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(54) Liquid softener composition.

(57) A liquid softener composition comprising:

(A) a slightly water-soluble quaternary ammonium salt type cationic surfactant having 2 or 3 alkyl or alkenyl groups with 14 to 24 carbon atoms in the molecule;

(B) a carboxylic acid type anionic polymer;

(C) a polyoxyethylene adducted nonionic surfactant; and

(D) an aqueous vehicle,

wherein the weight ratio of (A)/(C) is within range of from 100/1 to 3/1.

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LIQUID SOFTENER COMPOSITION

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a softener composition which can impart, for example, an excellent softness and antistatic property to fiber, clothing, and hair. More specifically, it relates to an aqueous liquid softener composition which can impart an excellent softness and antistatic property to chemical textile products such as of acryl, nylon, polyester, and also has an excellent dispersion stability.

2. Description of the Related Art

Heretofore, to prevent deterioration of the touch and antistatic properties of textile products after repeated wear and washing, a softener containing a quaternary ammonium salt having two long chain alkyl groups or alkenyl groups in the molecule as the main component has been employed. Representative examples of the quaternary ammonium salts include di-hardened tallow alkyldimethylammonium chloride, and methyl-1-tallow amidoethyl-2-alkylimidazolinium methylsulfate, but these single products, although they are capable of imparting excellent softness to cotton products, have no sufficient effect from the view point of imparting softness and an antistatic property to chemical fiber products. Accordingly, proposals have been made to modify the quaternary ammonium salt itself (Japanese Unexamined Patent Publication (Kokai) No. 55-51876); use of the quaternary ammonium salt in combination with another specific di-long chain alkyl quaternary salt (Japanese Unexamined Patent Publication (Kokai) Nos. 55-51874, 55-62268, 55-103364, 55-103365); use of the quaternary ammonium salt in combination with a tri-long chain alkyl quaternary salt (Japanese Unexamined Patent Publication (Kokai) Nos. 55-112375, 55-1112377, 56-79768); use of the quaternary ammonium salt in combination with a specific mono-long chain alkyl quaternary salt (Japanese Unexamined Patent Publication (Kokai) No. 57-205581); or, use of the quaternary ammonium salt in combination with an anionic surfactant (Japanese Unexamined Patent Publication (Kokai) Nos. 53-19497, 53-38794, 53-52799, 58-13775). Nevertheless, although some improvement can be observed when these compositions are used, the effects are still unsatisfactory, or on the contrary, the softness of cotton may be worsened in some cases. Thus, up to data, a softener for domestic use which can impart a sufficient softness to both textile products of cotton and chemical fibers, and provide an excellent antistatic effect for chemical fibers, is not available.

On the other hand, the present Applicant has found that an excellent effect can be obtained by use of a carboxylic acid type anionic polymer in combination with a quaternary ammonium salt and has filed a patent application therefor (Japanese Patent Application No. 62-127722). Nevertheless, when only these two components are used, it has been found that a phase separation after a lapse of days for storage or abrupt rise in viscosity elevation occurs, whereby no sufficient dispersion stability which is essential to the commercial product cannot be satisfactorily obtained. Separately from these, proposals have been made for granular additives to a detergent by using a dilong chain alkyl quaternary ammonium salt in combination with a specific anionic polymer (Japanese Unexamined Patent Publication (Kokai) Nos. 59-6298, 61-7398), but such granular products can not be sufficiently dispersed or dissolved in water, and therefore, the object of the present invention cannot be accomplished even by using such a granular additive for the conventional washing and rinsing steps.

SUMMARY OF THE INVENTION

Accordingly, an object of the present invention is to obviate the above-mentioned problems in the prior art and to provide an aqueous liquid softener composition which can impart the same softness to cotton as that of the prior art products, but a much greater softness and antistatic property to chemical fibers, compared with the prior art products in softening treatment practiced in the washing and rinsing steps at home, and further, has an excellent dispersion stability.

Other objects and advantages of the present invention will be apparent from the description set forth hereinbelow.

