United States Patent Office

3,279,882

Patented Oct. 18, 1966

3,279,882

PROCESS OF STABILIZING PROTEINACEOUS MATERIALS THROUGH TREATMENT WITH A POLYETHYLENEIMINE AND A POLYAZIRIDINE

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No Drawing. Filed July 7, 1964, Ser. No. 380,909
15 Claims. (Cl. 8—127.6)

The present application is a continuation-in-part of applicant's copending application Serial No. 105,285, filed April 25, 1961, now U.S. Patent No. 3,165,375, the entire disclosure of which is relied on and incorporated herein by reference.

The present invention relates to a method for treating proteinaceous materials in order to improve the physico-chemical properties thereof and more particularly, the present invention relates to a method for improving the dimensional stability and shrink resistance of textile materials containing wool, which employs a group of polyfunctional compounds. The present invention also pertains to products obtained by the aforesaid method.

In the above identified application there is disclosed a method for shrink-proofing textile materials containing wool by treating them with certain polyaziridinyl compounds. Polyaziridinyl compounds in which the nitrogen atom of the aziridine rings is an amino nitrogen, i.e., attached to a substituted or unsubstituted hydrocarbon residue, are aminoaziridine compounds and are shown to be vastly superior for the purpose of improving the physico-chemical properties of woolen textiles to those aziridinyl compounds in which the nitrogen atom of the aziridinyl groups is an amido nitrogen. However, because the amidoaziridine compounds are generally more economical and easier to prepare than are the aminoaziridine compounds, the amidoaziridine compounds are important for large scale, commercial operations in the shrink proofing of wool. It is therefore extremely desirable to improve the effectiveness of amidoaziridine compounds for shrink proofing of textile materials.

Accordingly, it is the object of the present invention to provide a method for treating proteinaceous materials, particularly textile materials containing wool, with amidoaziridine compounds to improve and enhance the physico-chemical properties of the treated material which improves the effectiveness of the amidoaziridine compounds and overcomes the disadvantages and drawbacks of other methods and compositions.

It is a further object of the present invention to provide a method for improving the effectiveness of amidoaziridine compounds for the treatment of textile materials containing wool in order to obtain a dimensionally stable textile product.

It is a further object of the present invention to provide a method for the shrink-proofing of woolen textile materials with amidoaziridine compounds that is unexpectedly superior to prior methods employing amidoaziridine compounds.

It is a further object of the present invention to provide dimensionally stable textile materials containing wool which have been treated according to the foregoing methods.

In attaining the above objects, one feature of the present invention resides in treating the proteinaceous materials with an aziridine compound and a particular polyamine compound, to be described hereinafter, whereby the dimensional properties of the treated material are greatly improved.

Another feature of the present invention resides in applying to the textile materials containing wool, a composition containing an amidoaziridine compound and an acyclic polyamine whereby an unexpected improvement in the dimensional properties of the treated textile are obtained.

Another feature of the present invention resides in treating textile material containing wool with a composition containing an amidoaziridine compound, an acyclic polyamine and certain other compounds which impart desirable functional properties such as water and/or oil repellency.

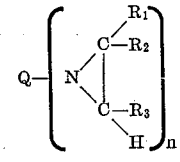
Other objects, features and advantages of the present invention will become apparent from the following detailed description hereof.

According to the present invention, the physico-chemical properties of proteinaceous materials such as textile materials containing wool can be vastly improved by applying thereto certain amidoaziridine compounds and certain acyclic polyamines as will be described hereinafter.

The effectiveness of polyaziridine compounds in which the nitrogen atom of the aziridine ring is an amide nitrogen for the dimensional stabilization of wool can be greatly increased by employing the amidoaziridine compounds in admixture with certain acyclic polyamines. The results obtained according to the present invention are comparable to the excellent results obtained by using the aminoaziridine compounds described in applicant's copending application Serial No. 105,285. Moreover, since the polyaziridines of the amide type are generally more economical and easier to prepare than the polyaziridines of the amine type, the increased effectiveness of compounds of the amidoaziridinyl type when employed in combination with the economic acyclic polyamines is a very desirable and useful result representing a considerable advantage and improvement in the art of textile treatment.

