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TREATMENT OF CELLULOSIC TEXTILES WITH 1,3-DIMETHYLOL-4,5-DIHYDROXY-2-IMIDAZOLIDINONE, ZINC NITRATE AND A SEQUESTERING AGENT

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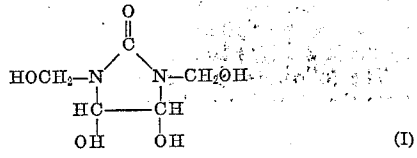
U.S. Cl. 8—74 4 Claims

ABSTRACT OF THE DISCLOSURE

A finish for cellulosic textile materials to give a wrinkle resistant and permanent crease to said textile materials, wherein the finish contains a sequestering agent making it compatible with other operations performed on the textile.

This application is a continuation of application Ser. No. 672,450, filed Oct. 3, 1967, now abandoned, which was a continuation-in-part of application Ser. No. 628,573, filed Apr. 5, 1967, now abandoned.

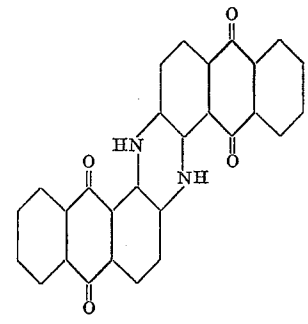
This invention relates to a nondiscoloring, durable press finish for dyed or undyed, cellulosic textile materials. More particularly, it relates to a process of applying an aqueous finish containing 1,3-dimethylol-4,5-dihydroxy-2-imidazolidinone of Formula I, a zinc nitrate catalyst and a sequestering agent to cellulosic materials, and to the treated cellulosic materials.



(I)

1,3 - dimethylol-4,5-dihydroxy-2-imidazolidinone is a very valuable finishing agent for textile materials. It has a wide and extensive use on cellulosic materials and blends of cellulosic materials with other fibers such as polyamides (nylon) and polyesters (Dacron). It is generally used together with sodium acetate. Although it can be used as a conventional wash-and-wear finish, its greatest use is in the durable press field, especially in the postcure process as described in U.S. Pat. No. 2,974,432. Zinc nitrate is the preferred curing catalyst. The finish has not, however, been entirely satisfactory since it is not compatible with other operations performed on the textile materials. For example, it has been found that it causes scorching on white goods during the pressing operation and yellowing during the postcuring operation.

Moreover, it has not been found to be satisfactory for use with certain "resin sensitive" dyes such as a group of blue vat dyes based on indanthrone (Formula II) and its chlorinated derivatives thereof which have considerable commercial values.



(II)

When a cellulosic fabric dyed with one of the indanthrone dyes is treated with a textile finish containing 1,3-dimethylol-4,5-dihydroxy-2-imidazolidinone, followed by a curing operation in the presence of zinc nitrate as the curing catalyst, the shade of the fabric is severely altered, becoming duller and much greener. The color change is so drastic that cloth dyed with one of the indanthrone dyes cannot, therefore, be treated with a wrinkle resistant finish containing 1,3 - dimethylol - 4,5 - dihydroxy-2-imidazolidinone and zinc nitrate.

Zinc nitrate is the preferred catalyst for use in curing 1,3 - dimethylol-4,5-dihydroxy-2-imidazolidinone. Other zinc salts, such as zinc chloride and zinc sulfate, do not produce the desired "wash-and-wear" properties. Other curing catalysts, such as magnesium chloride, are also not as satisfactory as zinc nitrate and are not used.

Therefore, the need exists for a method of applying and heat curing a textile finish containing 1,3-dimethylol-4,5-dihydroxy-2-imidazolidinone with the zinc nitrate catalyst to give a wrinkle resistant or permanent crease finish which is compatible with other operations, particularly with white cellulosic materials which will prevent or reduce (1) yellowing on curing, and (2) scorching on hot pressing, and with cellulosic materials dyed with "resin-sensitive" dyes.

It is therefore an object of this invention to provide a finish and a method for rendering cellulosic textile materials wrinkle resistant or providing a permanent crease, said finish being compatible with other operations on said textile material.

A further object is to provide a method and finish for undyed cellulosic textile materials, incorporating 1,3-dimethylol-4,5-dihydroxy-2-imidazolidinone and zinc nitrate, for obtaining wrinkle resistance or permanent creases on said textiles, which does not cause yellowing on curing or scorching on hot pressing or ironing after washing.