In accordance with the present invention, there is provided a liquid softener composition, comprising:

(A) a slightly water-soluble quaternary ammonium salt type cationic surfactant having 2 or 3 alkyl or alkenyl groups with 14 to 24 carbon atoms in the molecule;

(B) a carboxylic acid type anionic polymer;

(C) a polyoxyethylene adducted nonionic surfactant; and

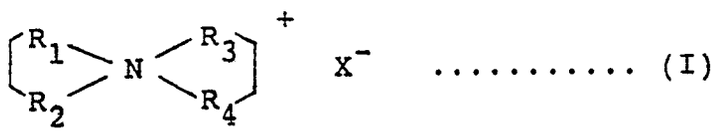
(D) an aqueous vehicle, with the weight ratio of (A)/(C) being within range of from 100/1 to 3/1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

It has been found that the above-mentioned object of the present invention can be accomplished by using a specific slightly water-soluble quaternary ammonium salt type cationic surfactant in combination with a carboxylic acid type anionic polymer and a polyoxyethylene adducted nonionic surfactant.

The slightly water-soluble quaternary ammonium salt of the component (A) usable in the present invention may be exemplified by those represented by the formula (I) or (II) shown below. These compounds can be used alone or as a mixture of two or more compounds, and these are cationic surfactants having 2 or 3 straight or branched alkyl or alkenyl groups with 14 to 24 carbon atoms in the molecule which may be respectively optionally substituted or intermingled with functional groups such as

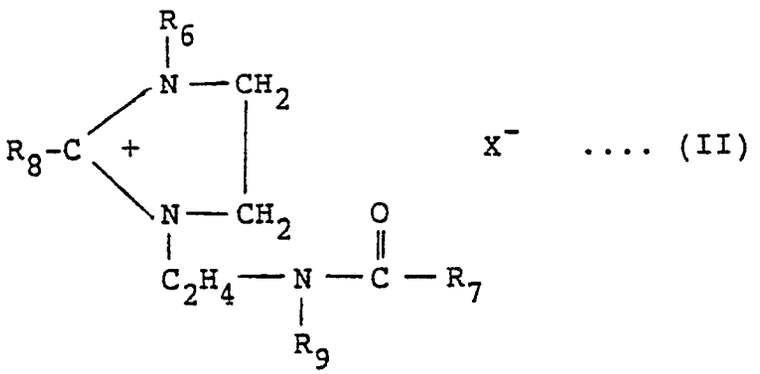
-OH, -O-, -$\overset{O}{\overset{\|}{C}}$-NH-, -$\overset{O}{\overset{\|}{C}}$-O-.



wherein at least two groups of R_1 - R_4 represent straight or branched alkyl or alkenyl groups which may be unsubstituted or optionally substituted by

-OH-, -O-, -$\overset{O}{\overset{\|}{C}}$-NH-, -$\overset{O}{\overset{\|}{C}}$-O-, etc.,

the remainder of the groups of R_1 - R_4 represent an alkyl group with 1 to 3 carbon atoms, a hydroxyalkyl group or a group represented by the formula $-(C_2H_4)_\ell H$ (where ℓ is an integer of 1 to 5, and X represents a halogen or a monoalkylsulfate group represented by R_5SO_4 where R_5 represents an alkyl group with 1 to 3 carbon atoms).



wherein R_6 represents an alkyl group with 1 to 4, preferably 1 to 2 carbon atoms, R_7 and R_8 each represent an alkyl or alkenyl group with 14 to 24 carbon atoms, R_9 represents hydrogen or an alkyl group with 1 to 4 carbon atoms, and X has the same meaning as in the formula (I).

At least two groups of R_1 - R_4 in the above formula (I) have 14 to 24, preferably 16 to 22 carbon atoms, R_7 and R_8 in the above formula (II) have 14 to 24, preferably 15 to 21 carbon atoms, each group may have

a distribution within these ranges, and the respective groups may be either the same or different from each other. When the carbon number is lower than this range, for example, when a mixture of quaternary ammonium salts of (I) or (II) synthesized from coconut fatty acids is used, the softness will be poor.

