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3,632,623

## ( $\beta$ -CARBAMYL- $\beta$ -HYDROXYETHYL)- ALKYLAMMONIUM SALTS

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5 Claims

### ABSTRACT OF THE DISCLOSURE

New ( $\beta$ -carbamoyl- $\beta$ -hydroxyethyl) - alkylammonium salts having a long chain alkyl radical and their production by reaction of primary or secondary long chain alkylamines with glycidamide followed by further reaction of the resultant intermediates with acids or quaternizing agents. These salts are valuable fat-liquoring auxiliaries for leather, have the ability of increasing the absorptivity of paper, are useful as ore flotation agents, and are effective rewetting agents for fibrous materials.

Cationactive substances, i.e. substances which contain a long chain aliphatic hydrocarbon radical and moreover one or more cationic hydrophilic groups, for example quaternary ammonium groups to ensure good solubility or dispersability in water are required for many industrial applications. These substances may serve for example as emulsifiers and as fat-liquoring agents or softening agent for fibrous materials such as leather, paper and textile material. Prior art agents of this type have the disadvantage that in spite of a content of at least one hydrophilic group in all they have a clearly hydrophobic character. No satisfactory attempt has yet been made to combine fat-liquoring or softening effect and hydrophilic effect in one and the same substance.

It is an object of this invention to provide a cationic surfactant which is universally applicable and a process for the manufacture of the same.

Another object of the invention is to provide new cationic substances which exert a fat liquoring or softening effect on fibrous material and at the same time have a pronounced hydrophilic character.

A further object of the invention is to provide substances which can be used as cationic fat liquoring agents for leather or as emulsifiers for such agents.

Yet another object of the invention is to provide new substances which improve the absorptivity of paper.

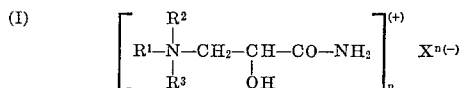
Another object of the invention is to provide outstandingly effective rewetting agents for fibrous materials, particularly for textile fibrous materials, i.e. substances which impart to the fibrous material treated therewith the property of being wetted again very rapidly with water or aqueous liquids after the material has been dried.

Finally it is an object of this invention to use the new cationic surfactants as agents for treating fibrous material.

Further objects of the invention will become evident from the following detailed description.

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These objects are achieved by new ( $\beta$ -carbamyl- $\beta$ -hydroxyethyl)-alkylammonium salts having the general formula:



where  $R^1$  denotes an aliphatic hydrocarbon radical particularly an alkyl or alkenyl radical having eight to twenty, preferably twelve to eighteen, carbon atoms,  $R^2$  denotes a hydrogen atom, an aliphatic hydrocarbon radical particularly an alkyl radical having one to four carbon atoms or the radical  $-CH_2CH(OH)-CO-NH_2$ ,  $R^3$  denotes a hydrogen atom, an aliphatic hydrocarbon radical, particularly an alkyl or alkenyl radical having one to four carbon atoms or an aromatic-aliphatic hydrocarbon radical, particularly an aralkyl or aralkenyl radical having seven to twelve carbon atoms,  $X^{n(-)}$  denotes the anion of an inorganic or organic acid and  $n$  denotes the valency of this anion which is preferably from 1 to 4.

Those substances having the Formula I have proved to be particularly important industrially which contain as the radical  $R^2$  the  $\beta$ -carbamyl- $\beta$ -hydroxyethyl radical



Moreover substances having the Formula I which contain a methyl or benzyl radical as the radical  $R^3$  are preferred owing to their easy accessibility.

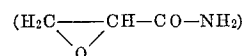
Substances having the Formula I are obtained when an amine having the general Formula II:



in which  $R^1$  denotes an aliphatic hydrocarbon radical having eight to twenty, preferably twelve to eighteen, carbon atoms and  $R^4$  denotes a hydrogen atom or an aliphatic hydrocarbon radical having one to four carbon atoms is reacted with glycidamide in a molar ratio of from 1:1 to 1:2 and the intermediate obtained is allowed to react with an inorganic or organic acid or with a quaternizing agent which introduces an aliphatic hydrocarbon radical, particularly an alkyl or alkenyl radical having one to four, preferably one or two, carbon atoms or an aromatic-aliphatic hydrocarbon radical, particularly an aralkyl or aralkenyl radical having seven to twelve carbon atoms, preferably a benzyl radical.

