre polygonal to round also oblong	do	do		
or dark sh brown	Pink	Cold : Bright yellow Boil : Copper brown	Yellow	Dark yellow	Fairly cylindrical cutical of overlapping scales	Round, also oval or elliptical, sometimes modullated	do	Does not dissolve (stain blue)	Dissolves in 1 minute	Sodium hypochlorite (5·25 percent) — dissolves
kening	Deep pink	Cold : Golden yellow to orange Boil : Dark brown to black	Dark yellow	—	Similar to wool but scales not so obvious	do	do	Dissolves partially (stain blue)	do	
lackening ply light	Dark bordeaux	Dark brown	Dull dark green	Moderate yellow brown	Continuous double thread with irregular masses adhering	Mostly triangular with rounded corners	Disintegrates and dissolves	Partly dissolves (slowly) stain yellow	Dissolves in 2 minutes	1) Nitric acid (conc) — disintegrates and dissolves 2) Nitric acid (dil) — at 70°C, the fibre stains yellow 3) Hydrochloric acid (conc) — dissolves
ko	Deep bright Pink to red	Golden brown	Dull golden	—	Structureless filament	do	Dissolves	Dissolves slowly	do	Sodium hypochlorite (5·25 percent) — dissolves
ackening	—	Cold : Orange red to bluish red (If the amount of weighting substance is 29 to 57 percent red to bordeaux)	—	—	Structureless filament, usually continuous	Majority triangular with rounded corner	Does not dissolve	Stain yellow	Dissolves slowly	
ackening ply light	Brownish red	Chestnut brown	Turbid yellow green	—	Ribbon like, occasionally twisted, frequently fine but distinct internal longitudinal striations	Mostly very long triangles with rounded corners (wedge-shaped)	Dissolves slowly	Dissolves slowly	Dissolves slowly to pulp	

APPENDIX C

(*Clause* 6.2)

MAN-MADE FIBRES

Sl. No.	Fibre	Burning Test	Staining Test						Microscopical Examination		Cuprammonium Hydroxide at Room Temperature for 30 Minutes	Solubility Tests				Other Miscellaneous Tests
			Zinc-Chlor-iodide	Alkaline Lead Acetate	Detex	Shirlastain A	Neocarmine W	Texchrome	Longitudinal	Cross-Section		80% H_2SO_4 (*m/m*) at Room Temperature for 15 Minutes	HNO_3 (conc) at Room Temperature for 15 Minutes	Acetone at Room Temperature for 20 Minutes	90 Percent Phenol or *m*-Cresol at Room Temperature	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
C-1.	REGENERATED FIBRES															
C-1.1	Viscose rayon	Burns with smell of burnt paper, leaves fine grey or black ash	Red to violet	—	Bluish to red violet	Bright pink lavender	Red violet	Very pale blue	Striated	Highly servated (nearly round for polynosic)	Dissolves	Dissolves	Does not dissolve (unstained)	Does not dissolve	Does not dissolve	Con HCl — soluble Formic acid 85% (boil) — insoluble
C-1.2	Cuprammonium rayon	do	do	—	Deep blue	Bright blue	Deep blue	—	Featureless	Round, occasionally oval	do	do	do	do	do	
C-1.3	Cellulose acetate rayon	Melts and burns with smell of acetic acid, forms black irregular bead	yellow (dissolves)	—	Yellow	Secondary-bright greenish yellow, Tri-slightly yellow	Greenish yellow	Yellow green	do	Three lobes, occasionally 2 and 4 lobes	Does not dissolve	Dissolves (yellow colouration)	Dissolves	Secondary — dissolves Tri-insoluble in 80 and 100% acetone	Swells, dissolves slowly (secondary acetate)	Methylene chloride (cold) — Tri-soluble Secondary — insoluble
C-1.4	Protein fibres (Casein, Ardil, Zein, etc)	Burns slowly, leave black fluffy ash, smell like burning hair or feathers	Yellowish to yellow	Light or dark greyish brown	Casein, Zein red, purplish red	Yellow to orange	Casein, Zein-yellow greenish yellow	Zein Strong yellowish green	Faint striations	Round with pittings	Stains blue slightly lateral swelling, does not dissolve	Insoluble, con H_2SO_4 — diamonds appear along the longitudinal axis of fibre within 1 minute, phenomenon transient	Swells, slightly stained yellow	—	—	5% NaOH — Ardil-insoluble. Casein fibre — very largely soluble
C-2.	SYNTHETIC FIBRES															
C-2.1	Polyamides (Nylon 6, Nylon 6·6 Nylon 11 etc)	Melts and shrinks from flame, gives round hard bead	Yellow to brown	—	White ivory salmon (cream)	Cold — golden yellow Hot — orange brown	Nylon 6 } Nylon 66 } yellow Nylon 11 -pale greenish yellow	Nylon 6 : Copper brown (hot) Nylon 66 : Light yellow green	Feature-less	Round (circular) occasionally with triangular/or 3 lobes	Does not dissolve	Dissolves	Dissolves (Rilosan gets fused)	Does not dissolve	Dissolves	Dimethylformamide (boil) Nylon 6 — soluble Nylon 6·6 — insoluble Formic acid 85% (cold) Nylon 11 — insoluble
C-2.2	Polyesters (Terylene, Dacron Kodel, etc)	Melts and burns, shrinks from flame, black hard irregular bead	Faintly yellowish	—	—	Cold : pale purple Hot : pale fawn	Faintly soiled	Very pale blue	Smooth	do	do	Con H_2SO_4 — dissolves	—	—	Dissolves at boil	Dimethylformamide (boil) soluble
C-2.3	Polyacrilonitrile (Acrilan, Cresian Orlon, Zefran, etc)	Melts and burns black round bead	Yellow to orange, swells	—	Light pink	Acrilan : Cold-pink Boil-khaki Cresian : Cold-faint yellow Boil-orange brown Orlon : Cold-Pink (hardly detectable) Boil-pale dull yellow	Faintly soiled yellowish green	Acrilan : pale green Cresian : dark greenish blue Orlon : pale yellow green Zefran : greyish blue	Featureless striations in case of Acrilan and Orlon	Round dogbone (Orlon)	do	Con H_2SO_4 Zefran dissolves to form orange coloured solution	Dissolves	Does not dissolve	Does not dissolve	Dimethylformamide Acrilan — dissolves slowly at 27°C Cresian — dissolves at 27°C Orlon and Zefran } dissolve at boil