Specific examples of the component (A) include one or a mixture of two or more of di-hardened tallow alkyldimethylammonium chloride, di-tallow alkyldimethylammonium bromide, dioleyldimethylammonium chloride, dipalmitylhydroxyethylammonium methylsulfate, distearylmethylpolyoxyethylene (average degree of polymerization is 3)ammonium chloride, diisostearyldimethylammonium methylsulfate, dieicosyldimethylammonium chloride, dibehenylmethylpolyoxyethylene (average degree of polymerization is 5)-ammonium chloride, dierucyldimethylammonium chloride, di[2-dodecanoylamino)ethyl]-dimethylammonium chloride, di[2-stearoylamino)propyl]dimethylammonium ethylsulfate, di(2-ethylpalmitoyl)-hydroxyethylmethylammonium methylsulfate, trioleylmethylammonium chloride, dioleylmonostearylmethylammonium chloride, dioleylmonobehenylmethylammonium chloride, monooleyldierucylmethylammonium chloride, tristearylmethylammonium methylsulfate, methyl-1-tallow amidoethyl-2-tallow alkylimidazolinium methylsulfate, methyl-1-hexadecanolylamidoethyl-2-pentadecylimidazolinium chloride, ethyl-1-octadecenoylamidoethyl-2-heptadecenylimidazolinium ethylsulfate, and the like. The content of the component (A) in the softener composition may be as desired but is preferably 3 to 50% by weight (hereinafter abbreviated merely as %), more preferably 4 to 20%.

As the carboxylic acid type anionic polymer of the component (B), homopolymers of ethylenically unsaturated carboxylic acids or anhydrides thereof or copolymers of said monomers can be used. The salts of these homopolymers and copolymers may be used. Also, these polymers may be used either as such or in the form of water soluble neutral salts such as alkali metal salts or alkaline earth metal salts. The component (B) has an average molecular weight generally of 500 to 50,000, preferably 500 to 20,000, and more preferably 500 to 10,000.

The above-mentioned anionic polymrs to be used as the component (B) should be the so-called "oligomers" which have a relatively low molecular weight. When the molecular weight thereof is higher, the desired sufficient dispersion stability obtained from the addition of the component (C) as mentioned hereinbelow is prevented. Contrarily, when the molecular weight is lower, the effect obtained from addition of the component (B) as mentioned hereinbelow becomes insufficient.

Specific examples of the component (B) may include one or a mixture of two or more of polyacrylic acid, polymethacrylic acid, polycrotonic acid, polyacotinic acid, poly-α-hydroxyacrylic acid, polymaleic acid, polysorbic acid, polyitaconic acid, poly(maleic anhydride), poly(itaconic anhydride) their copolymers, or salts of these homopolymers or copolymers.

In the liquid softener composition, the reason why excellent effect can be obtained by using the component (A) and the component (B) in combination is not clear, but it may be considered to be as follows. That is, although the ion bonding between the both may not be so strong, by forming a cation-anion complex with a part of the dispersed particles of the component (A), the component (A) can be made further hydrophobic to promote adsorption of the component (A) onto chemical fibers such as acrylic or polyester fibers which are hydrophobic fibers, whereby softness and antistatic property of the chemical fibers can be consequently further improved as compared with the case of the component (A) alone. On the other hand, the component (B) which is a water soluble polymer will not be incorporated into the dispersed particles of the component (A) and will not destroy the adsorption structure of the component (A), as different from a some kinds of anionic surfactant, and consequently will not give any adverse effect on the softness of cotton fibers.

In view of the above mechanism, it is important to control the amount of the component (B) formulated as the relative value to the component (A). Specifically, these compounds are formulated, in terms of the ratio of positive charge mols (a) of the component (A) to the negative charge mols (b) of the component (B), at a ratio (a)/(b) of 1/0.2 to 1/2.0, preferably 1/0.5 to 1/1.0. If the ratio of the component (B) to the component (A) is outside this range, the above effect of combined use is difficult to obtain.

The third essential component for accomplishing the object of the present invention is the component (C). That is, a sufficient dispersion stability is an essential condition for use as a softener for domestic use, but only with the components (A), (B), (D), the required dispersibility cannot be obtained, and accordingly the emulsifying stabilizing action of the component (C) is necessary.

