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FABRIC SOFTENER

Milton M. Waldman, Northbrook, and Andrea E. Mariahazy, Westchester, Ill., assignors, by mesne assignments, to Armour Industrial Chemical Company, a corporation of Delaware

No Drawing. Continuation-in-part of application Ser. No. 566,471, July 20, 1966. This application June 9, 1967, Ser. No. 644,819

Int. Cl. D06m *13/46*; C07c *87/30*; C11d *3/30*

U.S. Cl. 252—8.75 3 Claims

ABSTRACT OF THE DISCLOSURE

A fabric softener comprising certain arylalkyl quaternary compounds useful in either the wash or the rinse waters during the laundering of fabric.

This application is a continuation-in-part of application Ser. No. 566,471, filed July 20, 1966, now abandoned.

This invention relates to novel fabric softener compositions and methods for their use, and more particularly to compositions which, when applied via the wash or rinse waters during laundering of fabric, uniquely impart softening characteristics without the customary deleterious effect on the rewet characteristics of said fabric.

In the past, fabric softeners, which render fabric "soft" to hand feel and touch upon drying, after laundering, especially with detergent, comprised di-higher alkyl quaternary ammonium compounds. Where the compound contained only one long chain, its softening abilities were not as pronounced, and in many instances were totally absent in subjective testing.

Usually, the fabric softener was added to the rinse water because of incompatability with the detergents, and so that it would be retained by the fabric upon drying. Recent developments have uncovered softener compounds which may even be added to the wash water. They uniquely possess a substantivity to the fabric which is not deleteriously affected by the detergent of the wash water.

Unfortunately, generally softeners cut the absorbency by water of the fabric. Diapers, towels, drying cloths, underwear, underarm pads, stockings and socks, and the like, which desirably are treated with fabric softener to make them soft to the touch lose their absorbency to moisture because of the softener. The rewet properties are substantially diminished because of the presence of the long chain quaternary softener which seems to impart a wax-like coating on each fiber of the fabric so that rewetting is difficult.

An object of the invention is to provide a novel softener composition and method for its use.

Another object of the invention is to provide a softener composition which may be used in the wash water during laundering.

Still another object is to provide a softener composition which retains good rewet properties by the fabric which has been treated.

A further object is to provide a softener composition which uniquely promotes lint coagulation.

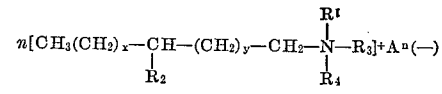
A still further object is to provide a softener composition which also imparts anti-static characteristics especially useful with synthetics and wool.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

It has now been found that when certain arylalkyl quaternary compounds are admixed with the wash or rinse waters for fabrics, they impart a unique softening action upon the fabric while retaining the rewet properties

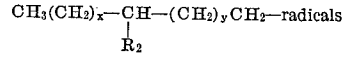
of said fabric. In addition, such compounds enhance lint coagulation and act as anti-static agents on said fabric, especially woolen or synthetic fabric. Compounds having the following structure are useful:

FORMULA I



where:

R_1 is a member of the group consisting of CH_3—, CH_3CH_2—, $CH_3CH_2CH_2$—, and



R_2 is a member of the group consisting of unsubstituted phenyl and phenyl substituted with from 1 to 2 groups selected from methyl, hydroxy, and methoxy;

R_3 and R_4 are each members of the group consisting of CH_3—, CH_3CH_2—, $CH_3CH_2CH_2$— and



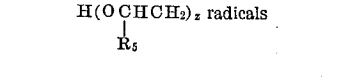
where R_5 is a member of the group consisting of H and CH_3—;

A is an anion such as a halogen, a nitrate, a nitrite, a sulfate, an acetate and the like;

n is an integer from 1 to 2;

x and y are integers from 0 to 19 with the total thereof ranging between 5 to 19;

z is an integer from 1 to 40 and where R_3 and R_4 are



the total is no greater than 60.

For wash water addition, 0.01 to 0.5% by weight and preferably about 0.2% is desirable, whereas for rinse water addition, 0.01 to 0.5% by weight and preferably about 0.1% is used. The percent by weight of softener is based on the weight of fabric to be treated.

The invention accordingly comprises a composition of matter possessing the characteristics, properties, and the relation of components which will be exemplified in the composition hereinafter described, and the several steps and the relation of one or more of such steps with respect to each of the others thereof, which will be exemplified in the method hereinafter disclosed, and the scope of the invention will be indicated in the claims.