The hydrocarbon radicals  $R^1$  and  $R^4$  in Formula II may be linear or branched, saturated or unsaturated. The starting material for the process according to this invention may be a single amine having the Formula II or a mixture of amines such as are recovered from natural fats or by amination of oxoalcohols. Examples of amines having the Formula II are octylamine, decylamines, dodecylamine, tridecylamine, tetradecylamine, palmitylamine, stearylamine, methylstearylamine, oleylamine, ethyl palm kernel oil amine, arachylamine and coconut oil amine. The primary amines, i.e. those in which  $R^4$  denotes a hydrogen atom, are preferred.

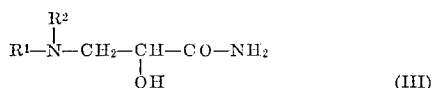
Amines having the Formula II are reacted (by known methods for the addition of amines to epoxy compounds) with glycidamide



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in a molar ratio of from 1:1 to 1:2. It has proved to be very suitable to place the glycidamide in the form of a 10 to 50% aqueous or alcoholic solution, preferably in solution in methanol, in a reactor and to add to it at from 30° to 80° C. the amine having the Formula II with or without a solvent. As a rule the reaction lasts from one hour to five hours. The end of the reaction can be ascertained by oxirane determination in the reaction mixture.

The intermediate obtained by reaction of amines having the Formula II with glycidamide has the following general Formula III:



where R<sup>1</sup> and R<sup>2</sup> have the same meanings as in Formula I.

The intermediate having the Formula III is converted in the second stage of the process according to this invention by a conventional method into either its secondary or tertiary ammonium salts (Formula I with both R<sup>2</sup> and R<sup>3</sup> denoting hydrogen atoms or with R<sup>3</sup> alone denoting a hydrogen atom) with either an inorganic or organic acid, or into its tertiary or quaternary ammonium salts (Formula I with only R<sup>3</sup> denoting a hydrogen atom or with both R<sup>2</sup> and R<sup>3</sup> denoting other than hydrogen atoms) with a quaternizing agent. The reaction may be carried out under the conditions given for the first stage of the process by direct addition of the amount of acid or quaternizing agent theoretically required to the reaction mixture after the first stage of the process is over. It is also possible however first to isolate the intermediate having the Formula III, to dissolve it again in water and/or alcohol, preferably in methanol, to form a 10 to 50% solution and then to add the acid or quaternizing agent to the solution at from 30° to 80° C.

The acids used for the second stage of the process are preferably strong or medium strength inorganic or organic acids, for example sulfuric acid, nitric acid, phosphoric acid, hydrobromic acid, hydrochloric acid, formic acid, oxalic acid, maleic acid, citric acid, nitrilotriacetic acid, ethylenediaminetetracetic acid and acetic acid. Examples of quaternizing agents are alkyl, alkenyl or aralkyl esters of strong acids. The best known agents of this type are alkyl, alkenyl, aralkyl and aralkenyl chlorides, bromides and iodides such as methyl chloride, ethyl chloride, methyl iodide, n-butyl iodide, allyl chloride, methallyl chloride, benzyl chloride and benzyl bromide, benzyl chloride bearing methyl or ethyl groups as nuclear substituents, phenyl-allyl bromide, dialkyl esters of sulfuric acid such as diethyl sulfate, methylethyl sulfate, methyl n-dodecyl sulfate and preferably dimethyl sulfate and esters of p-toluene-sulfonic acid, such as methyl p-toluenesulfonate.

The anion in the substances having the Formula I obtained from the intermediates (III) may be replaced by any other anion by precipitating the hydroxide of the substance (I) by adding an alkali metal hydroxide to an aqueous solution of the substance (I), filtering it off, washing it and then dissolving it in the desired acid to form the salt. In some cases the anion in a substance having the Formula I may be exchanged by reacting a substance having the Formula I which is dissolved in a solvent with an acid which forms a salt which is sparingly soluble in this solvent. Usually however the anion which has been introduced by reaction of the intermediate (III) is left in the substance having the Formula I. This is particularly advantageous because in general the anion has only a minor effect on the properties of the substance having the Formula I.