The component (C) usable in the present invention may be exemplified by polyoxyethylene alkylphenyl ether, polyoxyethylene alkyl (or alkenyl) ether, polyoxyethylene fatty acid amide, polyoxyethylene alkyl (or alkenyl) amine, and polyoxyethylene sorbitane fatty acid ester. Preferable average additional moles of ethylene oxide are at least 20, more preferably 20 to 100. Examples of such a component (C) are POE ($\overline{p}$ =20 - 100) alkyl(C_{8-12})phenyl ether, POE($\overline{p}$ =20 - 100) alkyl or alkenyl(C_{10-22}) ether, POE($\overline{p}$ =20 - 100) alkyl or alkenyl (C_{10-20}) amine, or mixtures thereof. In the above compounds, each POE represents

polyoxyethylene, $\overline{p}$ denotes the average adducted mols of ethylene oxide, and C the carbon number of the alkyl or alkenyl group (hereinafter the same).

The component (C) improves the emulsifying dispersion of the dispersed particles of the component (A) alone and the anion-cation complex of the dispersed particles of the component (A) with the component (B), which may be considered to form a random coil structure dissolved in the aqueous phase in the composition, and thus the amount of the component (C) formulated is preferably 100/1 to 3/1 as a weight ratio of (A)/(C), more preferably 50/1 to 5/10. If the ratio of the component (C) to the component (A) is outside of this range, the above effect cannot be exhibited, and conversely, the above effect of combined use of the component (A) and the component (B) is frequently inhibited.

The component (D) is used as the carrier for the essential components and the optional components of the present invention, and the amount thereof in the composition is the balance which makes up the total amount to 100%, in addition to the essential components and the optional components formulated.

The softener composition of the present invention can include optional components in addition to the above essential components, including viscosity controllers such as inorganic electrolytes like sodium chloride, potassium chloride, magnesium chloride, aluminum chloride, sodium sulfate, ammonium sulfate, sodium nitrate, or magnesium nitrate; and polyethylene glycol or other water soluble organic polymers; hydrotropes such as lower alcohols like ethanol, or isopropanol, ethylene glycol, glycerine, and urea; and pH controllers, sterilizers, pigment dyes, perfumes, antioxidants, UV-ray absorbers, and fluorescent brighteners.

The softener composition of the present invention can be prepared according to known methods. More specifically, it is desirable that the component (A) should be finely and uniformly dispersed, and for this purpose, it is preferable to use the method in which the components (B), (C) and optical components are previously dissolved in an aqueous vehicle, and to this solution is successively added, under heating to 40 °C to 80 °C if desired, the component (A) in a molten state to be mixed under stirring. On the other hand, when optional components susceptible to denaturation at high temperature are used, it is desirable to cool the above dispersion to about room temperature, followed by addition while stirring. A pH controller can be added to the softener composition of the present invention, but the pH of the composition is not limited. Usually, the pH is that when the respective components are formulated, but it is desirable to control pH to 4 to 8. For this purpose, an organic or inorganic acid or a basic compound can be formulated, as desired.

The softener composition of the present invention which can impart an excellent softness to not only cotton fibers but also chemical fibers, and further gives an excellent antistatic property to chemical fibers is valuable.

Also it has excellent freeze-tham stability, whereas it shows neither remarkable viscosity rise nor abnormal phase separation even when stored for a long term. Thus, the present composition is excellent in practical application.

EXAMPLES

The present invention now will be further illustrated by, but is by no means limited to, the following examples.

The preparation, performance evaluation and dispersion stability evaluation of the softener compositions in Examples were conducted according to the following methods.

Method of Preparation of Aqueous Dispersion:

Other components except for the component (A) were dissolved in water, the resultant solution was heated to 45 °C and to this was added dropwise under stirring the molten product of the component (A) to be dispersed uniformly, followed by cooling to 25 °C.

Finishing Treatment Method:

Commercially available cotton towel, acrylic cloth were washed repeatedly twice with a commercially available detergent for clothing by means of an electric washing machine at 50 °C, and then thoroughly rinsed with tap water at normal temperature to provide test cloths.

Next, into 30 liters of tap water of 25° C was added the softener composition to an amount of the component (A) added of 1 g to form a uniform solution. Each test cloth was dipped in this solution at a bath ratio of 30-fold to carry out the treatment for 3 minutes, and then dehydrated for 2 minutes. The cloth thus treated was dried on air, and then the cotton towel for evaluation of softening effect was left to stand under the conditions of 25° C, 65% RH for 24 hours, while the acrylic cloth for evaluation of antistatic effect under the conditions of 20° C, 50% RH for 72 hours, before use for the respective evaluation tests.