Another object is to provide a method and finish for cellulosic textile materials incorporating 1,3 - dimethylol-4,5-dihydroxy-2-imidazolidinone and zinc nitrate, for obtaining wrinkle resistance or permanent creases on said textiles, which does not discolor "resin sensitive" dyes on said textile materials.

A further object is to obtain an undyed textile material which is wrinkle resistant or permanently pressed and which does not yellow on curing or scorch on pressing.

Another object is to obtain a dyed textile material which is wrinkle resistant or permanently pressed and wherein the shade is not discolored.

These and other objects of the invention will become apparent as the description thereof proceeds.

A method has now been discovered for applying 1,3-dimethylol - 4,5 - dihydroxy-2-imidazolidinone to undyed cellulosic materials which will prevent or reduce yellowing on curing and scorching on hot pressing and to dyed textile materials to prevent discoloration of the dye.

In the process of this invention an aqueous solution of 1,3-dimethylol - 4,5 - dihydroxy - 2 - imidazolidinone, a sequestering agent, and zinc nitrate is applied to the cellulosic textile material. The textile material is then dried and the finish is cured at an elevated temperature. In a postcure process, the dried fabric is made into a garment or other article which is then pressed and cured.

"Cellulosic textile material" has the usual meaning and includes blends with other fibers such as polyamides (nylon) and polyesters (Dacron), including woven, knitted, felted, or other textile goods, for example.

Suitable sequestering agents for use in this invention are described in volume 12, page 164, of Encyclopedia of Chemical Technology, first edition, and in Organic Sequestering Agents by Chaberek (1959).

The two principal classes of sequestering agents which are suitable are the aminopolycarboxylic acids, such as ethylenediaminetetraacetic acid, nitrilotriacetic acid, di-(hydroxyethyl)glycine, (hydroxyethyl)ethylenediaminetriacetic acid and diethylenetriaminepentaacetic acid, and the hydroxycarboxylc acids, such as gluconic acid, citric acid and tartaric acid. These are used as partially neutralized alkali metal salts.

The "resin sensitive" dyes include certain dyes of several classes, such as direct dyes, sulfur dyes, reactive dyes, disperse dyes, vat dyes, and particularly indanthrone vat dyes.

The indanthrone dyes include indanthrone (C.I. Vat Blue 4, C.I. No. 69800), dichloroindanthrone (C.I. Vat Blue 6, C.I. No. 69825), monochloroindanthrone (C.I. Vat Blue 14, C.I. No. 69810), mixture of mono-, di- and trichloroindanthrones (C.I. Vat Blue 10, C.I. No. 69830), etc.

The sequestering agent can be put on the cellulosic materials simultaneously with, prior to or subsequent to the application of the 1,3-dimethylol-4,5-dihydroxy-2-imidazolidinone and zinc nitrate. It is preferred to apply the imidazolidinone, zinc nitrate and sequestering agent from the same aqueous solution. However, the sequestering agent can be applied from an aqueous solution before or after the application of the imidazolidinone and zinc nitrate.

The aqueous solution of 1,3-dimethylol-4,5-dihydroxy-2-imidazolidinone, sequestering agent, and zinc nitrate is applied to the textile material by any of the normal methods of application, such as by padding, spraying, dipping and the like.

The amount of 1,3-dimethylol-4,5-dihydroxy-2-imidazolidinone applied to the textile materials should be between 1.0% and 25.0%, preferably between 3.0% and 8.0%, based on the weight of the textile material.

The amount of sequestering agent used should be between 0.05% and 3.0%, preferably between 0.15% and 1.0% based on the weight of the solution. This corresponds to between about 0.025% and 3.0%, preferably between about 0.075% and 1.0%, based on the weight of the fabric.

The amount of zinc nitrate should be between 5.5% and 16.5%, preferably between 9.5% and 12.5%, based on the weight of the imidazolidinone.

The treated fabric may be dried and cured by conventional wash-and-wear procedures. Also, the well known postcuring procedure of U.S. Pat. No. 2,974,432 can be used, which consists of drying the treated fabric; cutting, sewing and pressing the garment; and curing the finish on the garment at an elevated temperature.

