

May 24, 1955

D. BURKS, JR
RESIN-TREATED REGENERATED CELLULOSE TEXTILE
MATERIAL AND METHOD OF MAKING THE SAME

2,709,141

Filed June 28, 1952

2 Sheets-Sheet 1

FIG. 1

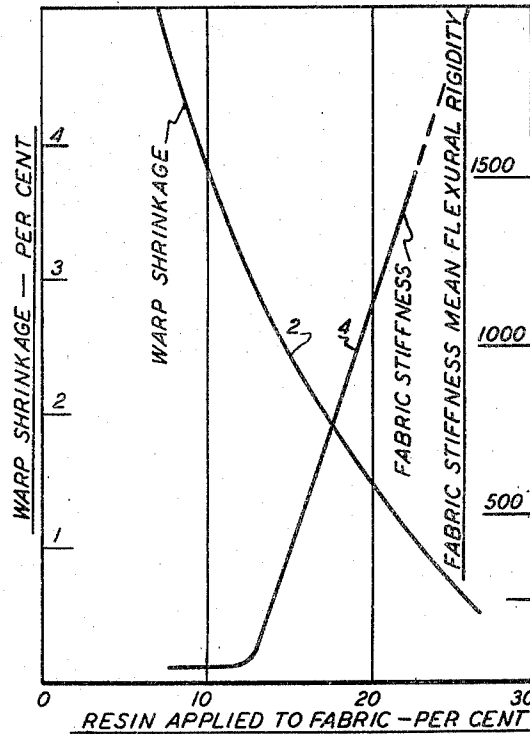
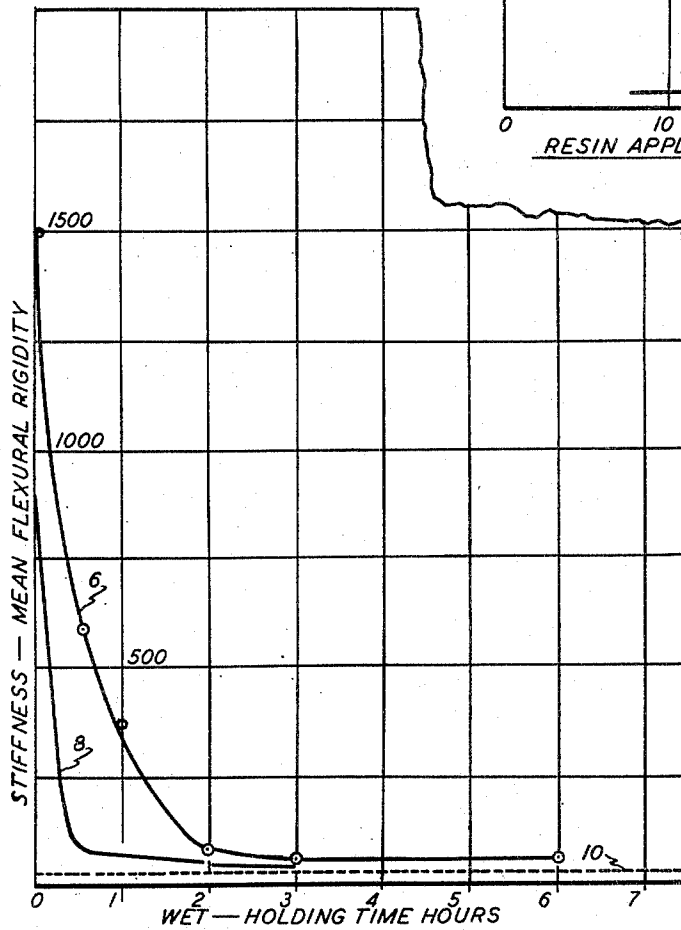