Performance Evaluation Method:

(a) Softness: Touch feelings of cotton towel before and after treatment were compared and evaluated according to the following standards:

+ 5 ..... very soft
+ 4 ..... considerably soft
+ 3 ..... soft
+ 2 ..... some softness
+ 1 ..... slightly soft
0 ..... unchanged, as before treatment;

(b) antistatic property: By means of a static honestometer (manufactured by Shishido Shokai), the polyester cloth was charged at an application voltage of 7 KV at a target distance of 20 mm, and the half life (sec.) of the residual voltage after the removal of the applied voltage was measured.

Method of Evaluation of Dispersion Stability:

(a) viscosity change: The viscosities for each softener composition prepared, one composition immediately after preparation, one freezed at -15° C for 40 hours and then thawed at 25° C and one stored at 45° C for one month were measured by means of a B type viscometer (manufactured by Tokyo Keiki) (measurement was conducted at 25° C);

(b) judgement of phase separation: each softener composition prepared was charged into a transparent cylinder bottle of 45 mm in inner diameter to 70 mm from the bottom of the bottle, stationarily stored at 5° C for one month, and then the separated length was measured. Evaluation:

o: not separated
Δ: separated length less than 3 mm
x: separated length of 3 mm or longer

Example 1

Various liquid softener compositions with various liquid properties shown below were prepared, and their performances and dispersion stabilitis thereof were evaluated. The results are shown in Table 1.

Component (A): di-hardened tallow alkyldimetyl-ammonium chloride: 5%
Component (B): (Polymer shown in Table 1)
: [equivalent in charge molar ratio to component (A)]
Component (C): POE (p=40) nonylphenyl ether
: 0.25% [(A)/(C) weight ratio=20/1]
Component (D): 3% aqueous ethylene glycol

: balance.

The above component (A) is available as a mixture with isopropanol, and therefore, the compositions were contaminated with about 1.7 (%) thereof.

Table 1

-	No.	Component (B) Name	Component (B) Amount (%)	Performance: Softness: Cotton towel	Performance: Softness: Acrylic cloth	Performance: Antistatic property: Acrylic cloth	Dispersion stability: Viscosity (centipoise): Immediately after preparation	Dispersion stability: Viscosity (centipoise): After storage (45°C, 1 month)	Dispersion stability: Viscosity (centipoise): After restored from freezing	Dispersion stability: Phase separation
Present products	1	Polyacrylic acid (average molecular weight 4,000)	0.64	+5	+5	3 (sec)	60	220	440	o
	2	" (" 8,000)	0.64	+5	+4 - +5	10	100	260	740	o
	3	" (" 30,000)	0.64	+5	+4 - +5	13	140	990	1100	o
	4	Sodium polyacrylate (" 7,000)	0.85	+5	+4 - +5	18	50	160	200	o
	5	Acrylic acid - methacrylic acid copolymer (Polymerization molar ratio = 3:1) (" 40,000)	0.67	+5	+4 - +5	4	370	1400	1200	o
	6	Acrylic acid - maleic acid copolymer (Polymerization molar ratio = 2:1) (" 9,000)	0.77	+5	+5	15	70	330	460	o
	7	Polymaleic acid (" 800)	0.51	+5	+5	17	65	290	550	o

Table 1 (continued)

-	No.	Component (B)		Performance			Dispersion stability			
				Softness		Antistatic property	Viscosity (centipoise)			Phase separation
		Name	Amount (%)	Cotton towel	Acrylic cloth	Acrylic cloth	Immediately after preparation	After storage (45°C, 1 month)	After restored from freezing	
Present Products	8	Polycrotonic acid (" 8,000)	0.76	+5	+5	25	280	1340	1160	o
Comparative example	9	(No addition)		+5	+4	40	230	880	730	o
	-	(untreated)		0	0	> 300	-	-	-	-

From Table 1, it can be understood that the softener compositions of the present invention have excellent performance and dispersion stability. More specifically, although considerable softness is exhibited in the case of di-hardened tallow alkyldimethylammonium chloride alone, the softness and antistatic property of the acrylic cloth are clearly improved by addition of the component (B). Particularly, No. 1 and No. 5 can be appreciated to exhibit a very excellent antistatic property. Also, according to the experience of the present inventors, a rise in viscosity under the above storage conditions may be permissible up to about 1500 centipoise in commercial product value, and it can be seen that the products of the present invention satisfy this condition without causing phase separation due to the addition effect of the component (C) and the presence of ethylene glycol in the component (D).