The treated textile material is normally dried before the pressing and curing operations are performed. A drying temperature between 175° and 250° F., preferably between 200° and 225° F., is used. The pressing operation can be done by any of the methods well known in the trade, such as by the use of a hot head press. The pressing operation is carried out at a temperature of 300° to 420° F. In the curing operation, the pressed fabric is heated at an elevated temperature under conditions normally used by the trade which is at a temperature between 300° and 420° F., preferably between 320° and 380° F., for a period sufficient to react the imidazolidinone with the cellulosic fabric. Heating periods between 5 and 20 minutes are normal.

The textile finish of this invention is compatible with many fluorescent brightening agents normally used on cellulosic materials, particularly the stilbene class of brightening agents.

Undyed cellulosic fabrics treated by the process of this invention have good resistance to scorching and discoloration when the fabrics are pressed and cured at elevated temperatures.

In one preferred embodiment of the invention with dyed fabrics, a cotton fabric dyed with an indanthrone vat dye is padded with an aqueous solution containing about 9% of 1,3-dimethylol-4,5-dihydroxy-imidazolidinone, about 1% of zinc nitrate and about 0.35% of ethylenediaminetetraacetic acid, tetrasodium salt. The treated fabric, containing about 6% of the imidazolidinone is dried at 225° F. The dried fabric is then cut and sewed into garments which are pressed at about 310° F. The pressed garments are then heated in an oven at about 340° F. until the imidazolidinone is cured on the garment. The thus treated garment is "durably pressed" where creases are desired and is wrinkle resistant in those areas where wrinkles and creases are not desired. During the pressing and drying operation the shade of the dyed fabric is essentially unchanged.

It has been discovered that the sodium acetate normally used in the finish containing 1,3-dimethylol-4,5-dihydroxy-2-imidazolidinone to decrease the initial losses in tensile strength, tear strength and abrasion resistance is not required when the sequestering agent is used. Additionally, the sequestering agent appears to give more stable pad baths than sodium acetate. It has been found that the sequestering agent used in the invention does not cause precipitation of the fluorescent brightening agents in finishing baths.

The following specific examples are set forth to illustrate the invention and are not intended to be limitative.

In the following examples, the parts and percentages are by weight.

The nonionic surface active agent used in the examples is the condensation product of nonylphenol with an average of 9.5 moles of ethylene oxide. Other suitable nonionic surfactants can also be used, such as other alkyl aryl polyethylene glycol ethers and ethylene oxide adducts of straight chain alcohols.

The fluorescent brightening agent used on undyed goods is C. I. Fluorescent Brightening Agent 25, a compatible brightening agent. It is a commercial product belonging to the sulfonated diaminostilbene class of brightening agents and was employed as an aqueous solution. In addition to this particular brightening agent, any other suitable ones can be used such as other members of the sulfonated diaminostilbene class, providing they are compatible with the other components of the finish.

EXAMPLE 1

Eight aqueous pad baths were prepared, each bath containing 11.2% of 1,3-dimethylol-4,5-dihydroxy-2-imidazol-

idinone, 1.25% of zinc nitrate, 0.25% of a nonionic surface active agent, 0.5% of C. I. Fluorescent Brightening Agent 25, and sodium acetate or a sequestering agent as shown in Table I. The pH of the pad baths was adjusted to 4.7 by addition of sodium hydroxide or hydrochloric acid as required.

TABLE I

Pad bath: Additive
- A ___ None.
- B ___ 0.1% sodium acetate.
- C ___ 0.4% ethylenediaminetetraacetic acid, tetrasodium salt.
- D ___ 0.4% gluconic acid.
- E ___ 0.4% nitrilotriacetic acid.
- F ___ 0.4% diethylenetriaminepentaacetic acid, pentasodium salt.
- G ___ 0.4% N,N-di(hydroxyethyl)glycine, sodium salt.
- H ___ 0.4% (hydroxyethyl)ethylenediaminetriacetic acid, trisodium salt.

The pad baths were applied by standard padding procedure to a 65/35 polyester/cotton fabric obtaining a 70% wet pickup. The fabrics, containing 7.9% on the weight of the fabric of 1,3-dimethylol-4,5-dihydroxy-2-imidazolidinone, were dried for 1 minute at 225° F., steamed for 5 seconds, pressed for 5 seconds at 350° F., and heated in an oven at 320° F. for 8 minutes.

