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—ABSTRACT FROM THE TRANSACTIONS—
ON THE TENSILE STRENGTH AND THE ELONGATION OF VISCOSE
STAPLE FIBER IN VARIOUS ALCOHOLS

By Hideo Ohe

(Received 14th, March, 1942)

Summary

The tensile strength and the elongation of the staple fibers produced by the different spinning methods were measured in various alcohols. The tensile strength thus obtained had the following relation.

Etanol, Propanol > Butanol, Pentanol > dry state (air) > Metanol > wet state (water).

For this reason the above relation has been discussed.

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ON THE SECTION OF VISCOSE SILK VI.
APPLIED EXPERIMENTS

By Z. Kawata

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I. Manufacturing Process of Superior Rayon

In order to manufacture rayon of superior quality, we must spine viscose of a proper composition with a spinning bath of fitted composition under the most suitable condition. Selected conditions to make superior rayon from the previous reports are as follows:

On viscose.

1. Pulp containing cellulose of suitable viscosity and a little per cent of hemicellulose.
2. The Cellulose content of viscose is 7.0—8.2 %.
3. The Alkali content of viscose is 80—100 % of cellulose.
4. The spinning viscosity is 15—20 sec. per 10 cm. of viscose at 20°C (dia. of steel ball $\frac{1}{8}$ inch).
5. The degree of ripeness is 12—14.

On the spinning bath.

1. Three elements of the bath (acid, salts and additional product) are in one solution and at least one of the salts must be metallic.
2. The acid is a sulphuric acid of 100—130 g/l.
3. The salts are sulphates and one of them is Na_2SO_4 of 100—250 g/l, another is ZnSO_4 of 10—20 g/l, and the other is MgSO_4 of 100—250 g/l.
4. Additional product is glucose of 50—150 g/l.

On spinning conditions.

1. The temperature of the bath is 45°C and the length of the bath is 10—20 cm.
2. Moderately high spinning speed with a little stretch. Under these conditions we could find a process to manufacture superior rayon after many experiments, and the section of this rayon was same as that of Coutauld Co. Ltd. Data of the experiment are as follow:

Viscose	A	B
Cellulose %	7.5	7.5
Alkali %	7.0	7.0
Spinning viscosity	17.5	18.0
Degree of ripeness	12.9	13.0
Spinning bath		
H_2SO_4 g/l	125	125
Na_2SO_4 "	160	230
MgSO_4 "	110	—
ZnSO_4 "	10	12
Glucose "	50	50
2nd bath (40°C water) there is none		
Spinning conditions		
No. of filaments	22	22
Temp. of bath °C	45	45
Length of bath cm	15	15
Spinning speed m/min.	50	50
Test of the fiber		
Appearance	a	a
Luster	a	a

Viscose	A	B
Softness	a	a
Dyeing affinity	a	a
Denier of yarn	116.06	113.86
Strength per denier g.	1.744	1.815
Elastic elongation %	20.90	21.97
Quality number	36.45	39.87
Measured temp. °C	22	22
" hum. %	60	60
Measure of the section		
Form	1-C	1-C
α (surface ratio)	2406	2420
β (coeff. of serration)	1.540	1.580

II. Investigation on the cause of abnormal fibers

Abnormal fibers are made due to various accidents in the rayon factory and the fibers are of bad repute on market, therefore we must investigate the cause of making such fibers. The investigations are carried out as follows:

1. Examine appearance, luster, spade and softness of the sample after size and dyestuff are removed.
2. Determine denier of yarn and number of filaments.
3. Measure tensile strength and elongation.
4. Test dyeing affinity.
5. Test reaction of chemicals with the fibers.
6. Determine ash and sulphur.
7. Detect finished chemicals of the fibers.
8. Observe the fiber with microscope.
9. Take photograph of the section and determine α and β .
10. Refer the records of manufacture of the fibers in the factory. Comparing these results with those of the normal fibers of the factory, the cause will become distinct.

Ex. 1. The sample is hard feeling and has ordinary appearance, luster and dyeing affinity. According to the test of the quality, it is a large denier, an inferior strength and there are a few serrations. The cause was much derivation of viscose in the spinning and the reaction became imperfect.

Ex. 2. The sample has milky appearance, less luster and good dyeing affinity. As results of the test, a large denier, an inferior strength and a rough surface are observed with microscope. The cause is the same as in Ex. 1.

Ex. 3. The sample indicated alkalinity after drying in the process of manufacture. It has ordinary appearance, luster strength and elongation, but it is traced milky and has a deep dyeing

affinity. There are large serrations but no small ones in the section. It was due to the drop of temperature of atmosphere or the second bath in the spinning process what produced the imperfect reaction.

Ex. 4. The sample has a yellowish appearance, a hard feeling and a different section. This is the fiber of an incomplete spinning reaction.

Ex. 5. The sample has an ordinary appearance and a large volume as compared with its weight. As the section is complex, it was spun with the bath of high temperature or the viscose of low percentage and gas was evolved.

Ex. 6. The sample is brittle. It has a little elongation but no difference at any quality as compared with the normal fibers. As the finished material indicated acid reaction, it has damaged the fibers.

Ex. 7. Sample of bad dyeing affinity. There are many causes to produce bad dyeing affinity, therefore I refer to the next report: Z. Kawata, this journal, 1932. 5. 94.

III. Important Items

1. On viscose.

The conditions of viscose are changed for use, viz. cellophane, staple fiber, rayon, mat or hollow rayon etc.... The composition of viscose is the most important and the viscosity must be high without difficulty of use.

2. On Bath.

The spinning bath must be composed with acid, salts and an additional product in one solution and one of the salts must be metallic. The reaction of the spinning bath can be measured after the method of the second report.

3. On the test of the fibers.

The practical test of quality of the fibers is done chiefly with regard to strength and elongation; moreover it must be done to measure dyeing affinity and section, and then we can know distinctly the quality of the fiber and the method of its manufacture.