The aziridine compounds which are employed for purposes of the present invention as will be described in detail can be represented by the formula:

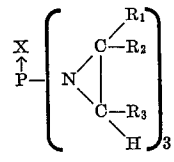
(I)



wherein R_1, R_2 and R_3 are selected from the group consisting of hydrogen and lower alkyl, n is an integer with a value of 2 to 3, Q is an organic or inorganic group and is connected to the nitrogen by an atom that is free of hydrogen and has its remaining valences satisfied by oxygen, sulfur or carbon atoms.

Among the polyaziridines of the amide type are the phosphoramides which are represented by the structural formula:

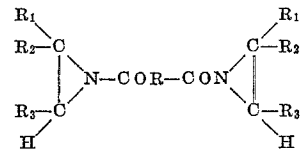
(II)



wherein R_1, R_2 and R_3 have the meaning given above and X is selected from the group consisting of oxygen and sulfur.

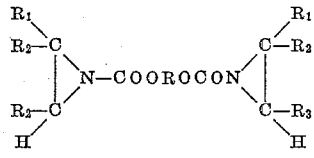
Further polyaziridines of the amide type suitable for

purposes of the present invention are the carboxamides which are represented by the structural formula:

(III) 

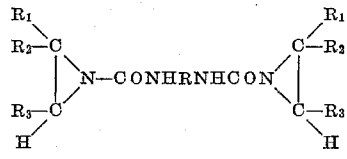
wherein R_1, R_2 and R_3 have the meaning given above and R represents a divalent organic group such as alkylene containing from 2 to 10 carbon atoms, hydroxy-substituted alkylene, and the like.

Included among the amidopolyaziridines are the carbamates which are represented by the structural formula:

(IV) 

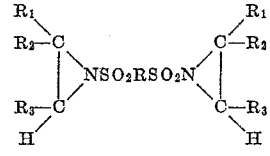
wherein R, R_1, R_2 and R_3 have the meaning given above.

Additional polyaziridine compounds of the amide type include substituted ureas represented by the structural formula:

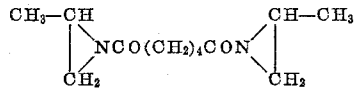
(V) 

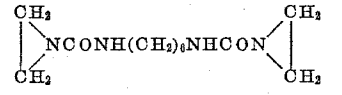
wherein R, R_1, R_2 and R_3 have the meaning given above.

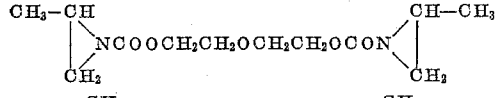
Still further examples of polyaziridine compounds included among the amide type are the sulfonamides represented by the structural formula:

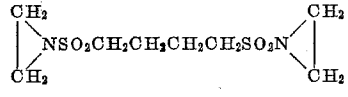
(VI) 

Representative compounds included within Formulae II through VI described above are listed below.

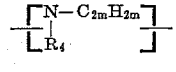
(a) 

(b) 

(c) 

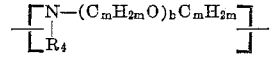
(d) 

The polyamines that can be employed in practising the methods of the present invention generally contain at least five amino groups per molecule and include polyalkylene polyamines containing the repeating unit represented by the structural formula:

(VII) 

wherein R_4 is selected from the group consisting of hydrogen and alkyl and *m* has a value of 2 to 6.

Additional polyamines are the polyaminopolyalkylene oxides containing the repeating unit represented by the structural formula:

(VIII) 

in which R_4 and *m* have the same meaning as given above and *b* is an integer with a value of 1 to 20.

According to the method of the present invention the textile material which may be in the form of fibers, threads, yarns or fabrics is contacted with a solution containing the polyaziridine of the amide type together with a polyamine. Water is the preferred solvent vehicle although any inert organic solvent can also be employed providing it does not interfere with the reaction or does not deleteriously affect the final product. In practice, the reactants can be employed in varying amount ranging, for example, from 10 parts polyaziridine and 90 parts polyamine to 90 parts polyaziridine and 10 parts polyamine. The optimum ratio of reactants for a specific mixture can be suitably varied so as to produce the most desirable product.