The fabrics were examined for discoloration by comparing the color of the treated fabrics with that of the untreated fabric.

The fabrics were laundered 5 times in a homestyle washing machine using water at 130–140° F. and a detergent followed by a rinse water treatment at about 110°–120° F. and tumble drying after each washing. The fabrics were then inspected for retention of creases placed in the fabric during the pressing operation.

The results are shown in Table II. Fabrics A–H corresond to pad baths A–H, respectively.

TABLE II

Fabric:	Discoloration	Cease retention
A	Severe	Excellent.
B	do	Do.
C	Very slight	Do.
D	Slight	Do.
E	do	Do.
F	Very slight	Do.
G	Slight	Do.
H	do	Do.

The above results demonstrate the effectiveness of various sequestering agents in reducing the discoloration of polyester/cotton fabrics when treated with 1,3-dimethylol-4,5-dihydroxy-2-imidazolidinone and zinc nitrate.

EXAMPLE 2

Five aqueous pad baths were prepared, each bath containing 8.0% of 1,3-dimethylol-4,5-dihydroxy-2-imidazolidinone, 0.80% of zinc nitrate, 0.25% of a nonionic surface active agent, 0.5% of C. I. Fluorescent Brightening Agent 25 and sodium acetate or a sequestering agent as shown in Table III. The pH of the pad baths was adjusted to 4.7 by addition of hydrochloric acid as required.

TABLE III

Pad bath: Additive
- A ___ 0.07% sodium acetate.
- B ___ 0.3% ethylenediaminetetraacetic acid, tetrasodium salt.
- C ___ 0.3% diethylenetriaminepentaacetic acid, pentasodium salt.
- D ___ 0.3% N,N-di(hydroxyethyl)glycine, sodium salt.
- E ___ 0.3% (hydroxyethyl)ethylenediaminetriacetic acid, trisodium salt.

The pad baths were applied by standard padding procedure to cotton broadcloth obtaining a 73% wet pickup. The fabrics, containing 5.8% on the weight of the fabric of 1,3-dimethylol-4,5-dihydroxy-2-imidazolidinone, were dried at 225° F. for 1 minute. Swatches of the dried fabrics were cured for 1 minute at 360° F.

The wrinkle recovery of the cured fabrics was measured by tentative test method 66–1959T of the American Association of Textile Chemists and Colorists.

The results are shown in Table IV. Fabrics A–E correspond to pad baths A–E, respectively.

TABLE IV

Fabric:	Wrinkle recovery, W&F, degrees
A	275
B	261
C	261
D	281
E	260
Untreated	227

These results show the lack of adverse effect of the sequestering agents on the wrinkle recovery properties of a cotton fabric treated with a finish containing 1,3-dimethylol-4,5-dihydroxy-2-imidazolidinone.

EXAMPLE 3

Six aqueous pad baths were prepared, each bath containing 8.6% of 1,3-dimethylol-4,5-dihydroxy-2-imidazolidinone, 0.85% of zinc nitrate, and sodium acetate or ethylenediaminetetraacetic acid, tetrasodium salt (EDTA) in the amounts shown in Table V. The pH of the pad baths containing EDTA were adjusted to 4.3 with hydrochloric acid.

TABLE V

	pH	Additive
Pad bath:		
A	4.7	0.07% sodium acetate.
B	4.3	0.20% EDTA.
C	4.3	0.25% EDTA.
D	4.3	0.30% EDTA.
E	4.3	0.35% EDTA.
F	4.3	0.40% EDTA.

The pad baths were applied by standard padding procedure to cotton broadcloth which had been prebrightened an preblued with an aqueous solution containing 0.5% of C.I. Fluorescent Brightening Agent 25, 0.03% of C.I. Vat Blue 6 and 0.25% of nonionic surface active agent.

The wet pickup was 70%. The fabrics, containing 6.0% on the weight of the fabric of 1,3-dimethylol-4,5-di-hydroxy-2-imidazolidinone, were dried for 1 minute at 225° F., steamed for 5 seconds and pressed for 5 seconds at 350° F., an then heated in an oven for 8 minutes at 320° F.

The wrinkle recovery of the fabrics was measured as described in Example 2. The laundering process is described in Example 1.