FIG. 2



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FIG. 3

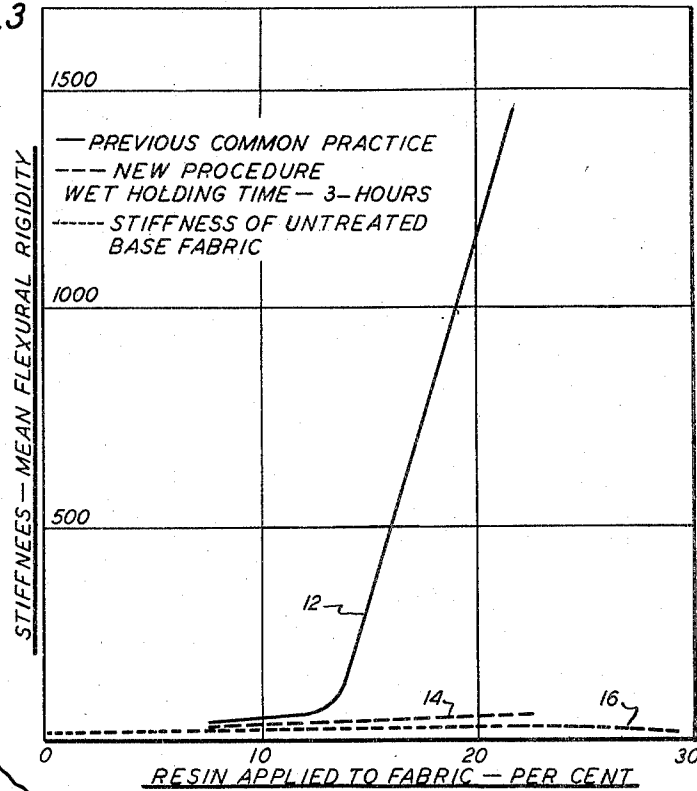
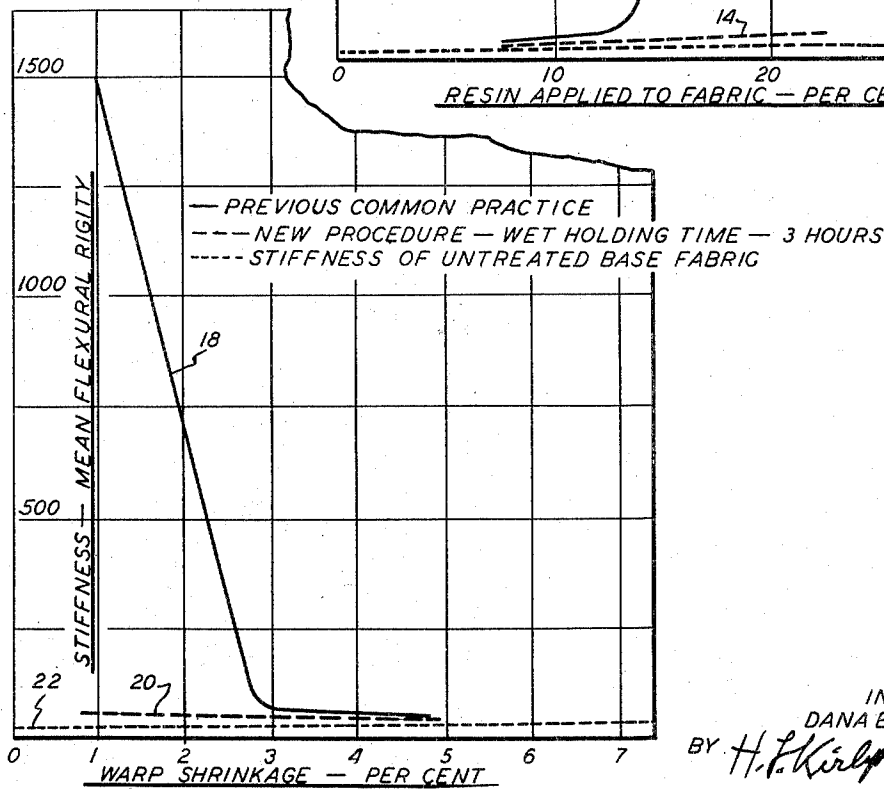


FIG. 4



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2,709,141

RESIN-TREATED REGENERATED CELLULOSE TEXTILE MATERIAL AND METHOD OF MAKING THE SAME

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Application June 28, 1952, Serial No. 296,226

14 Claims. (Cl. 117—139.4)

The present invention relates to the finishing of regenerated cellulose textile fabrics and more particularly to a novel regenerated cellulose textile fabric treated with synthetic resin precondensates, and the method of making the same.

Although regenerated cellulose fabrics have enjoyed considerable commercial success, they suffer from deficiencies which have seriously limited their utility. Such fabrics shrink excessively in laundering and because the shrinkage is progressive, cannot be satisfactorily stabilized by compressive shrinking methods, such as the "Sanforizing" process used on high-quality cotton fabrics. In light, open-weave fabrics for use as curtains this shrinkage may amount to as much as 15%. Even in heavier weight, more closely woven constructions suitable for outer wear, these fabrics shrink from 5 to 10%. Moreover, in outerwear fabrics an extremely desirable property is high resiliency, or the capacity to recover readily from wrinkling or creasing, and regenerated cellulose fabrics do not possess this property to any appreciable degree.