In general, the pH of the treating solution can, if desired, be adujsted to about 6 to 7 with acid in order to avoid possible damage to the woolen fabric or fiber which may result at elevated temperature from the alkalinity of the solution.

The total concentration of the reagent including polyaziridine plus polyamine that is employed for the treatment of the woolen textile can be varied over a considerable range, however, concentrations of 1% to about 10% based on the weight of the textile material treated are generally preferred.

Many methods for applying the reagent solution to the textile material can be utilized for the purposes of the present invention including spraying, dipping, padding and the like. Excess solution is squeezed out, for example, by passing the fabric through pad rolls or by centrifuging.

After impregnation, the textile is dried and then heated for a brief period of time to complete the reaction of polyaziridine and polyamine with each other and with the wool. Heating for about 1 to 10 min. at a temperature varying from 250° F. to 350° F. is generally sufficient. It is understood, of course, that both the duration and the temperature at which the heating is carried out can be varied from the stated figures. Generally, the textile material is washed to remove the unreacted materials which then completes the process.

It has been observed that woolen textile materials treated according to the methods of the present invention exhibit a shrinkage which is reduced from an excessive value of as much as 50% after 5 launderings for some woolen fabrics to less than about 5% area shrinkage under optimum conditions of treatment. Moreover, other properties of wool, such as the color, and, appearance and strength are not significantly altered. The shrink-proofing treatment of the present invention is extremely flexible in that it may be applied before or after dyeing with equally good results. The fabrics treated according to the new process are capable of undergoing other treatments, particularly chemical treatments such as creasing, reducing treatments and the like.

As explained above, one feature of the present invention resides in the treatment of textiles containing woal with a treating bath which, in addition to the polyaziridine and polyamine, also contains multi-functional finishes employing various finishing agents to impart certain specific properties. For example, fluoro-chemicals, such as fluoro-organic compounds, can be added to improve stain repellency and water repellency. Surprisingly, it has been found that the durability to laundering and dry cleaning of fluoro-chemical finishes applied in conjunction with the new shrink-proofing process is greatly improved when compared to the durability of the fluoro-chemical finishes applied alone. Thus, the present invention permits one to obtain a highly desirable combina-

tion of properties including, for example, shrink resistance, water repellency and stain repellency, in a single finishing step.

Although reference is made herein to woolen textile materials, it will be understood that it is intended to include fabrics and similar textile materials such as yarns containing 100% wool as well as mixtures of wool fibers with various other materials such as regenerated cellulose, cellulose, linen, polyester fibers and the like. In textile materials wherein blends of wool are used with natural or synthetic fibers, the wool generally comprises at least about 10% by weight.

The following examples are considered as illustrative of the method of the present invention and are not considered limiting thereof in any way. Test methods employed to obtain the results set forth in the examples are as follows.

Stiffness: ASTM D1388–55T Cantilever Method

Flex abrasion: ASTM D1175–61T ½ lb. head, 2 lbs. toggle

Reflectance: Photovolt 610, Search Unit 6104, Green Filter

Colorfastness:

To wash—AATCC 61–1962, Test 1A, 105° F.

To light—AATCC 16A–1963, 20 fadeometer hours.

To crocking—AATCC 8–1961.

To perspiration—AATCC 15–1962.

Shrinkage: Measurement after laundering according to the following washing procedure—18" x 18" specimens with 10" x 10" markings. Washed in automatic agitator home-type washing machine at 105° F. with 5 lb. load using detergent (Fab or Tide) and a running suds for 15 minutes. Washed specimens were rinsed and extracted in the washer for the full cycle and dried flat-bed pressed for 5 seconds at 275° F.–300° F. and conditioned for a minimum of 12 hours at 65% R.H. and 70° F. on a flat horizontal surface. Specimens measured for shrinkage in warp and filling directions. The above washing procedure was repeated as many times as required.

Oil repellency: Test Method Minnesota Mining and Manufacturing Co. Appendix A, pages 1–2. Measured after laundering (same washing procedure as for shrinkage), and after dry cleaning (Minnesota Mining and Manufacturing Co. Test method, Laboratory Dry Cleaning Procedure, Appendix A, page 4, Technical Bulletin).