The tensile strength of the fabrics was measured by ASTM standard method using a Scott tensile strength tester.

The fabrics were inspected for discoloration by comparing the color of the treated fabrics with that of the untreated fabric.

The results are shown in Table VI. Fabrics A–F correspond to pad baths A–F, respectively.

TABLE VI

	Wrinkle recovery, W & F, degrees			
	Initial	After 5 washes	Tensile strength (lb.)	Discoloration
Fabric:				
A	292	276	59	Severe.
B	296	284	62	Slight.
C	289	299	59	Do
D	297	297	66	Very slight.
E	290	277	71	Do.
F	289	284	72	Do.
Untreated	214	181	136	Do.

EXAMPLE 4

Six aqueous pad baths were prepared, each bath containing 8.6% of 1,3-dimethylol-4,5-dihydroxy-2-imidazolidinone, 0.85% of zinc nitrate, and sodium acetate of ethylenediaminetetraacetic acid, tetrasodium salt (EDTA) in the amounts shown in Table VII. The pH's of the pad baths containing EDTA shown in Table VII were adjusted to 4.3 with hydrochloric acid..

TABLE VII

	pH	Additive
Pad bath:		
A	4.7	0.074% sodium acetate.
B	4.3	0.20% EDTA.
C	4.3	0.25% EDTA.
D	4.3	0.30% EDTA.
E	4.3	0.35% EDTA.
F	4.3	0.40% EDTA.

The pad baths were applied by standard padding procedure to 65/35 polyester/cotton shirting prebrightened and preblued as described in Example 3, obtaining a wet pickup of 65%. The fabrics, containing 5.6% on the weight of the fabric of 1,3-dimethylol-4,5-dihydroxy-2-imidazolidinone, were dried for 1 minutes at 225° F., steamed 5 seconds and pressed for 5 seconds at 350° F., and then heated in an oven for 8 minutes at 320° F.

The fabrics were inspected for discoloration and retention of creases after 5 launderings as described in Example 1.

The results are shown in Table VIII. Fabrics A–F correspond to pad baths A–F, respectively.

TABLE VIII

	Discoloration	Crease retention
Fabric:		
A	Severe	Good.
B	Slight	Do.
C	do	Do.
D	do	Do.
E	do	Do.
F	do	Do.
Untreated		Fair.

EXAMPLE 5

Nine aqueous pad baths were prepared, each bath containing 8.6% of 1,3-dimethylol-4,5-dihydroxy-2-imidazolidinone, 0.85% of zinc nitrate, 0.25% of an nonionic surface active agent, 0.5% of C.I. Flourescent Brightening Agent 25, and sodium acetate or N,N-di(hydroxyethyl) glycine, sodium salt (DEG) as shown in Table IX. The pH's of the pad baths as shown in Table IX represent unadjusted final bath pH's.

TABLE IX

	pH	Additive
Pad bath:		
A	4.4	None.
B	4.8	0.07% sodium acetate.
C	4.5	0.05% DEG.
D	4.6	0.10% DEG.
E	4.9	0.20% DEG.
F	5.2	0.30% DEG.
G	5.5	0.40% DEG.
H	5.8	0.50% DEG.
I	6.1	0.60% DEG.

The pad baths were applied to (1) cotton broadcloth and (2) 65/35 polyester/cotton shirting by standard padding procedures with a 70% wet pickup on the cotton fabric and a 65% wet pickup on the polyester/cotton fabric. The fabrics containing 6.0% on the weight of the fabric on cotton and 5.6% on the polyester/cotton fabric of 1,3-dimethylol-4,5-dihydroxy-2-imidazolidinone were dried for 1 minute at 225° F., steamed for 5 seconds, pressed for 5 seconds at 350° F., and then heated in an oven for 8 minutes at 320° F.

The fabrics were inspected for discoloration as described in Example 1.

The results are shown in Table X. Fabrics A–I correspond to pad baths A–I, respectively.

TABLE X

	Discoloration	
	Cotton	Polyester cotton
Fabric:		
A	Severe	Severe.
B	do	Do.
C	do	Do.
D	Moderate	Do.
E	Slight	Moderate.
F	Very slight	Slight.
G	do	Very slight.
H	do	Do.
I	do	Do.