It has been well known in the art of finishing regenerated cellulose textile fabrics that the tendency of the fabric to shrink in laundering could be reduced and that its capacity to recover from wrinkling or creasing could be increased by impregnating the fabric with a solution or dispersion of a synthetic resin precondensate and a polymerization catalyst, and then curing the resin on the fabric. The improvement of the fabric with respect to dimensional stability and ability to recover from creasing is approximately proportional to the amount of resin applied. However, under conventional processing conditions, as the weight percentage of applied resin is increased to the point at which the regenerated cellulose contains an amount of the resin precondensate within the range from about 15% to about 35% on a weight basis, it has been found that the stiffness of the fabric sharply increases to an objectionable level, and other important properties of the fabric, such as tensile strength and elongation, are adversely affected. The resulting fabric is totally unsuited for ordinary textile uses.

It is the object of my invention to provide a method of resin-treating regenerated cellulose fabrics whereby the amount of resin precondensate applied to the fabric may be significantly increased beyond the level which has hitherto been feasible.

My invention is based on my surprising discovery that if a regenerated cellulose fabric, impregnated with a conventional polymerization catalyst and an aqueous solution of a synthetic resin precondensate is kept wet without substantial drying, following its impregnation with the resin solution and prior to the drying and curing of the fabric, for a period of time exceeding about 10 minutes, the amount of resin precondensate which may be applied to the fabric may be substantially increased beyond

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the point at which, in the absence of my wet-holding step, the cured fabric would be objectionably stiff and brittle.

The resins which I have found satisfactory for use in my process are water-soluble essentially monomeric precondensates selected from the group consisting of dimethylol urea, the lower alkylolmelamines, the lower alkyl ethers of dimethylol urea and the lower alkyl ethers of the lower alkylolmelamines.

Any of the conventional, readily cold-water soluble polymerization catalysts are suitable for use in my process. Among such catalysts are zinc chloride, diammonium hydrogen phosphate, ammonium chloride, ammonium sulfate, acetic acid, and oxalic acid. The choice of the particular catalyst is dependent on the resin employed and will ordinarily be determined by the recommendation of the resin supplier. I prefer to use an acid-forming catalyst, e. g. zinc chloride or ammonium salts of the mineral acids, rather than an acid itself.

The textile material to be treated in accordance with the invention may be in the form of webs or bats or woven, unwoven, knitted or other rayon constructions. Fabrics containing a mixture of fibers of regenerated cellulose and other natural or synthetic fibers may be used. Both warp and weft may contain or consist of regenerated cellulose, or one of these may be formed entirely or partly of other material such as cotton, cellulose acetate, or nylon. The term "regenerated cellulose" as used herein is intended to include regenerated cellulose whether made by the viscose or cuprammonium process. The fabric to be treated may first be thoroughly bottomed by scouring in the usual manner to remove sizing and other foreign material. After the bottoming treatment, the fabric is dried, preferably while framed to its original greige dimensions.

In carrying out my process, I first impregnate the fabric with an aqueous solution of the resin precondensate and a conventional cold water soluble polymerization catalyst. Following impregnation I reduce the fluid content of the fabric and so control the amount of applied resin, preferably by use of a pad mangle although any conventional equipment will suffice. When a pad mangle is used, the excess fluid is expressed by nipping the fabric through rollers the nips of which have been set at the appropriate pressure to control the amount of resin solution retained by the fabric. For optimum results, this amount should be such that the weight percentage of resin solution in the regenerated cellulose is not greater than 85%, and ordinarily is between about 60 and 80%. The saturated fabric is then stored in a closed container or batched on a shell and covered to avoid drying, and held for the critical period, i. e., for more than about 10 minutes. At the end of this wet-holding period, the wet fabric is framed to substantially the original greige dimensions and dried to remove the water. After the drying step the treated fabric is cured in the conventional way to effect polymerization of the resin. Curing may be carried out by passing the fabric over infra-red lamps, passing the fabric through a hot air chamber, or processing in any manner suitable for the particular conditions. The curing temperatures may vary considerably from about 325° to over 400° F. with a corresponding reduction in the time of cure with the increase of temperature.

Illustrative of the utility of my invention is its application to the resin-finishing of rayon marquisette curtain fabrics. Because of their open-mesh construction, such fabrics are notoriously dimensionally unstable when laundered, and many attempts have been made to shrink-

proof them by the application of synthetic resin precondensates. So far as I am aware, the art has not succeeded in producing a supple, light-weight, regenerated cellulose curtain fabric which will shrink less than about 3.5% upon repeated laundering. The accompanying drawings show the problem which existed with respect to the resin-treatment of such fabrics and the solution of the problem provided by my invention.

Fig. 1 is a graph showing the prior art effect of resin application on warpwise shrinkage and on fabric stiffness (as measured by the mean flexural rigidity as hereinafter defined);

Fig. 2 is a graph showing the effect of my novel finishing process on the stiffness of fabrics containing large amounts of resin;

Fig. 3 is a graph illustrating the relationship between fabric stiffness and the amount of applied resin in my fabric and in prior art resin-treated fabrics; and,

Fig. 4 is a graph showing the relationship between fabric stiffness and warpwise shrinkage on repeated laundering of my fabric and of prior art resin-treated fabrics.