(*Continued*)

Sl No.	Fibre	Burning Test	Staining Test						Microscopical Examination		Cuprammonium Hydroxide at Room Temperature for 30 Minutes	Solubility Tests				Other Miscellaneous Tests
			Zinc-Chlor-iodide	Alkaline Lead Acetate	Detex	Shirlastain A	Neocarmine W	Texchrome	Longitudinal	Cross-Section		80% H_2SO_4 (*m/m*) at Room Temperature for 15 Minutes	HNO_3 (conc) at Room Temperature for 15 Minutes	Acetone at Room Temperature for 20 Minutes	90 Percent Phenol or *m*-Cresol at Room Temperature	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
C-2.4	Polyvinyl Chloride (Rhovyl, Dynel PeCe, Vinyon, etc)	Melts and burns (self extinguishing, forms irregular black bead)	Dynel — yellowish to brown PeCe — yellowish	—	Rhovyl — light pink to lavender	Rhovyl (cold) — unstained (hot) — faint yellow Vinyon, Dynel — unstained	Vinyon pale yellow PeCe — faintly soiled grey	Rhovyl — very light blue Dynel — pale green	Rhovyl — featureless Vinyon — usually fine tube, lumen may be seen PeCe — one or two longitudinal lines Dynel — isolated longitudinal lines	Rhovyl : strongly indented Vinyon — dumbbell shape PeCe — dumbbell shape Dynel — sometimes T, V, Y — shaped	Does not dissolve	Does not dissolve	Does not dissolve	Dynel — swells and dissolves Rhovyl — dissolves Vinyon — dissolves on boiling	Dynel — dissolves Rhovyl — dissolves on boiling Vinyon — dissolves on boiling	Chlorobenzene (boil) Rhovyl dissolves, Dimethylformamide (cold) Rhovyl — dissolves, Toluene (cold) PeCe — dissolves, Cyclohexanone (cold) Dynel — dissolves
C-2.5	Polyvinylidene Chloride (Saran, Rovana, Velon, etc)	Melts and burns (self extinguishing) shrinks from flame, forms irregular black bead	—	—	—	—	—	—	Featureless	Round to oval smooth edge	—	—	—	—	—	Chlorobenzene (boil) — dissolves
C-2.6	Polyvinylalcohol (Vinylon, Kuralon, etc)	Melts and burns with sweet smell	—	—	—	—	—	Kuralon — violet	Vinylon : most fibres dark except thin skin; some with apparent lumen	Dog-bone, bent to various shapes edge smooth, thick dark core	Does not dissolve	Does not dissolve	Dissolves	Does not dissolve	Does not dissolves	Formic Acid 85% (cold) dissolves Glacial acetic acid (boil) — does not dissolve
C-2.7	Polytetrafluoro-ethylene (Teflon)	Fibre is carbonised and consumed by hot bunsen flame	—	—	—	—	—	—	Featureless	Round	do	do	Does not dissolve	do	do	Cyclohexanone (boil) 5 minutes — dissolves
C-2.8	Polyvinylidene dinitrile (Darvan, Darlan, etc)	Melts and burns readily with sweet smell	—	—	—	—	—	—	do	Lima bean to irregular	do	do	Partially dissolves	do	do	Dimethylformamide (27°C) 5 minutes — dissolves
C-2.9	Polystyrene (Styroflex, Polyfil, Shalon, Durabass, etc)	Melts and burns with production of great deal of soot	—	—	—	—	—	—	—	—						40% NaOH (boil) dissolves Benzene (boil) 5 minutes dissolves
C-2.10	Polyolefins a) Polyethylene (Polythene Courlene, etc)	Melts and burns with a smell of paraffin deal of soot	—	—	—	—	—	—	Rod like with smooth surface	Flat to round or oval	do	do	Does not dissolve	—	do	Cyclohexanone (boil) 15 to 20 minutes — dissolves Polypropylene dissolves rapidly Decalin (boil) 15 to 20 minutes — dissolves (Melts at temp of 120°C or less) Decalin (boil) 5 minutes — Dissolves (Melts at temp near 150 C)
	b) Polypropylene (Reevon, etc)	Melts ignites with difficulty							do							

APPENDIX D

(*Clause* 6.2)

MINERAL AND GLASS FIBRES

Sl No.	Fibre	Burning Test	Microscopical Examination		Other Tests
			Longitudinal	Cross-Section	
(1)	(2)	(3)	(4)	(5)	(6)
D-1.	Asbestos	Glows, does not burn	Very-fine, fibre-like crystal, of varying diameter (easily separated), fairly regular over fibre length	—	—
D-2.	Glass	do	Cylindrical, structureless, transparent, very regular over length; normally very fine (0·5 micron or less)	Circular, edge smooth	Hydrofluoric acid — dissolves

APPENDIX E

(*Note* 4 *under Clause* 5.6)

LIST OF SUPPLIERS OF STAINING AGENTS

1) Texanlab (Sales)
323, Ashish Industrial Estate
Gokhale Road (South), Dadar
Bombay 400025

2) E. I. du Pont de Nemours & Company
Wilmington 98, Del.