Example I

Samples of plain weave woolen flannel (100%, fulled, scoured, carbonized, neutralized, ready to dye, weight 6.7 oz./sq. yd., pH=7.20) were impregnated with aqueous solutions of tris-aziridinyl-phosphineoxide (APO, product of Chemirad Corp., N.J.), containing 0.2% nonionic surface active agent (Triton X–100), using a laboratory padder. The fabric samples so treated were framed and dried at 150° F., then cured at 300° F. for 5 minutes in a forced air draft oven. The fabric samples were thoroughly rinsed in lukewarm water, then framed and dried.

Percent Reagent OWF	Percent Weight Gain (W.G.)	Percent Shrinkage				Flex Abrasion Warp	Stiffness Warp
		1L		5L			
		W	F	W	F		
7.3	5.9	3.9	4.7	9.4	10.1	195	108
4.7	4.3	3.9	5.8	9.4	11.7	352	196
Untr. Control.	----------	5.5	9.5	15.0	15.0	1,100	110

The test results obtained and tabulated above demonstrate that the polyaziridinyl compounds of the amide type when used alone are relatively ineffective and result in a small reduction in shrinkage when compared to an untreated control sample of fabric.

Example II

The exact procedure was employed in this example as employed in Example I with the exception that bis(1,2-propylene) adipamide (BPA, product of Interchemical Corp.) was used in place of the APO of Example I. The fabrics were treated in exactly the same methods and tested under the same conditions. The results are shown in the table below:

Percent Reagent OWF	Percent W.G.	Percent Shrinkage				Flex Abrasion Warp	Stiffness Warp
		1L		5L			
		W	F	W	F		
9.8	6.2	3.9	4.7	7.8	10.2	290	103
7.3	5.2	4.7	4.7	10.9	11.7	290	100
4.7	4.0	5.6	5.6	11.7	11.7	400	104

The above table shows that the adipamide compound which is a polyaziridinyl compound of the amide type was not particularly effective in substantially reducing the area shrinkage when compared with the untreated control. At best, the improvement in shrink-proofing as compared to an untreated control was about 5%.

Example III

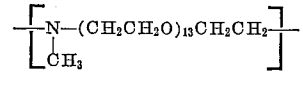
Samples of plain weave woolen flannel identical to that employed in Example I were impregnated with aqueous solutions containing tris-aziridinyl phosphineoxide (APO) and tetraethylene-pentamine (TEPA), using a laboratory padder. Before application to the fabric the reagent solution was neutralized with acetic acid to a pH of 7 and 0.2% Triton X–100 non-ionic surface active agent was added to the pad solution. The padded samples were then framed and dried at 150° F. then cured at 300° F. for 5 minutes in a forced air draft oven. The fabric samples were thoroughly rinsed in lukewarm water, then framed and dried.

APO-TEPA Weight Ratio	Percent Regent OWF	Percent W.G.	Percent Shrinkage After 5L		Stiffness Warp	Reflectance
			W	F		
2:1	12.7	10.5	4.0	4.5	246	62
1:2	10.7	5.1	4.5	4.5	247	55
TEPA alone	10.8	----------	15.0	15.0	110	62
APO alone	9.2	6.9	9.6	11.5	196	----------

The data contained in the above table shows the results in area shrinkage after 5 launderings and clearly demonstrates that a remarkable reduction in the area shrinkage is obtained when the woolen textile material is treated with a solution containing a combination of the polyaziridine of the amide type and a polyamine, when compared to the fabric samples that were treated with the polyaziridine alone and the polyamine alone.

Example IV

Samples of plain weave woolen flannel identical to that employed in Example III were treated following the exact same procedure as described in Example III with the exception that the polyamine contained the repeating unit:



which was used in admixture with the tris-aziridinyl phosphine oxide (APO). The results are tabulated below:

APO–Polyamine Weight Ratio	Percent Reagent OWF	Percent W.G.	Percent Shrinkage			
			1L		5L	
			W	F	W	F
4:1	6.2	4.2	3.5	3.5	7.5	7.5
2:1	6.5	4.2	3.5	3.5	5.5	5.5
1:1	6.6	4.4	3.5	3.5	4.5	4.5
1:2	6.9	4.5	4.5	2.5	5.5	4.5
1:4	6.9	4.1	5.5	2.5	7.0	4.5

The results shown in the table above further clearly show the unexpected improvement in percentage area shrinkage obtained when using a mixture of the polyamine with an amide type polyaziridine compound.