Reference is now made to the following examples which illustrate the composition and the method of use of the compounds of Formula I:

EXAMPLE I

Trimethyl phenyloctadecyl ammonium chloride, trimethyl tolyloctadecyl ammonium chloride, dimethyl di-(phenyloctadecyl) ammonium chloride and trimethyl xylyloctadecyl ammonium chloride show good softening (almost equivalent to Arquad 2HT, which is dimethyl di-tallow quaternary ammonium sold by Armour and Company, Chicago, Ill., and as used in commercially available softeners) when added to the rinse water during washing of Curity (trademark) diapers. However, the softening is of a different nature. It does not have as waxy a hand as with Arquad 2HT.

When tested for rewet evaluation by the wicking test, the following results are obtained:

TABLE 1

Softener	Rise (Avg. 10 runs) 5 min.	30 min.	Softening Properties
Untreated	10.9 cm	19.0 cm	
Arquad 2HT	2.0 cm	3.0 cm	Excellent.
Ethoxylated amine plus Arquad 2HT (traditional rewet formulation)	4.7 cm	8.3 cm	Do.
Trimethyl phenyloctadecyl ammonium chloride	8.2 cm	13.3 cm	Do.
Trimethyl tolyloctadecyl ammonium chloride.	9.7 cm	16.8 cm	Do.
Dimethyl di(phenyloctadecyl) ammonium chloride.	10.8 cm	19.6 cm	Do
Trimethyl octadecyl quaternary ammonium chloride.		3.0 cm	Do.
Trimethyl xylyloctadecyl quaternary ammonium chloride.		16.2 cm	Do.
Trimethyl hydroxyphenyloctadecyl ammonium chloride.		13.0 cm	Do.
Ethoxylated (2 moles) di(phenyloctadecyl) methyl ammonium chloride.		19.2 cm	Do
Ethoxylated (3 moles) phenyloctadecyl methyl ammonium chloride.		16.5 cm	Fair.

Although the trimethyl octadecyl quaternary has slightly higher softening properties than the trimethyl xylyloctadecyl quaternary, it is evident from Table 1 that the trimethyl xylyloctadecyl quaternary is far superior with respect to rewet. The presence of the aryl group apparently has caused improved rewet characteristics.

strip of Curity Diaper material, previously treated with the softener under test, is weighted at one end. The weighted end is immersed ¼–½ inches into dye solution and the top of the strip is clipped to a rod suspended across the top of the graduate. Aluminum foil is used to seal the top of the graduate to reduce evaporation. A stop watch is started at the moment the test strip is immersed in the dye solution. The height of the discoloration above the liquid level is measured every 5 to 10 minutes (over a 30 minute period) depending on the rate of wetting.

A plot of height vs. time is made. An untreated blank is run and plotted. A control of Arquad 2HT treated at 0.15% basis cloth is also run. Significant differences are considered to be 10% of the maximum difference between the blank and the control.

It should be evident from the data in Table 1 that the specifically named arylalkyl quaternary softeners above have better rewet characteristics than the popular commercially used Arquad 2HT softener. The dimethyl di(phenyloctadecyl) ammonium chloride treated diaper even has a rewet characteristic as good as the non-softened diaper while showing good softening. It is also apparent that the quaternaries with an aryl group as compared to Arquad 2HT or other quaternaries without an aryl substituent are substantially better on rewet characteristics.

EXAMPLE II

Additional quaternaries and combinations of quaternaries were evaluated using "Tide" by Protcter & Gamble of Cincinnati, Ohio, as the laundering detergent as follows:

TABLE 2

Softener	Parts by Weight	Rewet (Avg. 10 Runs) 5 min.	30 min.	Softening Rinse 0.1% [1] Added	Wash 0.2% [1] Added
Untreated		10.9	19.0		
Dimethyl di-tallow ammonium chloride		2.7	5.4	Excellent	
Dimethyl di(phenyloctadecyl) ammonium chloride		11.1	21.0	Acceptable	Definitely softer than untreated.
Dimethyl di(phenyloctadecyl) ammonium chloride / Dimethyl di-tallow ammonium chloride	1 / 1	4.3	8.4	Good	
Dimethyl di(phenyloctadecyl) ammonium chloride / Arquad 2HT	1 / 3	4.3	8.3	do	
Trimethyl phenyloctadecyl ammonium chloride		8.3	14.4	Acceptable	
Trimethyl xylyloctadecyl ammonium chloride		9.6	16.8	do	
Trimethyl phenyloctadecyl ammonium chloride / Arquad 2HT	1 / 1	4.1	7.5	Good	
Trimethyl phenyloctadecyl ammonium chloride / Arquad 2HT	1 / 3	3.5	6.9	Excellent	
Trimethyl xylyloctadecyl ammonium chloride / Arquad 2HT	1 / 1	5.2	9.7	Fair	
Trimethyl xylyloctadecyl ammonium chloride / Arquad 2HT	1 / 3	3.6	7.5	Good	
Trimethyl tolyloctadecyl ammonium chloride		9.5	17.2	Acceptable	
Trimethyl hydroxyphenyloctadecyl ammonium chloride		7–9	13.9	do	Do.
Trimethyl hydroxyphenyloctadecyl ammonium chloride / Arquad 2HT	1 / 3	3.9	7.2	Excellent	Do.
Trimethyl tolyltallow ammonium chloride		1.8	3.3	Acceptable	
Trimethyl tolyloctadecyl ammonium chloride / Arquad 2HT	1 / 1	4.5	8.5	Fair	
Trimethyl tolyloctadecyl ammonium chloride / Arquad 2HT	1 / 3	4.5	8.8	do	
Trimethyl tolyloctadecyl ammonium chloride / Arquad 2HT	1 / 1	3.0	6.6	Good	
Trimethyl tolyloctadecyl ammonium chloride / Arquad 2HT	1 / 3	0.6	2.4	Excellent	
Dimethyl di(tolyloctadecyl) ammonium chloride		10.5	20.3	Acceptable	Do.
Dimethyl di(tolyloctadecyl) ammonium chloride / Arquad 2HT	1 / 1	4.0	7.0	Good	
Dimethyl di(tolyloctadecyl) ammonium chloride / Arquad 2HT	1 / 3	3.7	8.1	Excellent	
Hendecylphenyl ammonium chloride		11.6	21.1	Acceptable	
Phenylbehenic ammonium chloride		10.5	19.6	Fair	
Ethoxylated (2 moles) di(phenyloctadecyl) methyl ammonium chloride / Arquad 2HT	1 / 3		8.5	Good	Fair

[1] Based on weight of fabric.

Wicking Test

Material:

1 liter graduate
Kiton Red 2G Dye—CIBA
Curity diaper

Procedure.—Into a 1 liter graduate, pour 200 ml. of a 0.1% solution of Kiton Red 2G Dye, A 1.5 inch wide

The di(phenyloctadecyl) and di(tolyloctadecyl) ammonium chloride, when used in the wash cycle, show a unique agglomeration of lint into discrete hard particles which can be more easily removed from the lint filter.

EXAMPLE III

Softener compositions utilizing certain di-phenyl quaternaries are formulated and then evaluated qualitatively by

a panel of housewives and the following test results are obtained:

TABLE 3

Softener Composition	Parts by Wt.	Softening [1] Wash Added, Percent Preference
Untreated		31.0
Dimethyl di(phenyloctadecyl) ammonium chloride	75	68.4
Dimethyl ditallow ammonium chloride	25	
Dimethyl di(phenyloctadecyl) ammonium cholride	1	64.6
Dimethyl ditallow ammonium chloride	1	
Dimethyl di(phenyloctadecyl) ammonium chloride	25	84.1
Dimethyl ditallow ammonium chloride	75	
Dimethyl di(phenyloctadecyl) ammonium chloride	75	61.8
Armosoft DC [2]	25	
Dimethyl di(phenyloctadecyl) ammonium chloride	1	47.2
Armosoft DC [2]	1	
Dimethyl di(phenyloctadecyl) ammonium chloride	25	44.6
Armosoft DC [2]	75	

[1] 0.2% on wt. of fabric.
[2] Armosoft DC=an Arquad 2HT type softener modified to improve rewet.

It should be evident from the above examples that a substantial improvement in the fabric softening art has been accomplished. Now, softening as well as maintenance of rewettability is retained. Surprisingly, lint coagulation is also accomplished.

It might be noted that the di-xylyl and the di-tolyl substituted quaternaries appear to be the most effective, so these are preferred.