The substances having the Formula I are valuable fat-liquoring auxiliaries for leather and also outstanding emulsifiers in the production of cationic fat-liquoring agents for leather. They are eminently suitable for increasing the absorptivity of paper and as flotation agents for the dressing of ores.

They may be used with special advantage as treatment agents of fibrous materials; those substances having the Formula I whose hydrocarbon radical R<sup>1</sup> contains from eight to fourteen carbon atoms impart to fibrous material treated therewith unusually good rewettability. Substances having the Formula I whose radical R<sup>1</sup> contains ten to fourteen, preferably twelve to thirteen, carbon atoms and which contain, as radical R<sup>2</sup>, the grouping:  $-\text{CH}_2-\text{CH}(\text{OH})-\text{CO}-\text{NH}_2$  have proved to be particularly good as rewetting agents. In the case of the higher members of the series of substances, the effectiveness as rewetting agents changes more and more into a general hydrophilic character as the number of carbon atoms increases; on the other hand those substances having the Formula I whose hydrocarbon radicals contain thirteen or more carbon atoms exert a very pronounced softening effect on fibrous materials treated therewith. These higher members are therefore predominantly important as cationic brightening agents. They have the great advantage over prior art brightening agents that they do not make the material being treated hydrophobic but leave its original absorptivity unchanged or even improve it.

Substances having the formed (I), particularly those in which R<sup>2</sup> denotes  $-\text{CH}_2-\text{CH}(\text{OH})-\text{CO}-\text{NH}_2$ , moreover have the advantage on account of their strong hydrophilic property that they are capable of forming relatively highly concentrated aqueous solutions which still have low viscosity at room temperature even with a content of active substance of 30% and which can be diluted at will for use by pouring in water without heating. Commercially available cationic brightening agents on the other hand form more or less thick pastes in aqueous solutions from an active substance content of about 15% and these pastes have to be carefully dissolved in hot water to convert them into formulations ready for use.

Conventional procedures may be adopted for using the substances having the Formula I as treatment agents for fibrous materials. The agents are generally applied to the fibrous material from aqueous solution by single or repeated dipping, padding or spraying. Aqueous solutions which contain from 0.1 to 10 grams per liter of substances having the Formula I have proved to be very suitable.

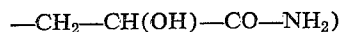
Fibrous materials which may be successfully treated with the substances having the Formula I include especially textile material of any organic fibrous material, for example of hydrophilic fibers such as cotton and rayon staple fiber, of hydrophobic fibers such as polyamide, polyester, polyacrylonitrile, cellulose ester and olefin fibers and mixtures of such fibers.

The invention is illustrated by the following examples. The parts and percentages in the examples are by weight.

#### EXAMPLES 1 TO 16

##### (a) Production of the intermediate (III)

General directions.—In the case of each sample (S) 1 mole of an amine (II) in which X denotes



is added while stirring at 50° to 60° C. during one to two hours to an about 25% aqueous, aqueous-methanolic or methanolic solution of glycidamide (the number of moles thereof being indicated under M). The whole is stirred for another two hours at this temperature. The reaction mixture is concentrated and cooled. Most of the substance (III) crystallizes out. The reaction sample is worked up as usual; the yield in percent is given under Y and the

melting point in °C. is given under MP. Details are given in the following Table 1:

Examples of the production of  $\beta$ -carbamyl- $\beta$ -hydroxy-ethylamines (III):