EXAMPLE 6

Six aqueous pad baths were prepared, each bath containing the amounts of 1,3 - dimethylol - 4,5-dihydroxy-2-imidazolidinone and zinc nitrate shown in Table XI, 0.25% of a nonionic surface active agent, 0.5% of C.I. Fluorescent Brightening Agent 25, and the amount of sodium acetate or N,N-di(hydroxyethyl)glycine, sodium salt (DEG) shown in Table XI. The pH of the pad baths is also shown in Table XI.

TABLE XI

	Imidazolidinone, percent	Zinc nitrate, percent	pH	Additive
Pad bath:				
A	4.3	0.43	4.9	0.037% sodium acetate.
B	4.3	0.43	4.7	0.25% DEG.
C	7.9	0.79	4.8	0.068% sodium acetate.
D	7.9	0.79	4.7	0.46% DEG.
E	11.5	1.30	4.6	0.099% sodium acetate.
F	11.5	1.30	4.7	0.68% DEG.

The pad baths were applied to cotton broadcloth by standard padding procedure with a 70% wet pickup. The fabrics containing the amount of 1,3-dimethylol-4,5-dihydroxy - 2 - imidazolidinone shown in Table XII were dried at 225° F. for 1 minute. Swatches of the dried fabrics were (1) heated at 320° F. for one minute, (2) heated at 360° F. for one minute or (3) steamed for 5 seconds, pressed for 5 seconds at 350° F., and then heated at 320° F. in an oven for 8 minutes.

The wrinkle recovery of the swatches heated for 1 minute at 320° F. or 360° F. was measured by the procedure of Example 2.

The swatches steamed, pressed and heated at 320° F. were inspected for discoloration by the procedure of Example 1.

The results are shown in Table XII. Fabrics A–F correspond to pad baths A–F, respectively.

TABLE XII

	Imidazolidinone percent (on weight of fabric)	Wrinkle recovery W & F, degrees at—		
		320° F.	360° F.	Discoloration
Fabric:				
A	3.0	231	236	Slight.
B	3.0	217	230	Do.
C	5.5	243	269	Moderate.
D	5.5	233	273	Slight.
E	8.0	286	288	Severe.
F	8.0	279	270	Slight.

EXAMPLE 7

Five aqueous pad baths were prepared, each bath containing 8.6% of 1,3 - dimethylol - 4,5 - dihydroxy-2-imidazolidinone, 0.85% of zinc nitrate, 0.25% of a nonionic surface active agent, 0.5% of C.I. Fluorescent Brightening Agent 25 and the amount of sodium acetate or nitrilotriacetic acid (NTA) shown in Table XIII. The pH's of the pad baths containing NTA shown in Table XIII were adjusted to 4.7 with sodium hydroxide.

TABLE XIII

Pad bath:	Additive
A	0.07% sodium acetate.
B	0.2% NTA.
C	0.1% NTA.
D	0.05% NTA.
E	0.025% NTA.

The pad baths were applied to cotton broadcloth by standard padding procedure with a 70% wet pickup. The fabrics containing 6.0% on the weight of the fabrics of 1,3 - dimethylol - 4,5 - dihydroxy - 2 - imidazolidinone were dried for one minute at 225° C. Swatches of the dried fabric were (1) heated at 320° F. for 1 minute, (2) heated at 360° F. for 1 minute, or (3) steamed for 5 seconds, pressed for 5 seconds at 350° F., and then heated in an oven at 320° F. for 8 minutes.

The wrinkle recovery of swatches heated for 1 minute at 320° F. or 360° F. were measured by the procedure of Example 2.

The swatches steamed, pressed and heated at 320° F. were inspected for discoloring by the procedure of Example 1.

The relative fluorescent intensity, a measurement of brightener activity, was measured by standard procedure using a fluorimeter.

The results are shown in Table XIV. Fabrics A–E correspond to pad baths A–E, respectively.