Example 2

Various softener compositions were prepared to a charge molar ratio (a)/(b) of the component (A) and the component (B) of 1/0.8, and their performances and dispersion stabilitis thereof were evaluated. The results are shown in Table 2.

Table 2

			Present products				Comparative example	
		No.	10	11	12	13	14	15
Composition (%)	Component (A)	Di-hardened tallow alkylaimethyl-ammonium chloride	4.0	9.0	12.0	5.0	5.0	5.0
	Component (B)	Polymale acid average (molecular weight 1500)	0.33	0.73	0.98	0.41	0.41	0.41
	Component (C)	POE($\bar{p}$=30) octylphenyl ether	0.04	-	-	-	-	-
		POE($\bar{p}$=50) oleyl ether	-	3.0	-	-	-	-
		POE($\bar{p}$=60) tallow alkylamine	-	-	2.4	-	-	-
		POE($\bar{p}$=40) sec-alkyl ether (C_{12} - C_{14})	-	-	-	0.1	0.44	2.0
	Component (D)	Ethylene glycol	5.0	6.0	10.0	4.0	4.0	4.0
		Sodium chloride	-	0.2	0.4	-	-	-
		Acetic acid	-	-	0.05	-	-	-
		Deionized water	balance	balance	balance	balance	balance	balance
Component (A)/Component (C) ratio			100/1	3/1	5/1	50/1	125/1	2.5/1

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Table 2 (continued)

			Present products				Comparative example	
		No.	10	11	12	13	14	15
Performances	Softness	Cotton towel	+5	+5	+5	+5	+5	+4 - +5
		Acrylic cloth	+5	+5	+5	+5	+5	+3 - +4
	Antistatic property (sec)	Acrylic cloth	13	18	9	15	16	35
Dispersion stability	Viscosity (centipoise)	Immediately after preparation	320	80	150	280	450	15
		After stored (45°C, 1 month)	1440	360	680	940	3300	80
		After restored from freezing	1300	720	870	1180	2860	130
	Phase separation		o	o	o	o	o	x

From Table 2, it can be understood that all of the products of the present invention have good performances and also excellent dispersion stability. In contrast, as shown in Comparative examples, if the ratio of the component (C) relative to the component (A) is too low, i.e., outside the range defined in the present invention (No. 14), viscosity elevation after a lapse of days for storage is marked, while if it is too much (No. 15), phase separation is liable to occur, and there is also an undesirable tendency that the performance to be improved by addition of the component (B) is contrariwise inhibited.

Example 3

Using dioleyldimethylammonium chloride as the component (A) and varying the amount of polyacrylic acid formulated as the component (B), softener compositions shown below were prepared and their performances were evaluated. The results are shown in Table 3:

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Component (A):  dioleyldimethylammonium chloride
                (iodine value = 73):  9 (%);
Component (B):  polyacrylic acid (average molecular
                weight = 1,000):  0 to about
                2.3 (%);
Component (C):  POE (p=50) oleylamine
              :  2 (%) [(A)/(C) weight ratio=4.5/1];
Component (D):  sodium chloride:   0.2 (%)
              :  glycerine:        10 (%)
              :  deionized water:  balance
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The above component (A), is provided as a mixture with isopropanol, and therefore, the compositions were contaminated with about 3 (%) thereof.