TABLE 1

S	M (II)	(III)	Y	M. P.
A.....	2 C <sub>12</sub> H <sub>25</sub> -NH <sub>2</sub>	C <sub>12</sub> H <sub>25</sub> -N-X X	87.5	143
B.....	2 C <sub>13</sub> H <sub>27</sub> -NH <sub>2</sub> mixture of isomers	C <sub>13</sub> H <sub>27</sub> -N-X X	85.0	10
C.....	1 C <sub>15</sub> H <sub>37</sub> -NH <sub>2</sub>	C <sub>15</sub> H <sub>37</sub> -NH-X	75.5	113
D.....	2 C <sub>15</sub> H <sub>37</sub> -NH <sub>2</sub>	C <sub>15</sub> H <sub>37</sub> -N-X X	95.0	165
E.....	1 C <sub>18</sub> H <sub>35</sub> -NH <sub>2</sub>	C <sub>18</sub> H <sub>35</sub> -NH-X	55.8	110
F.....	2 C <sub>18</sub> H <sub>35</sub> -NH <sub>2</sub>	C <sub>18</sub> H <sub>35</sub> -N-X X	85.0	165
G.....	2 Coconut oil amine C <sub>n</sub> H <sub>2n+1</sub> -NH <sub>2</sub> <sup>a</sup>	C <sub>n</sub> H <sub>2n+1</sub> -N-X X	90.2	109-111
H.....	1 C <sub>18</sub> H <sub>37</sub> -N-H C <sub>4</sub> H <sub>9</sub>	C <sub>18</sub> H <sub>37</sub> -N-X C <sub>4</sub> H <sub>9</sub>	67.0	25
I.....	1 C <sub>18</sub> H <sub>37</sub> -N-H CH <sub>3</sub>	C <sub>18</sub> H <sub>37</sub> -N-X CH <sub>3</sub>	75.4	25

<sup>a</sup> Mixture of mainly n=8, 10, 12, 14, 16, 18.

(b) Production of substance (I) from intermediate (III)

General directions.—An equimolar amount of a quaternizing agent (QA) or acid is added in each Example (E) to an about 25% aqueous, aqueous-methanolic or methanolic solution of the intermediate (III) at 30° to 50° C. during two to three hours while stirring. The reaction mixture is stirred for another two to three hours at 50° C. to complete the reaction.

After the reaction mixture has been concentrated and cooled, the product (I) is obtained sometimes as crystals and sometimes in pasty form. The yields (percent) are given under Y and the melting points under M.P., d. denoting decomposition.

Details are collected in the following Table 2.

Elementary analyses of (I) agree with the calculated values within the limits of experimental error.

The following abbreviations are used in Table 2:

E=Example;  
DS=dimethyl sulfate;  
BC=benzyl chloride;  
BI=butyl iodide (C<sub>4</sub>H<sub>9</sub>I);  
AB=allyl bromide (CH<sub>2</sub>=CH-CH<sub>2</sub>-Br);  
SA, SB etc.=intermediate (III) as obtained from sample A, sample B, etc.;  
MS=the radical -CH<sub>2</sub>SO<sub>4</sub>;  
X=-CH<sub>2</sub>-CH(OH)-CO-NH<sub>2</sub>.

TABLE 2.—EXAMPLES OF THE PRODUCTION OF AMMONIUM SALT (I)

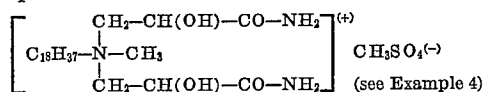
E	III	QA	Acid	I	Y	M. P.
1....	SA	DS	.....	$\left[ \begin{array}{c} \text{CH}_3 \\   \\ \text{C}_{12}\text{H}_{25}-\text{N}-\text{X} \\   \\ \text{X} \end{array} \right]^{(+)} \text{MS}(-)$	96.7	Pasty.
2....	SB	DS	.....	$\left[ \begin{array}{c} \text{CH}_3 \\   \\ \text{C}_{13}\text{H}_{27}-\text{N}-\text{X} \\   \\ \text{X} \end{array} \right]^{(+)} \text{MS}(-)$	91.5	Do.
3....	SC	DS	.....	$\left[ \begin{array}{c} \text{CH}_3 \\   \\ \text{C}_{15}\text{H}_{37}-\text{N}-\text{X} \\   \\ \text{H} \end{array} \right]^{(+)} \text{MS}(-)$	90.0	Do.
4....	SD	DS	.....	$\left[ \begin{array}{c} \text{CH}_3 \\   \\ \text{C}_{18}\text{H}_{37}-\text{N}-\text{X} \\   \\ \text{X} \end{array} \right]^{(+)} \text{MS}(-)$	95.5	Do.
5....	SF	DS	.....	$\left[ \begin{array}{c} \text{CH}_3 \\   \\ \text{C}_{18}\text{H}_{35}-\text{N}-\text{X} \\   \\ \text{X} \end{array} \right]^{(+)} \text{MS}(-)$	92.5	Do.
6....	SE	DS	.....	$\left[ \begin{array}{c} \text{CH}_3 \\   \\ \text{C}_{18}\text{H}_{35}-\text{N}-\text{X} \\   \\ \text{H} \end{array} \right]^{(+)} \text{MS}(-)$	89.4	Do.
7....	SD	.....	HCl	$\left[ \begin{array}{c} \text{H} \\   \\ \text{C}_{18}\text{H}_{37}-\text{N}-\text{X} \\   \\ \text{X} \end{array} \right]^{(+)} \text{Cl}(-)$	90.5	110 d.
8....	SC	.....	HCl	$\left[ \begin{array}{c} \text{H} \\   \\ \text{C}_{15}\text{H}_{37}-\text{N}-\text{X} \\   \\ \text{H} \end{array} \right]^{(+)} \text{Cl}(-)$	75.5	124 d.
9....	SE	.....	HCl	$\left[ \begin{array}{c} \text{H} \\   \\ \text{C}_{18}\text{H}_{35}-\text{N}-\text{X} \\   \\ \text{H} \end{array} \right]^{(+)} \text{Cl}(-)$	85.2	126 d.
10....	SA	BC	.....	$\left[ \begin{array}{c} \text{X} \\   \\ \text{C}_{12}\text{H}_{25}-\text{N}-\text{CH}_2-\text{C}_6\text{H}_5 \\   \\ \text{X} \end{array} \right]^{(+)} \text{Cl}(-)$	95.2	37-40.