For the purpose of quantitatively evaluating and comparing the qualities of flexibility and suppleness of different fabrics I have selected fabric stiffness as the physical property which primarily determines these qualities. As a measurement of stiffness I have adopted the quantity "mean flexural rigidity," sometimes hereinafter abbreviated to MFR. The numerical value of "mean flexural rigidity" is equal to the geometric mean of the flexural rigidity value for the warp and the flexural rigidity value for the filling, each value being expressed in milligram-centimeters and computed in the manner described by F. T. Pierce, "The handle of cloth as a measurable quantity," *The Journal of the Textile Institute, Transactions*, vol. 21, page 400 (1939).

Curve 2 of Fig. 1 shows a typical instance of the variation of warp shrinkage with increasing amounts of applied resin. This curve, and all of the graphs of Figs. 1-4, represent test data obtained on an open-mesh regenerated cellulose marquisette. The curves of Fig. 1 were obtained by impregnating the fabric with an aqueous solution of dimethyl ether of dimethylolurea and zinc chloride as a catalyst, drying at 175° F. and curing at 350° F., in accordance with a current commercial shrinkproofing process, and then testing for shrinkability as specified in the Standard Government Wash Test, CCC-T-191A (Rayon). It will be observed from curve 2 that application of amounts of resin greater than about 15% is necessary to reduce the shrinkage to a value of the order of 2% or less.

Curve 4, Fig. 1, illustrates the accompanying increase in fabric stiffness with increasing amounts of resin applied to the same fabric. As this curve shows, application of as much as 15% of resin precondensate would increase the stiffness of the fabric to a value many times the value for the untreated fabric, and result in a boardy fabric useless for most purposes. It is evident from a consideration of curves 2 and 4 that desirable low levels of dimensional stability could not be attained by the application of large amounts of resin without destroying the fabric's qualities of flexibility, drapability and suppleness.

The remarkable result of my new process is graphically illustrated in Fig. 2, in which the curves show the decrease in mean flexural rigidity of the cured fabric as the wet-holding time is increased. Curve 6 was obtained on a fabric in which 22.5% of resin precondensate had been incorporated; the fabric of curve 8 was similar except that the amount of precondensate applied was 18.0%. Line 10 shows the flexural rigidity of the same fabric untreated. It will be observed from each curve that the fabric stiffness is reduced to a level that approximates that of the untreated base fabric, even with large amounts of applied resin.

The effect of the amount of applied resin is further shown by Fig. 3 in which curve 12 shows the rapid increase of fabric stiffness as the amount of resin applied is increased above about 12% in a conventional process.

Curve 14 shows the effect of a wet-holding step of 3 hours' duration in a process otherwise the same, as applied to the same fabric, in keeping the mean flexural rigidity at about the same value, line 16, as that of the untreated fabric.

Fig. 4 shows the effect of the wet-holding step on fabric stiffness for different degrees of shrinkproofness of the fabric. Curve 20 represents a fabric of my invention (curve 14) as contrasted with the curve 18 for a prior art fabric (curve 12). Line 22 indicates the mean flexural rigidity value for the untreated fabric. From these curves it is clear that the long-sought objective—low shrinkage combined with low stiffness—has been attained.

As shown by curve 4 of Fig. 1, the maximum amount of resin precondensate which may be applied to a rayon marquisette fabric by prior-art methods, without substantially destroying its flexibility and suppleness, is less than about 15%. For heavier-weight fabrics such as are used in suitings, sport shirts, uniforms, and garment interliners, curves similar to curve 4 may be drawn but the resin-level at which the fabric stiffness increases sharply in the absence of my wet-holding step will generally be higher than about 15% and lower than about 25% depending primarily on the particular fabric. For example, with a 48 x 47, 2.85 pounds/yard, regenerated cellulose woven sheeting, I have found that my wet-holding step may not produce a significant change in fabric properties until the amount of resin precondensate applied is increased to about 20%.

Although I am unable to give any formula for predicting precisely the lower resin-level at which my wet-holding step becomes important in the resin-treatment of heavier-weight fabrics, the fact remains that my invention makes it possible to increase the amount of resin significantly beyond this level without destroying the utility of the fabric. Furthermore, the interaction of variables of the process, such as ambient temperature, humidity, age of the precondensate, and local differences within the fabric with respect to resin concentration—variables which are difficult or impossible for the operator to control in commercial finishing—make it advisable to employ my wet-holding step whenever the amount of applied resin exceeds about 15%.