Table 3

-	No.	Amount of the component (B) (%)	Component (A)/Component (B) charge molar ratio (a)/(b)	Performance evaluation results		
				Softness		Antistatic property
				Cotton towel	Acrylic cloth	Acrylic cloth
Comparative example	16	(no addition)	1/0	+3	+3	100 (sec)
Present products	17	0.11	1/0.1	+3	+3	80
	18	0.23	1/0.2	+3	+3	50
	19	0.57	1/0.5	+3	+3 - +4	15
	20	0.91	1/0.8	+3 - +4	+3 - +4	3
	21	1.14	1/1.0	+3 - +4	+3 - +4	2
	22	1.71	1/1.5	+3	+3 - +4	30
	23	2.29	1/2.0	+3	+3	70
	24	2.86	1/2.5	+3	+3	90

From Table 3, it can be understood that softness and/or antistatic property of the acrylic cloth can be improved by an addition of the component (B). Furthermore, it is also clear that the softness of the cotton

towel is improved in some cases. Thus, these effects are more marked when the charge molar ratio (a)/(b) is within the range from 1/0.2 to 1/2.0, more preferably from 1/0.5 to 1/1.0. Also all of the above compositions of the present invention have a good dispersion stability, which may be attributed to the addition effects of the component (C) and glycerine in the component (D).

Example 4

Using various slightly water soluble di/tri-long chain alkyl/alkenyl quaternary ammonium salts as the component (A) and sodium polyacrylate as the component (A) at equivalent charge molar ratio (a)/(b), softener compositions with the compositions shown below were prepared and their performances were evaluated and compared with the case when sodium polyacrylate was not added. The results are shown in Table 4.

Component (A): (quaternary ammonium salt listed in Table 4)
: 5.0 (%);
Component (B): sodium polyacrylate (average molecular weight 7000)
: 0 (%) or amount to charge molar ratio (a)/(b) of 1/1;
Component (C): POE (p=20) branched alkyl ether ($C_{13.15}$ branching ratio 50%)
: 0.4 (%)
[(A)/(C) weight ratio=12.5/1]
Component (D): propylene glycol: 6.0 (%)
deionized water: balance

Table 4

-	No.	Composition: Name of component (A)	Composition: Amount of component (B) (%)	Performances: Softness: Cotton towel	Performances: Softness: Acrylic cloth	Performances: Antistatic property: Acrylic cloth
Present products	25	Dioleyldimethylammonium chloride	0.82	+3	+3 - +4	3 ( )
	26	Di(methyl branched isostearyl)dimethyl-ammonium chloride	0.80	+3 - +4	+4	2
	27	Dioleylmonostearylammonium chloride	0.59	+3 - +4	+4 - +5	4
	28	Di-hardened tallow alkylemethyl POE($\bar{p}$=3) ammonium chloride	0.69	+4 - +5	+3 - +4	4
	29	Di(2-tallow amidoethyl)methyl POE($\bar{p}$=2) ammonium chloride	0.61	+3	+3	44
	30	Di(2-palmitoylethyl)hydroxyethylmethyl-ammonium methylsulfate	0.69	+3	+3 - +4	58
	31	Methyl-tallow amidoethyl-2-tallow imido-zolinium methyl sulfate	0.65	+3 - +4	+4	6
Compar-ative example	32	(the same as No. 25)	0	+3	+3	100
	33	(the same as No. 25)	0	+3 - +4	+3 - +4	75
	34	(the same as No. 27)	0	+3 - +4	+3 - +4	43

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Table 4 (continued)

	No.	Composition: Name of component (A)	Composition: Amount of component (B) (%)	Performances: Softness: Cotton towel	Performances: Softness: Acrylic cloth	Performances: Antistatic property: Acrylic cloth
Comparative example	35	(the same as No. 28)	0	+4 - +5	+4	25
	36	(the same as No. 29)	0	+2	+2	220
	37	(the same as No. 30)	0	+2	+3	140
	38	(the same as No. 31)	0	+3 - +4	+3	110

From Table 4, it can be understood that the carboxylic acid type anionic polymers used in the present invention have performance improvement effects on all of the slightly water soluble quaternary ammonium salts having different structures from each other. More specifically, in Table 4, it can be seen that by an addition of sodium polyacrylate in equivalent amount to the component (A), in all cases, the performances,

particularly softness and antistatic property of the acrylic cloths are greatly improved. Also, all of the above compositions of the present invention have good dispersion stability.