TABLE 2.—(Continued)

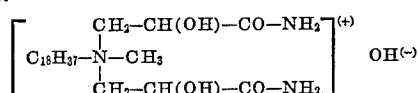
E	III	QA	Acid	I	Y	M.P.
11...	SD	BC	-----	$\left[ \begin{array}{c} \text{X} \\   \\ \text{C}_{18}\text{H}_{37}-\text{N}-\text{CH}_2-\text{C}_6\text{H}_5 \\   \\ \text{X} \end{array} \right]^{(+)} \text{Cl}(-)$	97.3	128-130.
12...	SG	BC	-----	$\left[ \begin{array}{c} \text{X} \\   \\ \text{C}_n\text{H}_{2n+1}-\text{N}-\text{CH}_2-\text{C}_6\text{H}_5 \\   \\ \text{X} \end{array} \right]^{(+)} \text{Cl}(-)$	94.8	Pasty.
13...	SG	DS	-----	$\left[ \begin{array}{c} \text{X} \\   \\ \text{C}_n\text{H}_{2n+1}-\text{N}-\text{CH}_3 \\   \\ \text{X} \end{array} \right]^{(+)} \text{MS}(-)$	95.1	Do.
14...	SH	BI	-----	$\left[ \begin{array}{c} \text{C}_4\text{H}_9 \\   \\ \text{C}_{18}\text{H}_{37}-\text{N}-\text{X} \\   \\ \text{C}_4\text{H}_9 \end{array} \right]^{(+)} \text{I}(-)$	65.2	130.
15...	SI	DS	-----	$\left[ \begin{array}{c} \text{CH}_3 \\   \\ \text{C}_{18}\text{H}_{37}-\text{N}-\text{X} \\   \\ \text{CH}_3 \end{array} \right]^{(+)} \text{MS}(-)$	80.0	148.
16...	SD	AB	-----	$\left[ \begin{array}{c} \text{X} \\   \\ \text{C}_{18}\text{H}_{37}-\text{N}-\text{CH}_2-\text{CH}=\text{CH}_2 \\   \\ \text{X} \end{array} \right]^{(+)} \text{Br}(-)$	75.4	150 d.

## EXAMPLE 17

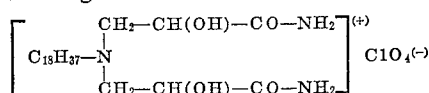
569 parts of the substance having the formula:



is dissolved in 1700 parts of water. 40 parts of sodium hydroxide (dissolved in water) is added to this solution. A precipitate is deposited. The precipitate is filtered off, washed with a little water and dried. It consists of 396 parts (83% of the theory) of the hydroxide having the formula:



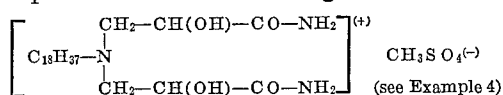
which has a melting point of 144° C. (with decomposition). The hydroxide is dissolved in 1200 parts of methanol and the solution has added to it twice its molar amount of commercial perchloric acid. The precipitate formed is filtered off, washed with a little methanol and dried. It consists of 456 parts (98% of the theory) of the substance having the formula:



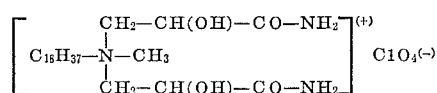
and having a melting point of 190° C. (with decomposition).