3) American Cyanamid Company
Calco Chemical Division
Bound Brook, N. J.

4) Test Fibres, Inc.
P. O. Box 567
Plainfield, N. J.

5) General Dyestuffs Corporation
435, Hudson Street,
New York, N. Y.

6) National Aniline Division
Allied Chemical & Dye Corporation
40, Rector Street,
New York 6, N. Y.

7) Fesago
Chemische Fabrik Dr. Gossler
GmbH, Heidelburg,
Germany

8) Dr Herman Baumann
United Piece Dye Works
Lodi, N. J.

9) Fischer Scientific Company
711–723 Forbes Street
Pittsburgh, Pa

INDIAN STANDARDS

ON

CHEMICAL METHODS OF TEST FOR QUANTITATIVE CHEMICAL ANALYSIS OF FIBRE MIXTURES

IS:

1564-1962 Method for quantitative chemical analysis of binary mixtures of cellulose triacetate and certain other fibres

1889 (Part I)-1976 Method for quantitative chemical analysis of binary mixtures of regenerated cellulose fibres and cotton : Part I Sodium zincate method (*first revision*)

1889 (Part II)-1976 Method for quantitative chemical analysis of binary mixtures of regenerated cellulose fibres and cotton : Part II Cadoxen solvent method

1889 (Part III)-1979 Method for quantitative chemical analysis of binary mixtures of regenerated cellulose fibres and cotton : Part III Formic acid-zinc chloride

1889 (Part IV)-1979 Method for quantitative chemical analysis of binary mixtures of regenerated cellulose fibres and cotton : Part IV Sulphuric acid method (*first revision*)

2005-1962 Method for quantitative chemical analysis of binary mixtures of polyamide fibres and certain other fibres

2006-1978 Method for quantitative chemical analysis of binary mixtures of protein fibres and certain other fibres(*first revision*)

2176-1962 Method for quantitative chemical analysis of binary mixtures of secondary cellulose acetate and certain other fibres

2177-1962 Method for quantitative chemical analysis of mixtures of cellulose triacetate and secondary cellulose acetate fibres

2727-1964 Method for quantitative chemical analysis of binary mixtures of manila and sisal fibres

3416-1966 Method for quantitative chemical analysis of mixture of polyester fibres with cotton or regenerated cellulose

3421-1966 Method for quantitative chemical analysis of binary mixtures of acrylic and certain other fibres

6503-1972 Method for quantitative chemical analysis of ternary mixtures of protein fibres, nylon 6 or nylon 6·6, and certain other fibres

6504-1979 Method for quantitative chemical analysis of ternary mixtures of viscose rayon, cotton and protein fibres (*first revision*)

6570-1972 Method for quantitative chemical analysis of binary mixtures of jute and animal fibres

9068-1979 Recommended methods for the removal of non-fibrous matter prior to quantitative analysis of fibre mixtures

SUPPLEMENT TO

Indian Standard

METHODS FOR IDENTIFICATION OF TEXTILE FIBRES

(First Revision)

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 4

July 1989

SUPPLEMENT TO

Indian Standard

METHODS FOR IDENTIFICATION OF TEXTILES FIBRES

(First Revision)

This supplement is intended to incorporate in this standard the microphotographs of cotton, flax, jute, silk, wool, acetate rayon, viscose rayon, acrylic, nylon and polyester fibres. The microphotographs included in this supplement give the cross-sectional and or longitudinal views of these fibres. Due to addition of this supplement, *clause* **0.2.1** may be reworded as under:

'Microphotographs of some important fibres have been incorporated separately as a supplement to this standard. For further details, the references given in *clause* **0.4** may be used.'

As in the Original Standard, this Page is Intentionally Left Blank

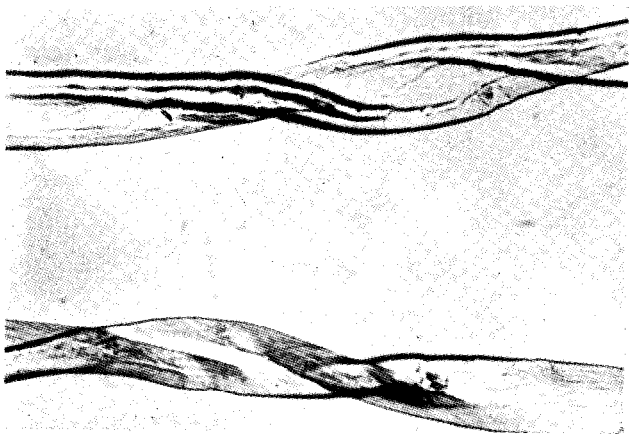

FIG. 1(a) RAW COTTON — LONGITUDINAL VIEW
(× 500)

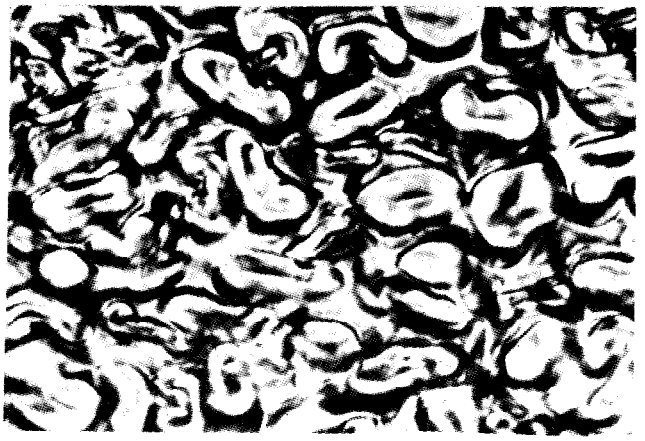

FIG. 1(b) RAW COTTON — CROSS-SECTIONAL VIEW
(× 750)