The duration of the wet-holding step necessary to produce a commercially useful fabric will vary with the amount and type of resin precondensate applied, the characteristics of the particular regenerated cellulose, and other variables of the process, but is, I have found, usually longer than about 25 minutes. Continued improvement in the suppleness and flexibility of the resin-treated and cured fabric is obtained in some cases with wet-holding periods as long as three days. When the amount of applied resin is near the lower resin-level at which my wet-holding step becomes important, generally the duration of the wet-holding step required to obtain a given degree of suppleness will be shorter than when the amount of applied resin is greater. The optimum duration required by any particular set of conditions can readily be determined by the skilled operator. Ordinarily this time will be between about one hour and four or five hours.

While it may be possible under some circumstances with relatively heavy-weight regenerated cellulose fabrics to apply sufficient resin to secure adequate shrinkage control without using my wet-holding step, the improvement in other fabric properties obtained by a further increment of applied resin is remarkable. In the garment interliner field I have been able to produce fabrics which are equal, or even superior, in crease-resistance to the highest quality animal-fiber interliners. The larger

amounts of resin which may be applied by my process greatly reduced the water-imbibition capacity of the fabric, although the fabric still retains a high capacity for transmitting moisture. In shirting or suiting materials these properties are especially desirable, and such fabrics treated according to my invention will dry as rapidly as nylon fabrics of similar construction but will not create the clamminess associated with nylon fabrics because of the low capacity of nylon to transmit moisture away from the body of the wearer.

While my process permits a significant increase in the amounts of resin precondensate which may be applied to regenerated cellulose fabrics, it is important to point out that these fabrics have an ultimate capacity for resin which is generally about 35% based on the relative weights of the applied resin and the untreated regenerated cellulose. The exact capacity will vary somewhat with the particular fabric and with the variables of the process. When this ultimate capacity has been exceeded, no amount of wet-holding will suffice to avoid stiffness.

The following examples of specific ways in which my process may be carried out to produce my novel fabric are given by way of illustration of my invention and not of limitation thereof:

Example I

A 48 x 47, 2.85 yard, 39" bottomed white regenerated cellulose (viscose) woven sheeting, which following bottoming had been dried on a tenter to substantially the original greige dimensions, was impregnated with an aqueous solution containing 27.5% of dimethyl ether of dimethylol urea, and 2.5% of zinc chloride (catalyst). The impregnated fabric was pressed between squeeze rolls at such a pressure that the saturated fabric retained a weight of solution equal to about 74% of the original weight of the fabric. A portion (A) of the squeezed fabric was dried according to conventional practice—i. e., within 2–3 minutes after impregnation and cured in an oven at 350° for three minutes; the remainder (B) was batched on a roll, covered to prevent drying, and allowed to stand in a wet condition for 18 hours. The wet fabric was then dried in a drying oven at 150° F. for 2 minutes and finally cured in an oven at 350° F. for three minutes.

The mean flexural rigidity of both treated fabric portions, and of an untreated control sample (C) of the same fabric, was determined. Samples (B) and (C) were then washed in accordance with the Government Standard Wash Test, CCC-T-191A (Rayon). The mean flexural rigidity (MFR) values, and the warp shrinkage after each washing are shown in the following table:

Fabric	Resin Pickup, percent	MFR	Warp Shrinkage, percent				
			1st Wash	2nd Wash	3rd Wash	4th Wash	5th Wash
Treated (A)-----	20.4	2,440	0.7	0.9	1.0	1.1	1.1
Fabric (B)-----	20.4	158					
Untreated Fabric (C)-----	0.0	126	10.0	10.9	11.5	11.7	11.7

Example II

A 44 x 30, white regenerated cellulose (viscose) marquisette, which had been bottomed and then dried on a tenter to substantially the original greige dimensions, was impregnated with an aqueous solution containing 35% of dimethylol urea resin (American Cyanamid-Aerotex 450), and 3.2% of zinc chloride (catalyst). The impregnated fabric was pressed between squeeze rolls at a pressure such that the saturated fabric retained a weight of solution approximately equal to 60% of the original weight of the fabric and a weight of dimethylol urea resin approximately equal to 21% of the original weight of the fabric. The squeezed fabric was then batched on a roll, covered to prevent drying and allowed to stand in a wet condition for about 17 hours. The wet fabric was

dried in a covered tenter frame at a temperature of 150° F. and then cured in an oven at 340° F. for five minutes.

The MFR values for five samples and a control sample were determined and the samples then washed in accordance with the Government Standard Wash Test, CCC-T-191A (Rayon). The following table shows shrinkage and MFR data for each of these samples as well as the MFR of a sample (6) of the same base fabric identically treated except for the omission of my wet-holding step.