## EXAMPLE 18

569 parts of the substance having the formula:



is dissolved in 1700 parts of methanol and twice the molar amount of commercial perchloric acid is added. A precipitate is formed which is filtered off, washed with methanol and dried. It consists of 530 parts (95% of the theory) of a substance having the formula:



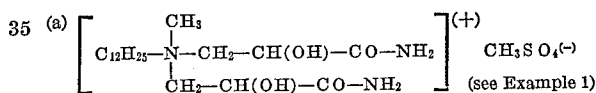
and having a melting point of 190° C. with decomposition.

## EXAMPLE 19

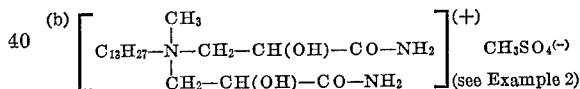
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The following substances are used as rewetting agents and compared:

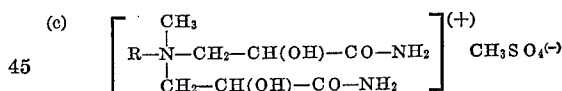
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R denotes a mixture of alkyl radicals from coconut oil amine (C<sub>8</sub> to C<sub>18</sub>, mainly C<sub>12</sub> and C<sub>14</sub>) (see Example 13).

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(d) A mixture of dodecyl and tetradecyl dimethyl benzyl ammonium chloride as the commercially available cationic surfactant having a pronounced rewetting action.

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In each case lengths of raw cotton cloth from the same source and having the same dimensions are dipped for thirty seconds in an aqueous solution of the substance to be tested at a concentration of 1 g./liter and in another aqueous solution of 3 g./liter and at a liquor ratio of 10:1 and then squeezed out in a padding machine so that a 50% wet pickup results. The procedure is then repeated.

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The lengths of cloth are then rinsed at the same liquor ratio in distilled water, padded to the same squeeze effect and dried at 50° to 60° C. in a drying cabinet. Circular rags having a diameter of 3 cm. are punched out from the lengths of cloth and the wetting times in distilled water are determined according to the funnel method (see Schwen "Die Bedeutung der anwendungstechnischen Prüfmetho-den für die Textilveredlung und ihre Normung im Hinblick auf Farbstoffe und oberflächenaktive Hilfsmittel" in Zeitschrift für die gesamte Textilindustrie, 61 (1059), parts 11 and 12).

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The results collected in the following Table 3 indicate the great superiority of the agents according to this invention.

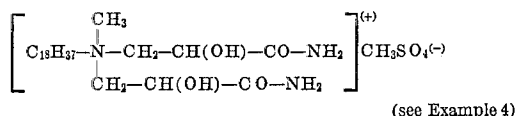
TABLE 3

Product	Wetting time in seconds	
	At 1 g./l.	At 3 g./l.
(a)-----	42	20
(b)-----	15	8
(c)-----	72	23
(d)-----	133	62

The values given are mean values of five measurements. 10

### EXAMPLE 20

Cotton towelling is treated with an aqueous solution of 0.3 g./liter of the substance having the formula: 15



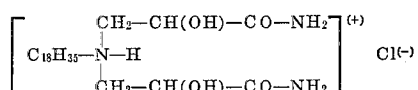
at a liquor ratio of 30:1 for ten minutes at 40° C., and then hydroextracted and dried at 80° C. A material is obtained which has a soft, pleasant handle and whose rewettability and consequently absorptivity have only undergone insignificant change as compared with unbrightened material. The known method of laying a specimen on the surface of water is used as a measure of the rewettability. 25

In this method a circular specimen having a diameter of 3 cm. is used and the time is measured before the specimen overcomes the surface tension of the water and sinks. Bleached and unbrightened towelling has a submersion time of eleven seconds in this test, while the brightened specimen has a submersion time of twelve and a half seconds. 30