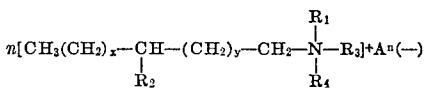
In selling softener formulations to the consumer, an aqueous concentrate of 1 to 20% by weight of the softener is generally utilized. Similar formulations for the softener of this invention may also be utilized for retail sale.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained, and, since certain changes may be made in the above composition of matter and in carrying out the above method without departing from the scope of the invention, it is intended that all matter contained in the above description shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention, which, as a matter of language, might be said to fall therebetween.

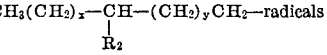
We claim:

1. A softener composition consisting essentially of an aqueous solution of 1 to 20% by weight of an arylalkyl quaternary falling within the following formula:



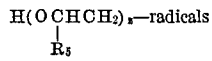
where:

R_1 is a member of the group consisting of CH_3—, CH_3CH_2—, $CH_3CH_2CH_2$—, and



R_2 is a member of the group consisting of unsubstituted phenyl and phenyl substituted with from 1 to 2 groups selected from methyl, hydroxy, and methoxy;

R_3 and R_4 are each members of the group consisting of CH_3—, CH_3CH_2—, $CH_3CH_2CH_2$— and



where R_5 is a member of the group consisting of H and CH_3—;

A is an anion such as a halogen, a nitrate, a nitrite, a sulfate, an acetate;

n is an integer from 1 to 2;

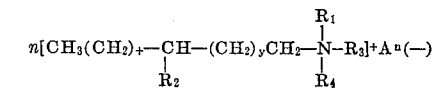
x and y are integers from 0 to 19 with the total thereof ranging between 5 to 19;

z is an integer from from 1 to 40 and where R_3 and R_4 are



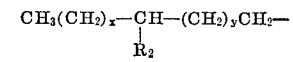
radicals, the total is no greater than 60.

2. A rinse water for laundered fabric consisting essentially of about 0.01 to 0.5% by weight of the fabric being washed of an arylalkyl quaternary falling within the following formula:



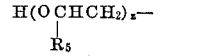
where:

R_1 is a member of the group consisting of CH_3—, CH_3CH_2—, $CH_3CH_2CH_2$—, and



R_2 is a member of the group consisting of unsubstituted phenyl and phenyl substituted with from 1 to 2 groups selected from methyl, hydroxyl, and methoxy;

R_3 and R_4 are each members of the group consisting of CH_3—, CH_3CH_2—, $CH_3CH_2CH_2$— and



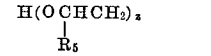
where R_5 is a member of the group consisting of H and CH_3—;

A is an anion such as a halogen, a nitrate, a nitrite, a sulfate, an acetate;

n is an integer from 1 to 2;

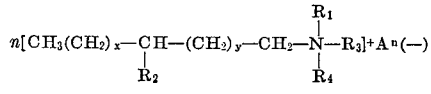
x and y are integers from 0 to 19 with the total thereof ranging between 5 to 19;

z is an integer from 1 to 40 and where R_3 and R_4 are



radicals, the total is no greater than 60.

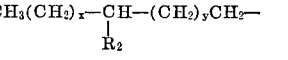
3. A method for softening fabric comprising adding 0.01 to 0.5% by weight of the fabric of an arylalkyl quaternary falling within the following formula:



where:

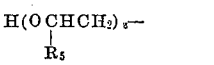
R_1 is a member of the group consisting of CH_3—, CH_3CH_2—

CH_3CH_2—, $CH_3CH_2CH_2$, and



R_2 is a member of the group consisting of unsubstituted phenyl and phenyl substituted with 1 to 2 groups selected from methyl, hydroxy, and methoxy;

R_3 and R_4 are each members of the group consisting of CH_3—, CH_3CH_2—, $CH_3CH_2CH_2$— and



where R_5 is a member of the group consisting of H and CH_3—;

A is an anion such as a halogen, a nitrate, a nitrite, a sulfate, an acetate;

n is an integer from 1 to 2;

x and y are integers from 0 to 19 with the total thereof ranging between 5 to 19;

z is an integer from 1 to 40 and where R_3 and R_4 are

$$H(OCHCH_2)_z$$
$$|$$
$$R_5$$

radicals, the total is no greater than 60;

to water and immersing said fabric therein.

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HERBERT B. GUYNN, Primary Examiner

D. L. ALBRECHT, Assistant Examiner

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