Samples-----	1	2	3	4	5	6	Un-treated Fabric
MFR-----	85	79	78	79	90	1,370	23
Warp Shrinkage----	1.9	1.8	1.1	1.9	1.9	-----	13.3

Example III

A 46 x 34, light weight regenerated cellulose (viscose) marquisette, 44" wide, which had been bottomed and dried on a tenter frame to substantially the original greige dimensions, was impregnated with an aqueous solution containing 23.6% of water soluble methylated methylol-melamine and 2.1% of zinc chloride (catalyst). The fabric was pressed between squeeze rolls under a pressure such that the fabric retained a weight of solution equal to about 77% of the original weight of the fabric. The wet fabric was then batched on a roll, covered to prevent drying and allowed to stand in a wet condition for 70 hours. The wet fabric was next dried in a drying oven at 150° F. for two minutes, and then cured in a curing oven at 350° F. for 3 minutes.

The following table gives the pertinent shrinkage and MFR data, as well as the mean flexural rigidities determined for otherwise identical runs in which wet-holding times of 3, 8, and 24 hours were employed.

Fabric	Resin Pickup, percent	MFR	Warp Shrinkage, Percent				
			1st Wash	2nd Wash	3rd Wash	4th Wash	5th Wash
Treated Fabric-----	18.2	3 hrs. 1,165--- 8 hrs. 772--- 24 hrs. 317--- 70 hrs. 110---	0.9	1.0	1.6	1.1	1.6
Untreated Fabric-----	0.0	23-----					
			13.3	14.5	14.2	14.1	14.0

Example IV

Two samples of a 46 x 34 light weight marquisette 44 inches wide, with nylon filling and regenerated cellulose (viscose) warps, which had been boarded, bottomed, and dried on a tenter frame to substantially the original greige dimensions, were impregnated with an aqueous solution containing 30% of dimethyl ether of dimethylol urea and 2.7% of zinc chloride (catalyst). The wet fabrics were passed between squeeze rolls at a pressure such that they retained a weight of solution equal to about 50% of the original weight of the fabric (or about 73% based on the regenerated cellulose portion of the fabric), then batched on a shell, covered to prevent drying, and allowed to stand (one sample for approximately 3 hours and the other for 20 hours). The wet samples were dried in a covered tenter at approximately their original greige dimensions, at 150° F., for two minutes, and then cured in an oven at 350° F. for about three minutes. Analysis showed that substantially all of the cured resin present was in the viscose warp yarns. The mean flexural rigidity of the cured samples, and of an untreated control sample of the same fabric was determined and the fabrics were then washed in accordance with the Government Standard Wash Test, CCC-T-191A (Rayon).

The following table shows shrinkage and MFR data for each of these samples as well as the MFR of the fabric

identically treated except for the omission of my wet-holding step.

Fabric	Resin Pickup, Percent	MFR	Warp Shrinkage, Percent				
			1st Wash	2nd Wash	3rd Wash	4th Wash	5th Wash
Treated Fabric.....	*15	3 hrs. 98.....	1.4	1.4	1.7	1.7	1.8
Untreated Fabric.....	0.0	20 hrs. 82.....	1.1	1.1	1.2	1.2	1.5
Treated Fabric, No wet-holding.	*15	22.....	14.2	14.7	16.0	16.7	16.7
		526.....					

*Or about 22% based on the regenerated cellulose.

Example V

A sample of a 46 x 32 regenerated cellulose (viscose) marquisette, 44 inches wide, which had been bottomed and dried on a tenter frame to substantially the original greige dimensions was impregnated with an aqueous resin solution containing 40% of dimethyl ether of dimethylol urea and 3.6% of zinc chloride (catalyst). The impregnated fabric was pressed between squeeze rolls at a pressure such that the saturated fabric retained a weight of solution equal to about 60% of the weight of the original fabric, then batched on a roll, covered to prevent drying, and allowed to stand in a wet condition for about 3 hours. The wet fabric was then framed to substantially the original greige dimensions and dried in a drying oven at 160° F. for about one-half minute. Thereafter, the treated fabric was cured in a curing oven at about 340° F. for three and one half minutes. The cured sample was washed with an untreated control of the same material in accordance with the Government Standard Wash Test, CCC-T-191A (Rayon). The original flexibility and suppleness of the two fabrics as measured by the mean flexural rigidity (MFR) and the dimensional stability of the warp and filling after each washing, expressed as percent, are shown in the following table wherein "W" indicates warpwise and "F" weftwise shrinkage:

Samples	Resin Pickup, Percent	MFR	Shrinkage, Percent									
			1st Wash		2nd Wash		3rd Wash		4th Wash		5th Wash	
			W	F	W	F	W	F	W	F	W	F
Treated Fabric.....	24	45	0.0	*0.3	0.7	0.0	0.8	*0.1	0.9	0.0	1.1	*0.1
Untreated Fabric.....	0.0	23	13.6	11.9	13.4	11.7	11.4	11.7	18.3	13.4	13.9	12.4

*Dimensional increase.