Test material treated with the methosulfate of the triethanolamine ester of stearic acid to which the same amount has been applied floats on the surface of water even after five minutes without being wetted. 35

### EXAMPLE 21

Cotton tricot, which has been bleached in known manner with bleaching powder liquor and hydrogen peroxide, is treated under the conditions specified in Example 20 with an aqueous solution of 0.3 g./liter of the substance having the formula: 40



(prepared as described in Example 7 using sample F) and dried. 45

The textile has a soft and smooth handle, is resilient and voluminous. Sumersion time is 5.2 seconds, that of an untreated specimen is 4.5 seconds. A prior art cationic compound having comparable softening effect (obtained from 1 mole of oleylamine and 2 moles of ethylene oxide followed by quaternization with dimethyl sulfate) impairs the rewettability of this cotton tricot to such an extent that in the test for rewettability the test specimen is still floating on the surface of the water after five minutes. 50

### EXAMPLE 22

Raw cotton towelling is treated with an aqueous solution of 0.5 g./liter of the substance obtained according to Example 7 under the conditions specified in Example 20 and dried. The material has a soft, agreeable handle and has become absorptive by the treatment. Whereas the 55

raw cotton fabric which has not been after-treated floats on the surface of water even after five minutes in the rewettability test owing to its content of cotton wax, a sample of the fabric treated in accordance with the invention sinks after twenty-five seconds. 60

### EXAMPLE 23

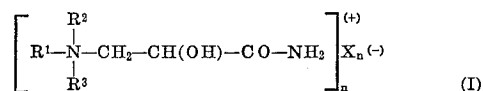
Charmeuse of polycaprolactam fibers is treated under the conditions described in Example 20 with an aqueous solution of 1 g./liter of the substance obtained according to Example 2. The treated textile material has a soft and smooth handle and is clearly superior in rewettability to an untreated comparison material for it sinks in the rewetting test after about ten seconds whereas the untreated material remains floating even after two minutes. 65

### EXAMPLE 24

Cotton yarn in the form of X-spools is treated in a dyeing machine under the conditions described in Example 20 with an aqueous solution of 1 g./liter of the substance obtained according to Example 11. The yarn treated in this way may be woven and knitted without trouble owing to the softness and smoothness brought about by the treatment. Owing to its pronounced hydrophilic character, the yarn is suitable for the production of tricot which after finishing off needs no additional finish with brightening or hydrophilic agents. 70

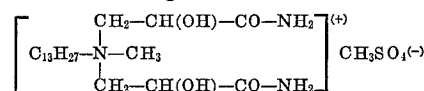
We claim:

1. A substance having the general formula: 75

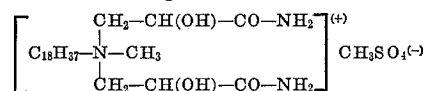


wherein R<sup>1</sup> denotes an alkyl or alkenyl group having eight to twenty carbon atoms, R<sup>2</sup> denotes a hydrogen atom, an alkyl group having one to four carbon atoms or the radical —CH<sub>2</sub>—CH(OH)—CO—NH<sub>2</sub>, R<sup>3</sup> denotes a hydrogen atom, an alkyl or alkenyl group having one to four carbon atoms or an aralkyl or aralkenyl group having seven to twelve carbon atoms, X<sup>n(-)</sup> is chloride, bromide, iodide, mono-alkyl sulfate or the anion of sulfuric acid, nitric acid, phosphoric acid, formic acid, oxalic acid, maleic acid, citric acid, nitrilotriacetic acid, ethylenediaminetetracetic acid, acetic acid or p-toluene-sulfonic acid. 80

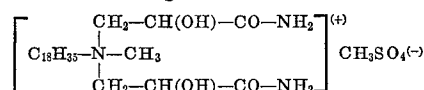
2. A substance having the formula: 85



3. A substance having the formula: 90



4. A substance having the formula: 95



5. A substance as claimed in claim 1 wherein R<sup>2</sup> is the radical —CH<sub>2</sub>CH(OH)—CO—NH<sub>2</sub>. 100

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BERNARD HELFIN, Primary Examiner

L. DE CRESCENTE, Assistant Examiner

U.S. Cl. X.R.

252—8.57, 8.7, 8.8, 357, 353; 260—501.13, 501.15, 559 A, 561 N