TABLE XIV

	Wrinkle recovery W & F, degrees			Fluorescent intensity, percent
	320° F.	360° F.	Discoloration	
Fabric:				
A	277	280	Severe	100
B	273	278	Very slight	135
C	273	274	Slight	128
D	276	275	Moderate	112
E	261	278	Severe	110
Untreated	202	202		

EXAMPLE 8

Five pad baths were prepared, each bath containing 8.6% of 1,3 - dimethylol-4,5-dihydroxy-2-imidazolidinone, 0.85% of zinc nitrate, 0.25% of a nonionic surface active agent, 0.5% of C.I. Fluorescent Brightening Agent 25 and the amount of sodium acetate or nitrilotriacetic acid (NTA) shown in Table XV. The pH's of the pad baths containing NTA were adjusted to 4.7 with sodium hydroxide. Pad bath compatibility was noted after 8 hours. Two of the pad baths were allowed to stand 16 hours before application to fabric.

TABLE XV

	Additive	Pad bath compatibility	Pad bath stored for 16 hours
Pad bath:			
A	0.07% sodium acetate	Very cloudy	No.
B	0.3% NTA	Clear	Yes.
C	0.2% NTA	do	Yes.
D	0.3% NTA	do	No.
E	0.2% NTA	do	No.

The pad baths were applied to cotton broadcloth by the procedure of Example 7. The wrinkle recovery, discoloration and fluorescent intensity were measured by the method of Example 7.

The results are shown in Table XVI. Fabrics A–E correspond to pad baths A–E, respectively.

TABLE XVI

	Wrinkle recovery W & F, degrees			Fluorescent intensity, percent
	320° F.	360° F.	Discoloration	
Fabric:				
A	275	272	Moderate	100
B	242	244	Very slight	125
C	244	269	Slight	119
D	215	267	Very slight	125
E	246	257	Slight	120

EXAMPLE 9

Two pad baths were prepared, each bath containing 9.0% of 1,3-dimethylol-4,5-dihydroxy-2-imidazolidinone, 0.96% of zinc nitrate, 0.75% of a polyethylene emulsion containing polyethylene glycol monostearate and coconut oil ethanolamine (a commercial textile softener), 0.2% of a nonionic surface active agent, and the amount of ethylenediaminetetraacetic acid, tetrasodium salt (EDTA) shown in Table XVII.

TABLE XVII

Pad bath:	EDTA
A	None.
B	0.38%.

The pad baths were applied by standard padding procedure to 80 x 80 cotton percale dyed with 3.0% on the weight of the fabric of an indanthrone dye, C.I. Vat Blue 6 (C.I. No. 69,825) obtaining a 70% wet pick-up. The fabrics, containing 6.3% on the weight of the fabric of 1,3-dimethylol - 4,5 - dihydroxy-2-imidazolidinone, were dried at 225° F. for one minute, pressed for 15 sec. at 310° F., and heated in an oven at 340° F. for 10 minutes.

The fabrics were examined for shade change by comparing the treated fabrics with untreated dyed fabric.

The fabrics were laundered five times in a home-style washing machine using water at 120° F. and tumble drying after each washing. The fabrics were then inspected for retention of creases placed in the fabric during the pressing operation.

The results are shown in Table XVIII. Fabrics A and B correspond to Pad Baths A and B, respectively.

TABLE XVIII

	Shade change	Crease retention
Fabric:		
A	Definite	Excellent.
B	Negligible	Do.

EXAMPLE 10

Two pad baths were prepared, each bath containing 11.2% of 1,3-dimethylol - 4,5 - dihydroxy-2-imidazolidinone, 1.25% of zinc nitrate, 0.25% of a non-ionic surface active agent, and the amount of citric acid (hydrated) shown in Table XIX.

TABLE XIX

Pad bath:	Citric acid
A	None.
B	0.7%.

The pH of the pad baths was adjusted to 4.7 by the addition of sodium hydroxide.

The pad baths were applied by standard padding procedure to 80 x 80 cotton percale dyed with 3.0% on the weight of the fabric of an indanthrone dye, C.I. Vat Blue 6 (C.I. No. 69825), obtaining an 80% wet pick-up. The fabrics, containing 9.0% on the weight of the fabric of 1,3-dimethylol - 4,5 - dihydroxy-2-imidazolidinone, were dried at 225° F. for one minute, steamed for 5 seconds, pressed for 15 seconds at 310° F., and heated in an oven at 380° F. for 6 minutes.

The fabrics were examined for shade change by comparing the treated fabrics with untreated dye fabrics. The durable press properties of the two fabrics were also determined.

The results are shown in Table XX. Fabrics A and B correspond to Pad Baths A and B, respectively.