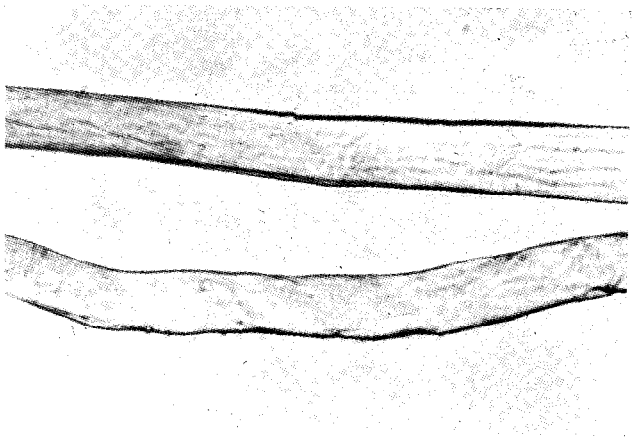

FIG. 2(a) MERCERIZED COTTON — LONGITUDINAL VIEW
(× 500)

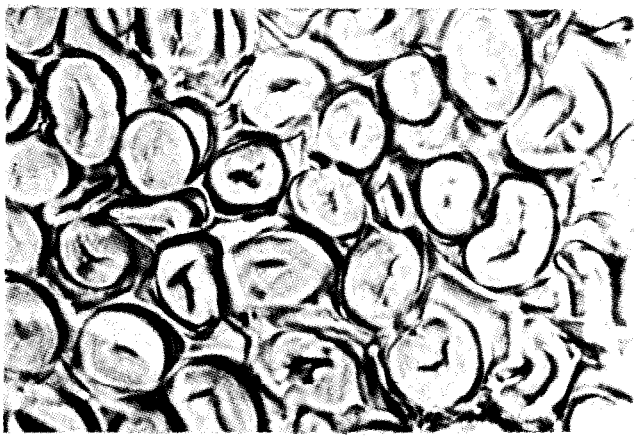

FIG. 2(b) MERCERIZED COTTON — CROSS-SECTIONAL VIEW
(× 750)

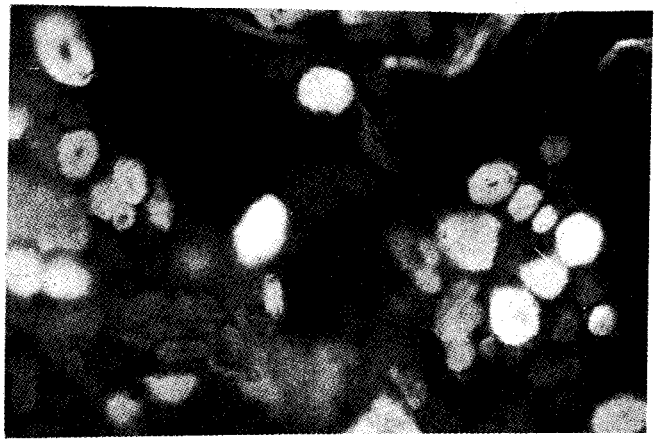

FIG. 3 FLAX — CROSS-SECTIONAL VIEW
(× 100)

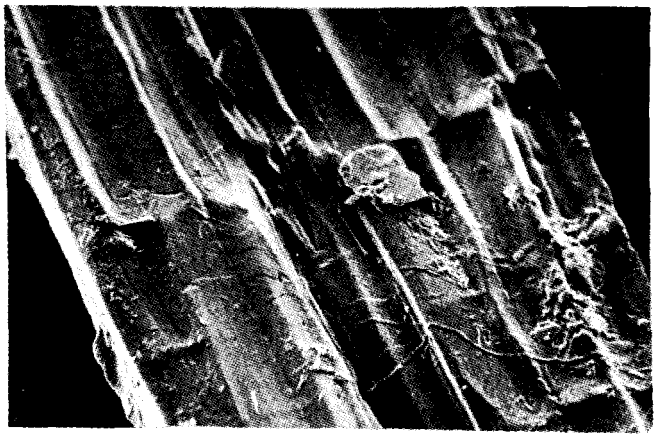

FIG. 4(a) RAW JUTE FIBRE (UNPURIFIED) — LONGITUDINAL VIEW
(× 600)

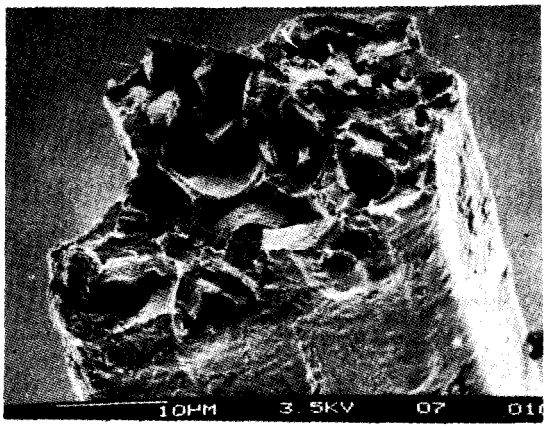

FIG. 4(b) FRACTURED RAW JUTE FIBRE (UNPURIFIED) CROSS — SECTIONAL VIEW
(× 200)