Example V

Samples of plain weave woolen flannel identical to that employed in Example III were treated with a mixture of tris-aziridinyl phosphine oxide and a polyethyleneimine with an average molecular weight of 30,000 to 40,000 (PEI) following the exact same procedure as employed in Example III. The padded samples were framed and dried at 150° F. then cured at 250° F. for 5 minutes in a forced draft oven. The fabric samples were thoroughly rinsed in warm water then framed and dried and tested according to the prescribed methods above. The results of the tests are shown in the table below.

APO–PEI Weight Ratio	Percent Reagent OWF	Percent W.G.	Percent Shrinkage After 5L		Flex Abrasion Warp	Stiffness Warp	Reflectance
			W	F			
3:1	5.8	4.6	4.5	5.5	750	172	60
7:3	5.6	4.7	3.4	4.5	675	185	62
2:1	5.6	4.9	3.5	3.5	875	181	61
3:2	5.8	5.4	3.5	4.0	700	166	61
1:1	6.1	6.3	4.0	3.5	700	230	60
PEI alone	6.0	3.7	8.0	8.5	-------	-------	51

It is apparent that treatment with polyethyleneimine alone was not satisfactory for reducing the shrinkage to an acceptable level. Furthermore, the sample treated with PEI alone was badly discolored while the other samples exhibited no discoloration.

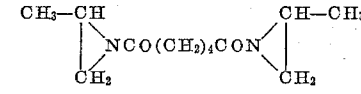
Example VI

Example V was repeated using an APO–PEI mixture in 2:1 weight ratio, and varying the reagent concentration. The padded samples, after drying at 150° F., were cured at 250° F. for 5 minutes in a forced draft oven. The cured fabric samples were thoroughly rinsed in warm water, then framed and dried. The test results are reported below:

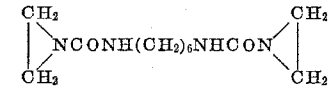
Percent Reagent OWF	Percent W.G.	Percent Shrinkage After 5L		Flex Abrasion Warp	Stiffness Warp	Reflectance
		W	F			
10.0	8.3	3.0	4.0	650	229	60
6.8	7.0	5.0	3.0	800	228	60
4.5	5.6	4.5	4.0	750	183	60
2.3	3.9	5.5	4.5	1,100	142	60

Similar results were obtained when the tris-aziridinyl phosphineoxide APO) in the mixture was replaced by each of the following:

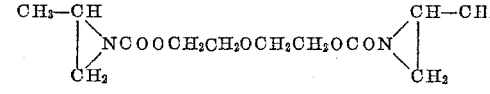
(a)



(b)



(c)



In each case, the mixture of polyaziridine with PEI was vastly more effective than the polyaziridine alone or the PEI alone.

Example VII

Example V was repeated, employing APO–PEI in 2:1 weight ratio in combination with a polyfluoroalkyl acrylate emulsion marketed under the trade name of Scotchgard FC–208 by the Minnesota Mining and Manufacturing Co., for the treatment. After drying at 150° F., the padded samples were cured at 250 and 300° F. for 5 minutes in a forced draft oven. The samples were thoroughly rinsed in warm water, then framed and dried and tested according to the procedure described above. The following table reports the results thereof:

Sample	Percent APO OWF	Percent PEI OWF	Percent Scotchgard OWF	Percent W.G.	Curing Temp. ° F.
A1	4.5	2.25	0.32	5.7	250
A2	4.5	2.25	0.32	6.1	300
B1	4.5	2.25	0.96	6.6	250
B2	4.5	2.25	0.96	6.9	300
D1	-------	-------	0.96	1.0	250
D2	-------	-------	0.96	1.0	300

Sample	Percent Shrinkage After 5L		Oil Repellency			Oil Repellency After Dry Cleaning		
	W	F	Dry	1L	5L	1 Cycle	2 Cycles	3 Cycles
A1	4.0	4.0	70	0/50	0	-------	-------	-------
A2	2.0	2.5	100	50	0	-------	-------	-------
B1	2.0	3.5	100+	90	70/80	-------	-------	-------
B2	1.5	2.5	100+	90	80	100	100	90/100
D1	12.0	12.5	70	0/50	0	-------	-------	-------
D2	13.5	14.5	50/90	0	0	50/70	50/70	50

Example VIII

The following example illustrates the results obtained when fabric treated according to the new process is dyed after the shrink-proofing treatment.