A mean flexural rigidity value of 1125 was obtained for the fabric when treated identically except for the omission of my wet-holding step.

Example VI

A 46 x 34, regenerated cellulose (viscose) marquisette curtain fabric 44" wide, which had been bottomed and

tion containing 40% of water soluble methylolmelamine and 2.4% of an acid-forming catalytic agent produced by Monsanto Chemical Company and sold under the trade name "AC." The fabric was squeezed so as to retain a weight of solution approximately equal to 57% of the original weight of the fabric. Following the squeezing step, the wet saturated fabric was batched on a shell, covered to prevent drying, and allowed to stand for approximately 30 hours. The wet fabric was then dried in a covered tenter at 150° F. for 2 minutes and finally cured in an oven at 350° F. for about three minutes. The fabric had a commercially satisfactory flexibility and suppleness for use as curtain material and a shrinkage less than 2%. The same base fabric when identically treated except for the omission of my wet-holding step, was objectionably stiff and boardy.

Example VII

A composite cotton-viscose rayon fabric (garment interliner fabric) in the greige, consisting of 31.5/1 cotton warps, 64 sley, and 7/1, 3 denier rayon fillings, 38 pick, and weighing 0.46 pound per yard, was desized, framed to 40 inches and dried. The fabric was then impregnated with an aqueous solution containing the following ingredients: dimethyl ether of dimethylol urea about 35%; zinc chloride about 3.2 percent and a small amount of pigment dyes. Following impregnation, the fabric was pressed between squeeze rolls so that it retained a weight of solution equal to about 70% of the weight of the original fabric, then batched on a roll, covered to prevent evaporation, and allowed to stand in a damp condition for approximately 48 hours. The wet fabric was then framed to a width of 40 inches, dried in a drying oven at 260° F. for about 2 minutes and then cured in a curing oven at 340° F. for five minutes. The cured sample was thereafter treated with a 6% aqueous solution of ammonia, allowed to stand in a damp condition for 3 hours, jig washed first in cold water and then in warm water at 140° F., again framed to a width of 40 inches and dried. The finished sample was washed with an untreated control sample of the same fabric in accordance with the Standard

Government Wash Test CCC-T-191A (Rayon). The original flexibility and suppleness of the two fabrics as measured by the mean flexural rigidity (MFR) and the dimensional stability of the warp and filling after each washing, expressed as percent, are shown in the following table:

Fabric	Resin Pickup, Percent	MFR	Shrinkage, Percent									
			1st Wash		2nd Wash		3rd Wash		4th Wash		5th Wash	
			W	F	W	F	W	F	W	F	W	F
Treated.....	24.5	321	0.6	*1.1	1.0	*1.6	1.0	*1.2	1.1	*1.1	1.3	*1.2
Untreated.....		207	8.8	*5.3	9.7	*5.3	9.6	*5.0	10.6	*5.3	9.9	*4.4

*Dimensional increase.

then dried on a tenter frame to substantially the original greige dimensions, was impregnated with an aqueous solu-

The mean flexural rigidity value of 321 shown in the above table compares with an MFR value of 1810 for

the same base fabric when identically treated except for the omission of my wet-holding step.

Example VIII

A sample of a 46 x 32 regenerated cellulose (viscose) marquisette 44 inches wide, which has been bottomed, and dried on a tenter frame to substantially the original greige dimensions, was impregnated with an aqueous solution containing 40% of dimethyl ether of dimethylol urea and 3.6% zinc chloride (catalyst). The wet fabric was passed between squeeze rolls at a pressure such that it retained a weight of solution equal to about 60% of the weight of the original fabric, then batched on a shell, covered to prevent drying, and allowed to stand in a wet condition for 31 minutes. Thereafter the wet sample was framed to substantially the original greige dimensions and dried in a covered tenter at 150° F., for two minutes, and then cured in a curing oven at 350° F. for about three minutes. The cured samples were washed, with an untreated control sample of the same fabric, in accordance with the Government Standard Wash Test, CCC-T-191A (Rayon). The original flexibility and suppleness of the two fabrics as measured by the mean flexural rigidity (MFR) and the warp shrinkage after each washing, expressed in per cent, are shown in the following table, which also includes, for comparison, the MFR of the same base fabric when identically treated except for the omission of my wet-holding step.

	Resin Pickup, Percent	MFR	Warp Shrinkage, Percent				
			1st Wash	2nd Wash	3rd Wash	4th Wash	5th Wash
Treated Fabric.....	24	53	1.7	1.7	1.7	1.7	1.1
Untreated Fabric.....	0.0	23	13.3	14.5	14.2	14.1	14.0
Treated Fabric, No wet-holding.....	24	1,160	-----	-----	-----	-----	-----

In all of the foregoing examples the fabric was framed to substantially its original greige dimensions after the wet-holding step and immediately before drying.