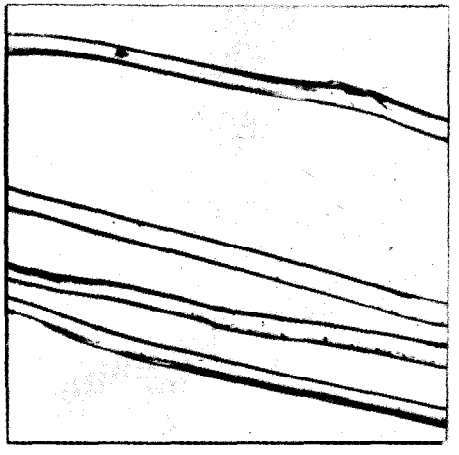

FIG. 5(a) RAW SILK — LONGITUDINAL VIEW
(× 250)

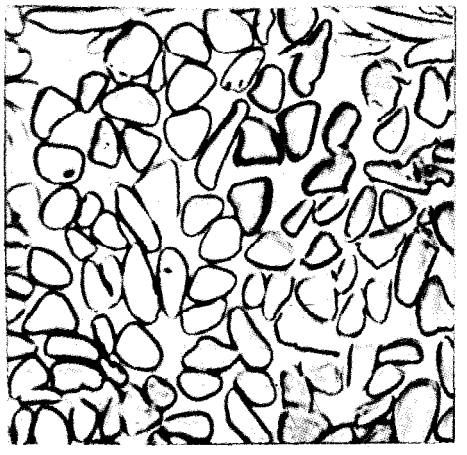

FIG. 5(b) RAW SILK — CROSS-SECTIONAL VIEW
(× 500)

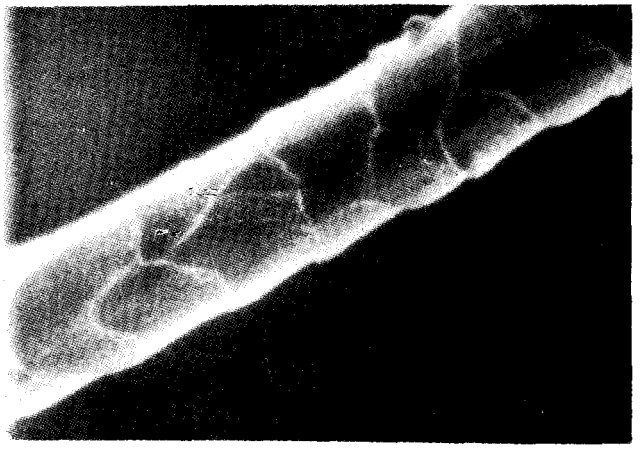

FIG. 6(a) WOOL — LONGITUDINAL VIEW
(× 1 000)

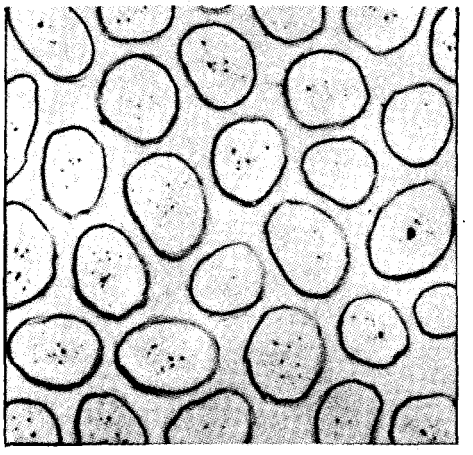

FIG. 6(b) WOOL — CROSS-SECTIONAL VIEW
(× 500)

FIG. 7 ACETATE RAYON — CROSS-SECTIONAL VIEW
(× 320)

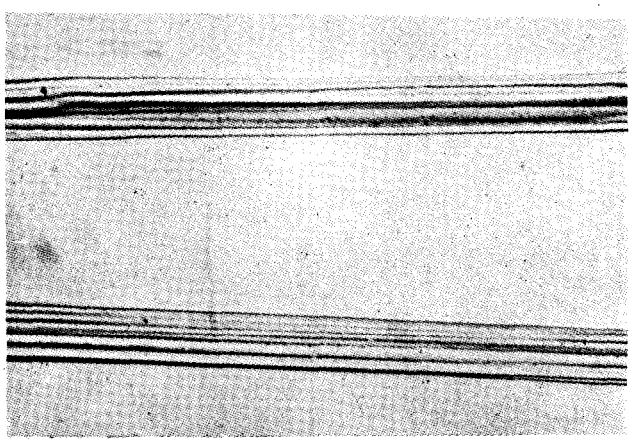

FIG. 8(a) VISCOSE, NORMAL — LONGITUDINAL VIEW
(× 500)

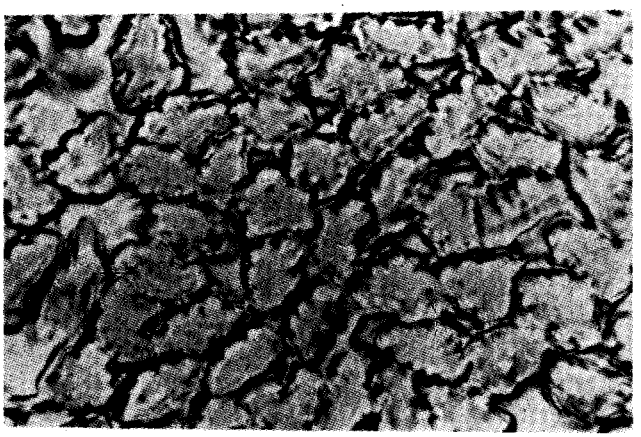

FIG. 8(b) VISCOSE, NORMAL — CROSS-SECTIONAL VIEW
(× 750)