Example V was repeated, but an APO–PEI mixture in 2:1 weight ratio was used for the treatment. The amount of reagent applied was 5.7% on weight of fabric OWF). The padded samples were framed and dried at 150° F., then cured at 250° F. for 5 minutes in forced air draft oven. The fabric samples were thoroughly rinsed in warm water, then framed, dried and relaxed.

The samples so treated were dyed with 1% Capracyl Red B (Col. Ind. No. Acid Red 178) pre-metallized dye and also with 1% Alizarine Direct Blue A (Col. Ind. No. Acid Blue 25) acid dye, according to standard wool dyeing procedure.

The dyeings resulted in an excellent uniform shade.

Fabric Properties		Percent Shrinkage After 5L		Flex Abrasion	Stiffness Warp
Sample	Count	W	F		
A	39 x 36	4.5	0.5	475	142
AR	39 x 37	3.0	1.5	475	103
AB	38 x 37	6.5	3.5	825	102
R	39 x 38	11.5	11.5	675	83
B	38 x 38	13.0	12.0	925	90
Untreated (Relaxed, not dyed).	38 x 38	14.0	11.5	1050	97

A: Treated, not dyed.
AR: Treated, dyed red.
AB: Treated, dyed blue.
R: Untreated, dyed red.
B: Untreated, dyed blue.

Example IX

A mixture of 4% APO–2% PEI was applied for the treatment of plain weave woolen flannel samples previously dyed with 1% Capracyl Red B (Col. Ind. No. Acid Red 178) pre-metallized dye and also with 1% Alizarine Direct Blue A (Col. Ind. No. Acid Blue 5) dye. The samples padded with the APO–PEI mixture were framed and dried at 150° F., then cured at 250° F. for 5 minutes. The fabric samples were thoroughly rinsed in warm water, then framed, dried and relaxed. The application resulted in a 5.5% weight gain.

Sample	Percent Shrinkage After 5L		Count	Flex Abrasion Warp	Stiffness Warp
	W	F			
RA	1.0	1.0	37 x 36	375	135
BA	2.5	3.5	36 x 37	550	123
R	8.5	5.5	37 x 37	375	65
B	13.0	12.0	38 x 38	925	90

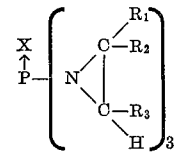
RA: Dyed red, then shrink-proofed.
BA: Dyed blue, then shrink-proofed.
R: Dyed red, not shrink-proofed.
B: Dyed blue, not shrink-proofed.

It is understood that various other modifications will be apparent to and can readily be made by those skilled in the art without departing from the scope and spirit of this invention. Accordingly, it is not intended that the scope of the claims appended hereto be limited to the description set forth herein but rather that the claims be construed as encompassing all the features of patentable novelty which reside in the present invention including all features which would be treated as equivalents thereof by those skilled in the art to which the invention pertains.

What is claimed is:

1. A method for improving the physico-chemical properties of proteinaceous materials comprising treating said materials with polyfunctional amidoaziridine compounds and a polyethyleneimine containing at least 5 amino nitrogens per molecule, wherein the proportions of polyaziridine to polyimine range from 10:90 to 90:10 in parts by weight.

2. A method for improving the dimensional properties of textile materials containing wool which comprises applying to the textile material a polyfunctional amidoaziridine compound corresponding to the structure:



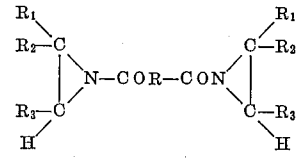
wherein

R_1, R_2 and R_3 are selected from the group consisting of hydrogen and lower alkyl, and

X is a member selected from the group consisting of oxygen and sulfur, and

a polyethyleneimine containing at least 5 amino nitrogens per molecule, wherein the proportions of polyaziridine to polyimine range from 10:90 to 90:10 in part by weight.