TABLE XX

	Shade change	Durable press
Fabric:		
A	Definite	Excellent.
B	None	Do.

In the use of citric acid as the sequestering agent, sufficient sodium hydroxide is added to provide a pH of between about 4.5 and 5.5, preferably 4.7 to 4.9.

EXAMPLE 11

Three pad baths were prepared, each bath containing 11.3% of 1,3-dimethylol - 4,5 - dihydroxy-2-imidazolidinone, 1.25% of zinc nitrate, 0.25% of a non-ionic surface active agent, 0.5% of a commercial fluorescent brightening agent of the DAS type (Calcofluor) White 3RT) and the amount of citric acid (hydrated) shown in Table XXI. The pH of pad bath C was adjusted by addition of sodium hydroxide.

TABLE XXI

	Citric acid, percent	pH of bath
Pad bath:		
A	0	4.5
B	0.7	4.0
C	0.7	4.5

The pad baths were applied by standard padding procedure to white cotton broadcloth obtaining a 75% wet pick-up. The fabrics, containing 8.5% on the weight of the fabric of 1,3-dimethylol-4,5-dihydroxy-2-imidazolidinone, were dried at 225° F., steamed for 5 seconds, pressed for 5 seconds at 350° F., and heated in an oven at 320° F. for 8 minutes.

The wrinkle recovery of the fabrics was measured by the procedure of Example 2. The fabrics were inspected for discoloration by the procedure of Example 1.

The results are shown in Table XXII. Fabrics A, B and C correspond to Pad Baths A, B and C, respectively.

TABLE XXII

	Wrinkle recovery W+F, degrees	Discoloration
Fabric:		
A	295	Severe.
B	304	Moderate.
C	295	Slight.

EXAMPLE 12

Three pads baths were prepared according to Example 11.

The pad baths were applied by the procedure of Example 11 to white 65/35 polyester/cotton shirting obtaining a 60% wet pick-up. The fabrics contained 6.75% of 1,3-dimethylol-4,5-dihydroxy-2-imidazolidinone.

The fabrics were inspected for discoloration and appearance after 5 launderings as described in Example 1.

The results are shown in Table XXIII. Fabrics A, B and C correspond to Pad Baths A, B and C, respectively.

TABLE XXIII

	Appearance	Discoloration
Fabric:		
A	Good	Severe.
B	do	Moderate.
C	do	Slight.

While certain specific embodiments and preferred modes of practice have been set forth, this is solely for purposes of illustrating the invention, and it will be obvious that various changes and modifications may be made without departing from the spirit of the disclosure and the scope of the appended claims.

We claim:

1. A process for producing a non-discoloring, wrinkle resistant finish on cellulosic textile materials, said materials being subject to discoloration of resin sensitive dyes thereon or yellowing on curing consisting essentially of: forming a treated cellulosic textile by applying one or more aqueous solutions of 1,3-dimethylol-4,5-dihydroxy-2-imidazolidinone, zinc nitrate and a sequestering agent thereto; drying the treated textile; and curing the dried textile by heating for a period sufficient to cause the imidazolidinone to react with the cellulose textile; wherein the amounts of the 1,3-dimethylol-4,5-dihydroxy - 2 - imidazolidinone and sequestering agent applied to said cellulosic textile are in the range of 1.0% and 25.0% and between about 0.025% and 3.0%, respectively, based on the weight of the fabric, and the amount of zinc nitrate is between 5.5% and 16.5% based on the weight of the imidazolidinone; the drying temperature is between 175° F. and 250° F.; the curing temperature is between 300° F. and 420° F.; whereby a non-discoloring, wrinkle resistant finish is produced on the cellulosic textile.

2. A process according to claim 1 wherein the textile to be treated has an indanthrone dye thereon.

3. A cellulosic textile material, subject to discoloration of resin sensitive dyes thereon or yellowing on curing, having a non-discolored, wrinkle resistant finish thereon by application of the heat cured product of 1,3-dimethylol-4,5-dihydroxy-2-imidazolidinone and a sequestering agent in amounts in the range of 1.0% and 25.0% and between about 0.025% and 3.0%, respectively, based on the weight of the fabric, and zinc nitrate in an amount of between 5.5% and 16.5% based on the weight of the imidazolidinone.

4. A textile according to claim 3 wherein the textile to be treated is indanthrone dyed.

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