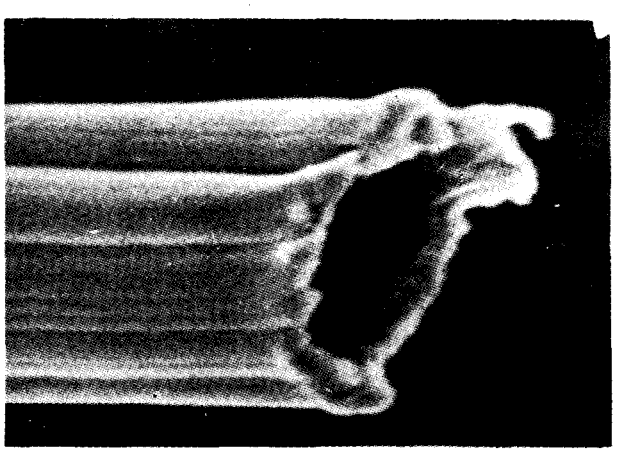

FIG. 8(c) HOLLOW VISCOSE — VISCOSE FIBRE
(× 2 000)

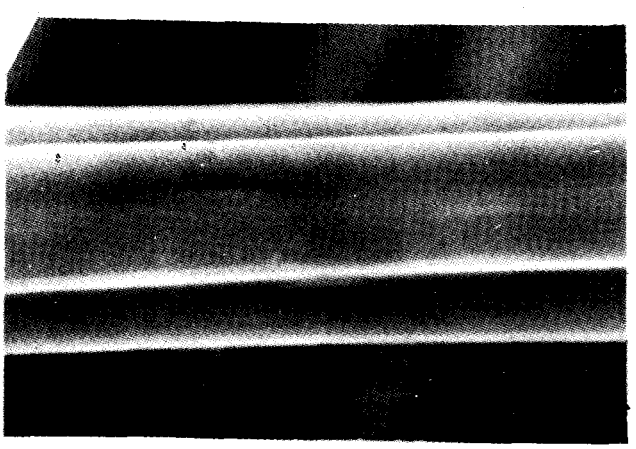

FIG. 8(d) TRILOBAL VISCOSE — LONGITUDINAL VIEW
(× 2 000)

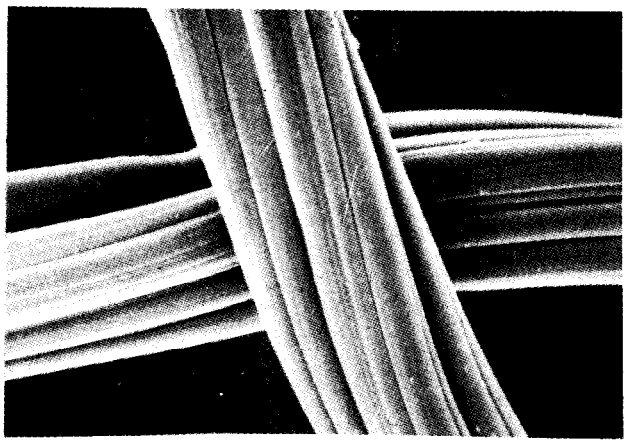

FIG. 8(e) CRIMPED VISCOSE — LONGITUDINAL VIEW
(× 1 500)

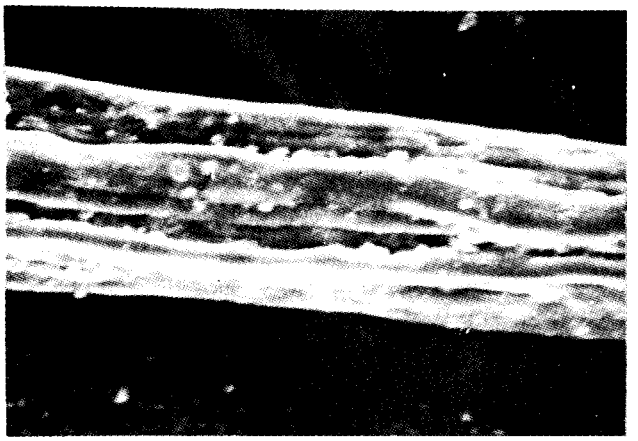

FIG. 8(f) INFLATED VISCOSE — LONGITUDINAL VIEW
(× 1 000)

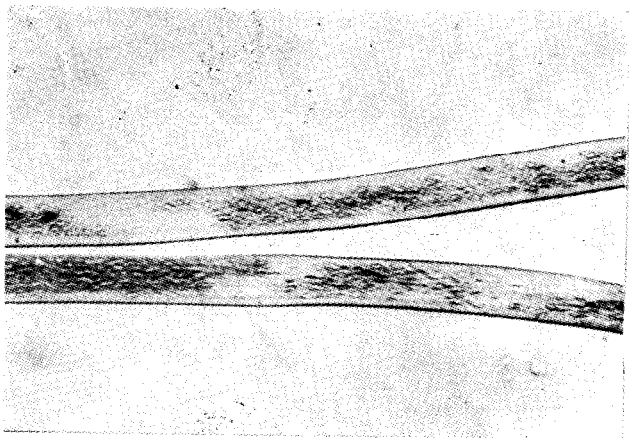

FIG. 8(g) VISCOSE, POLYNOSIC — LONGITUDINAL VIEW
(× 500)