3. A method of improving the dimensional properties of textile materials containing wool which comprises applying to the textile material a polyfunctional aziridine compound corresponding to the structure:



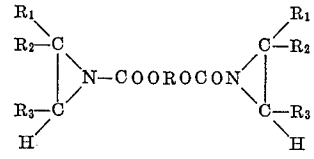
wherein

R_1, R_2 and R_3 are selected from the group consisting of hydrogen and lower alkyl, and

R represents a divalent aliphatic organic group, and

a polyethyleneimine containing at least 5 amino nitrogens per molecule, wherein the proportions of polyaziridine to polyimine range from 10:90 to 90:10 in parts by weight.

4. A method for improving the dimensional properties of textile materials containing wool which comprises applying to the textile material a polyfunctional aziridine compound corresponding to the structure:



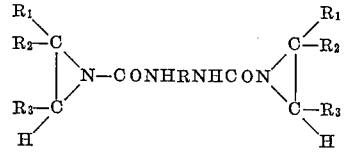
wherein

R_1, R_2 and R_3 are selected from the group consisting of hydrogen and lower alkyl and

R represents a divalent aliphatic organic group, and

a polyethyleneimine containing at least 5 amino nitrogens per molecule, wherein the proportions of polyaziridine to polyimine range from 10:90 to 90:10 in parts by weight.

5. A method for improving the dimensional properties of textile materials containing wool which comprises applying to the textile material a polyfunctional aziridine compound corresponding to the structure:



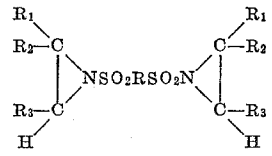
wherein

R_1, R_2 and R_3 are selected from the group consisting of hydrogen and lower alkyl and R represents a divalent aliphatic organic group, and

a polyethyleneimine containing at least 5 amino nitro-

gens per molecule, wherein the proportions of polyaziridine to polyimine range from 10:90 to 90:10 in parts by weight.

6. A method for improving the dimensional properties of textile materials containing wool which comprises applying to the textile material a polyfunctional aziridine compound corresponding to the structure:



wherein

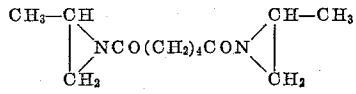
R_1, R_2 and R_3 are selected from the group consisting of hydrogen and lower alkyl and R is an acyclic aliphatic organic group, and

a polyethyleneimine containing at least 5 amino nitrogens per molecule, wherein the proportions of polyaziridine to polyimine range from 10:90 to 90:10 in parts by weight.

7. In the method as defined in claim 1 wherein the proteinaceous material is a woolen textile fabric.

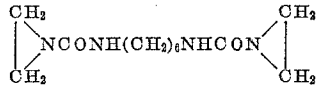
8. In the method of claim 1 wherein the aziridine compound is tris-aziridinylphosphine oxide.

9. In the method of claim 1 wherein the aziridine compound is:

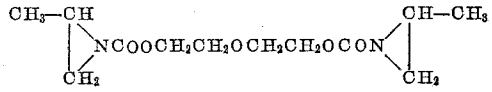


compound is:

10. The method of claim 1 wherein the aziridine



11. The method of claim 1 wherein the aziridine compound is:



12. The method as defined in claim 7 wherein the textile material is heated from about 250° F. to about 350° F. in order to cure the reaction and is thereafter washed to remove unreacted materials.

13. A textile material containing wool treated according to the method as described in claim 1.

14. A woolen fabric treated according to the method as described in claim 7.

15. In a method for imparting desirable dimensional properties to a textile material containing wool wherein previous methods employing amidoaziridine compounds have not produced satisfactory reduction in shrinkage, the improvement whereby an increased effectiveness in shrinkproofing is obtained resulting in a satisfactory textile material and which improvement comprises applying to the textile material a mixture of an amidoaziridine compound and a polyethyleneimine containing at least five nitrogens per molecule, wherein the proportions of polyaziridine to polyimine range from 10:90 to 90:10 in parts by weight, and thereafter heating to cure the reaction and washing to remove unreacted materials.

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