Claims

1. A liquid softener composition comprising:

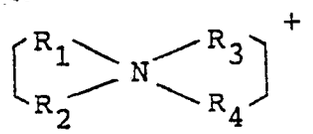
(A) a slightly water-soluble quaternary ammonium salt cationic surfactant having 2 or 3 alkyl or alkenyl groups with 14 to 24 carbon atoms in the molecule;

(B) a carboxylic acid anionic polymer;

(C) a polyoxyethylene adducted nonionic surfactant; and

(D) an aqueous vehicle, with the weight ratio of the components (A)/(C) being within range of from 100/1 to 3/1.

2. A liquid softener composition as claimed in claim 1, wherein said slightly water-soluble quaternary ammonium salt cationic surfactant (A) is at least one component selected from the group consisting of the cationic surfactants having the formulae (I) and (II):

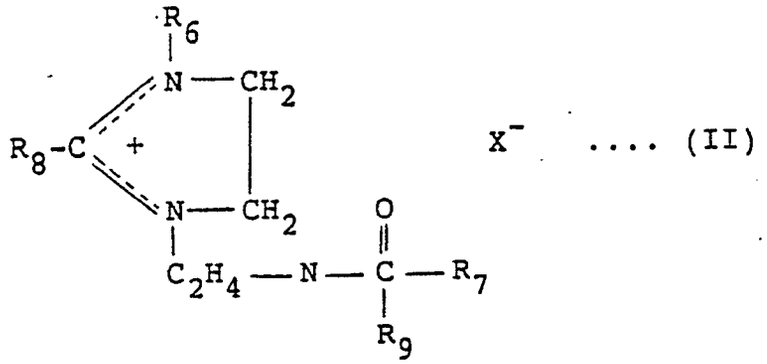


$$\left[\begin{matrix} R_1 \\ R_2 \end{matrix}\!\!>\!N\!<\!\!\begin{matrix} R_3 \\ R_4 \end{matrix}\right]^{+} X^{-} \quad \cdots\cdots\cdots\cdots \quad (I)$$

wherein at least two groups R_1 through R_4 represent straight or branched alkyl or alkenyl groups which may be unsubstituted or optionally substituted with

-OH-, -O-, $-\overset{O}{\overset{\|}{C}}$-NH-, or $-\overset{O}{\overset{\|}{C}}$-O-,

the remainder of the groups of R_1 - R_4 represent an alkyl group with 1 to 3 carbon atoms, a hydroxyalkyl group or a group represented by the formula $-(C_2H_4)_\ell H$ where ℓ is an integer of 1 to 5, and X represents a halogen or a monoalkylsulfate group represented by R_5SO_4 where R_5 represents an alkyl group with 1 to 3 carbon atoms.



$$R_8\text{-}C^{+}\!<\!\begin{matrix} N(R_6)\text{—}CH_2 \\ N\text{—}CH_2 \end{matrix}\!\!>\!\text{—}\,C_2H_4\text{—}N(R_9)\text{—}\overset{O}{\overset{\|}{C}}\text{—}R_7 \qquad X^{-} \quad \cdots\cdots \quad (II)$$

wherein R6 represents an alkyl group with 1 to 4, preferably 1 to 2 carbon atoms, R_7 and R_8 each represent an alkyl or alkenyl group with 14 to 24 carbon atoms, R_9 represents hydrogen or an alkyl group with 1 to 4 carbon atoms, and X has the same meaning as in the formula (I).

3. A liquid softener composition as claimed in claim 1, wherein the amount of the component (A) is 3 to 50% by weight.

4. A liquid softener composition as claimed in claim 1, wherein said carboxylic acid anionic polymer (B) is at least one polymer selected from the group consisting of homopolymers of ethylenically unsaturated carboxylic acids and anhydrides thereof and their copolymers and salts of said homopolymers and copolymers.

5. A liquid softener composition as claimed in claim 1, wherein said carboxylic acid anionic polymer (B) has an average molecular weight of 500 to 50000.

6. A liquid softener composition as claimed in claim 1, wherein the ratio of the components (A)/(B), in terms of positive charge mol (a) of component (A)/negative charge mol (b) of component (B), of 1/0.2 to 1/2.

7. A liquid softener composition as claimed in claim 1, wherein the average adducted moles of ethylene oxide of the component (C) is at least 20.

8. A liquid softener composition as claimed in claim 1, wherein the weight ratio of the components (A)-(C) is 50/1 to 5/1.