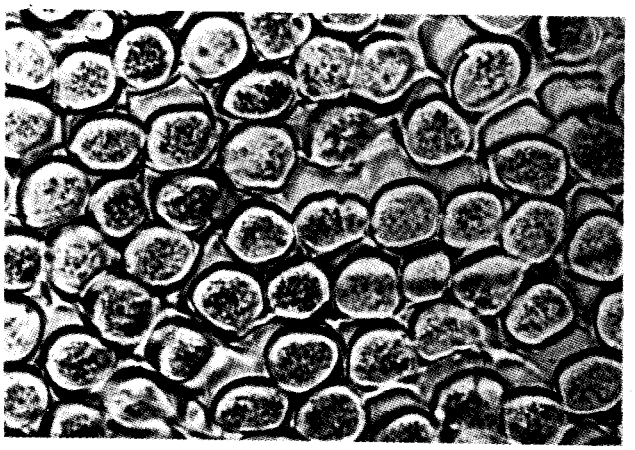

FIG. 8(h) VISCOSE, POLYNOSIC — CROSS-SECTIONAL VIEW
(× 750)

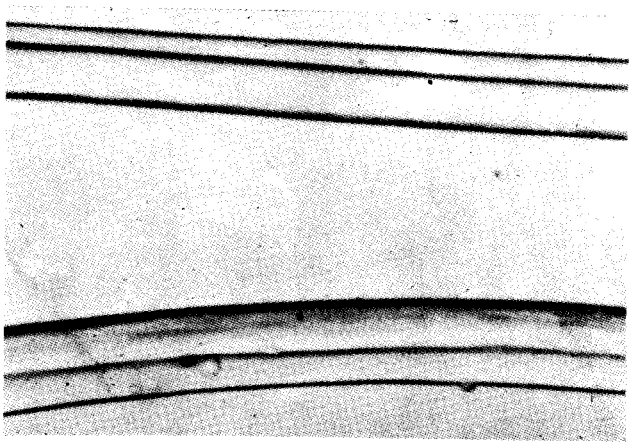

FIG. 9(a) ACRYLIC, BEAN SHAPE — LONGITUDINAL VIEW
(× 500)

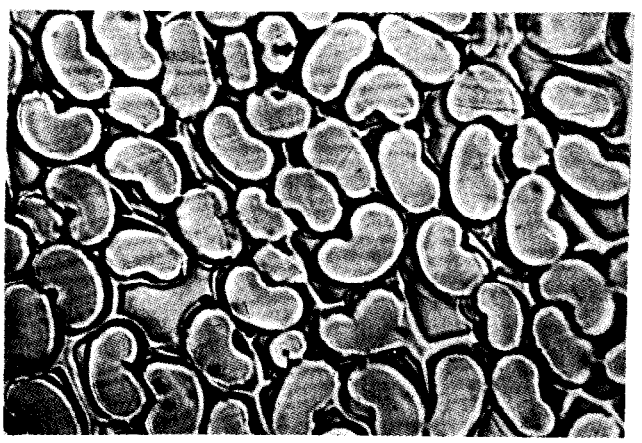

FIG. 9(b) ACRYLIC, BEAN SHAPE — CROSS-SECTIONAL VIEW
(× 500)

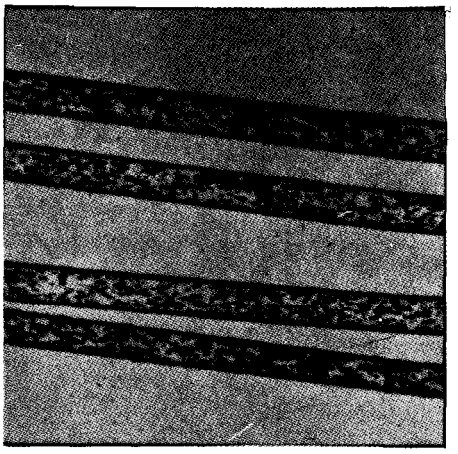

FIG. 10(a) NYLON 6 — LONGITUDINAL VIEW
(× 250)

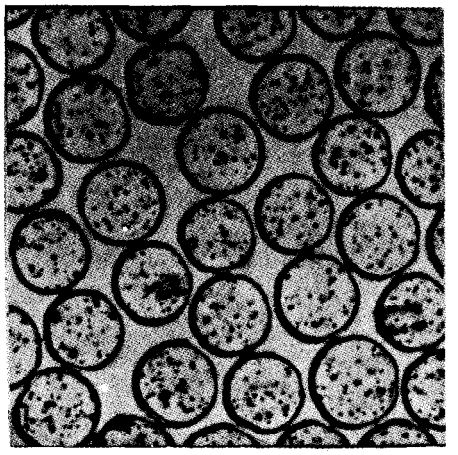

FIG. 10(b) NYLON 6 — CROSS-SECTIONAL VIEW
(× 500)

FIG. 10(c) NYLON, TRILOBAL — CROSS-SECTIONAL VIEW
(× 320)

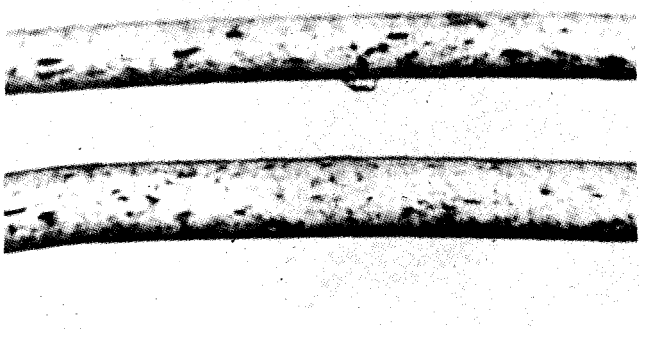

FIG. 11(a) POLYESTER, REGULAR (CIRCULAR) — LONGITUDINAL VIEW
(× 500)