The present application is a continuation-in-part of my prior application, Serial No. 78,414, filed February 25, 1949, and now abandoned.

I claim:

1. The process of treating a textile material containing regenerated cellulose to render it dimensionally stable to repeated laundering, reduce its water imbibition capacity and greatly increase its resilience while preserving substantially unimpaired the flexibility and suppleness of the untreated material as measured by its mean flexural rigidity, which comprises impregnating the material with an aqueous solution of an acidic, readily-cold-water-soluble polymerization catalyst and an essentially monomeric resin precondensate selected from the class consisting of dimethylol urea, the lower alkylolmelamines, the lower alkyl ethers of dimethylol urea and the lower alkyl ethers of the lower alkylolmelamines, squeezing the impregnated material to leave in the material an amount of the solution no more than sufficient to provide on the regenerated cellulose up to a limit of about 85% of solution and an amount of the resin precondensate within the range from about 15% to about 35%, both based on the weight of the regenerated cellulose, maintaining the squeezed impregnated material in a wet condition at room temperature for a period of from about 10 minutes to about 3 days, and thereafter drying the material and subjecting the dried material to a curing temperature to convert the resin precondensate to water insoluble condition, the amount of resin fixed in the material being significantly greater than the least amount which would cause the material after curing to be objectionably stiff in the absence of the step of maintaining the material in a wet condition.

2. A process according to claim 1, in which the resin precondensate is dimethylol urea.

3. A process according to claim 1 in which the resin precondensate is a lower alkylolmelamine.

4. A process according to claim 1 in which the resin precondensate is a lower alkyl ether of dimethylol urea.

5. A process according to claim 1 in which the resin precondensate is a lower alkyl ether of a lower alkyl melamine.

6. A process according to claim 4 in which the regenerated cellulose is viscose.

7. A process according to claim 4 in which the polymerization catalyst is an acid salt.

8. A process according to claim 4 in which the polymerization catalyst is an acid salt selected from the class consisting of ammonium chloride, zinc chloride, and diammonium phosphate.

9. A process according to claim 4 in which the squeezed impregnated material is maintained in a wet condition for a period of at least one hour.

10. A process according to claim 4 in which the curing temperature is between about 325° F. and about 400° F.

11. The method of treating a textile sheet material containing cellulose regenerated from viscose to render said sheet material dimensionally stable to repeated laundering, reduce its water-imbibition capacity and greatly increase its resilience while preserving substantially unimpaired the flexibility and suppleness of the untreated material which comprises impregnating the material with an aqueous solution of a polymerization catalyst selected from the group consisting of ammonium chloride, zinc chloride, and diammonium phosphate, and an essentially monomeric lower alkyl ether of dimethylol urea, squeezing the impregnated material to leave in the material a weight percentage of solution no more than sufficient to provide on the regenerated cellulose up to a limit of about 85% of solution and an amount of the lower alkyl ether of dimethylol urea within the range from about 15% to about 35%, both by weight of the regenerated cellulose, maintaining the squeezed impregnated material in a wet condition at room temperature for a period from about one hour to three days, and thereafter drying the material and subjecting it to a curing temperature between about 325° F. and 400° F., the amount of resin fixed in the material being significantly greater than the least amount which would cause the material after curing to be objectionably stiff in the absence of the step of maintaining the material in a wet condition.

12. The process of claim 1 wherein the textile material consists of cotton and regenerated cellulose.

13. The process of claim 1 wherein the textile material consists of regenerated cellulose.

14. A supple, highly resilient, resin-treated textile sheet material containing regenerated cellulose, said material having been impregnated with an aqueous solution of an acidic readily-cold-water soluble polymerization catalyst and an essentially monomeric resin precondensate selected from the class consisting of dimethylol urea, the lower alkylolmelamines, the lower alkyl ethers of dimethylol urea and the lower alkyl ethers of the lower alkylolmelamines, to leave in the material an amount of the solution no more than sufficient to provide on the regenerated cellulose up to a limit of about 85% of solution and an amount of the resin precondensate within the range from about 15% to about 35%, both based on the weight of the regenerated cellulose, the material thereafter having been maintained in a wet condition at room temperature for a period of from 10 minutes to about 3 days, and the material thereafter having been dried and the resin cured, the amount of resin fixed in the material being significantly greater than the least amount which would cause the material after curing to be objectionably stiff in the absence of the step of maintaining the material in a wet condition, and sufficient to render the material dimensionally stable to repeated laundering, the

material having a reduced water-imbibition capacity, greatly increased resilience and substantially the flexibility and suppleness of the untreated material as measured by its mean flexural rigidity.

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