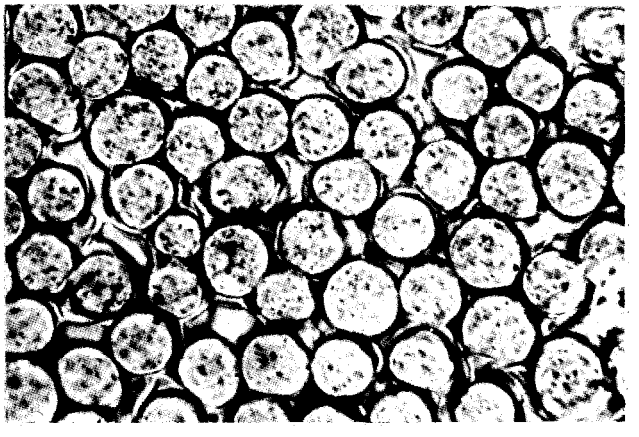

FIG. 11(b) POLYESTER, REGULAR (CIRCULAR) — CROSS-SECTIONAL VIEW
(× 500)

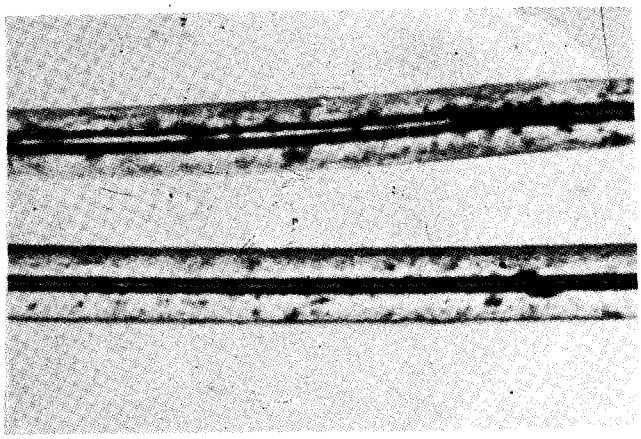

FIG. 11(c) POLYESTER, HOLLOW — LONGITUDINAL VIEW
(× 500)

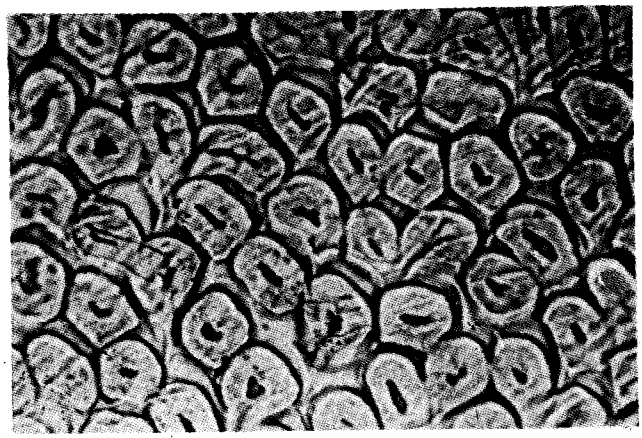

FIG. 11(d) POLYESTER, HOLLOW — CROSS-SECTIONAL VIEW
(× 500)

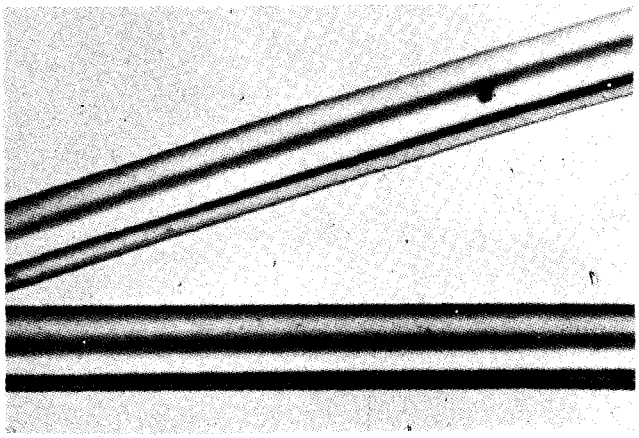

FIG. 11(e) POLYESTER, TRILOBAL — LONGITUDINAL VIEW
(× 500)

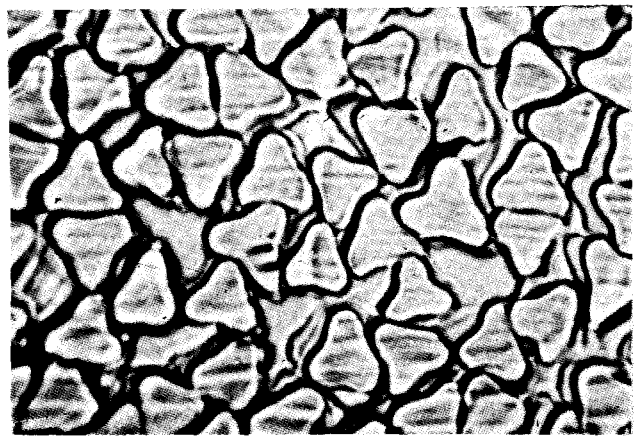

FIG. 11(f) POLYESTER, TRILOBAL — CROSS-SECTIONAL VIEW
(× 500)

BUREAU OF INDIAN STANDARDS

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Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002

Telephones : 3 31 01 31 3 31 13 75

Telegrams : Manaksanstha
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Regional Offices:

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*Eastern :	1/14 C. I. T. Scheme VII M, V. I. P. Road, Maniktola, CALCUTTA 700054	36 24 99
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