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ANIONIC LIQUID DETERGENT COMPOSITION

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ABSTRACT OF THE DISCLOSURE

A transparent anionic liquid detergent composition comprising 5 to 30% by weight of an anionic surface active agent having SO_3 radical or SO_4 radical, 5 to 45% by weight of a water-softening builder, 5 to 25% by weight of an alkaline inorganic salt, wherein more than 70% of the total amount of cations (in terms of the number of ions) in said three compounds is alkanol ammonium ion.

BACKGROUND OF THE INVENTION

(a) Field of the invention

The present invention relates to an anionic liquid detergent composition containing a water-softenig builder and an alkaline builder.

(b) Description of the prior art

A liquid detergent, when compared with the powdery or granular detergent, is less voluminous and is convenient for use with no fear of its being scattered and no necessity of taking the trouble to dissolve it in water—especially for the purpose of removing heavy soils. However, the majority of those liquid detergents heretofore in use have been nonionic, and the nonionic surface active agent constituting the principal component of such nonionic liquid detergents is apt to be salted out from the builder solution, resulting in lowering of the detergency of detergents so that the range of use of such surfactants has been limited. Accordingly, with a view to making up for such shortcomings of the nonionic liquid detergent, development of various hydrotropes and stabilizers has been promoted, and there have so far been produced fairly stable detergents of this kind. This notwithstanding, the nonionic detergent is poor in foam producing power on account of properties of the nonionic surface active agent contained therein, thereby leading to a tendency to use it excessively on the part of the consumer. Besides, its high viscosity causes much adhesion of detergent onto a receptacle, etc., thereby making it inconvenient to handle and uneconomical. Such being the case, it has not yet been recognized as a completely acceptable detergent.

To speak of the anionic liquid detergent on the other hand, in spite of the use of a large hydrotrope content therein for the purpose of solubilization or stabilization of anionic surfactant within the builder solution just like the case of the nonionic liquid detergent, it has been defective in that it is unstable at low temperature and apt to separate and change in quality due to freezing or melting. Accordingly, with a view to improving the solubility of such anionic surfactant, various means such as application of ammonium salt or ethanol amine salt have hitherto been proposed. But, these compounds proved defective in that they would readily get dissociated to give off an irritating smell peculiar to ammonia or change in quality, thereby bringing about a detergency only about the same as that of conventional powdery or granular detergents. Even such means as combining the nonionic surfactant with the anionic surfactant in preparing a detergent will not bring about any drastic solution of the problem though it may be effective to some extent in making up for the defects inherent in the respective surfactant.

SUMMARY OF THE INVENTION

The object of the present invention is to provide an anionic liquid detergent composition which is free from separation and change in quality even when preserved at a low temperature or a high temperature, not to mention at room temperature, and is capable of always maintaining a satisfactory transparency, low viscosity, high detergency and good foaming property.

In other words, the detergent composition according to the present invention comprises 5 to 30 wt. percent—preferably 15 to 25 wt. percent—of an anionic surfactant having SO_3 radical or SO_4 radical, 5 to 45 wt. percent—preferably 15 to 30 wt. percent—of a water-softening builder, 5 to 25 wt. percent—preferably 7 to 15 wt. percent—of an alkaline inorganic salt and is characterized by that 70% or more—preferably 70 to 80 percent—of the total amount of cations (in terms of the number of ions) in said three compounds is alkanol ammonium.

The anionic surfactant applicable in the present inventio is one having SO_3 or SO_4 radical and includes preferably straight-chain alkylbenzene sulfonate (the alkyl radical having 10–20 carbon atoms), alkyl sulfate having 10–20 carbon atoms, α-olefin sulfonate having 10–20 carbon atoms, alkane sulfonate having 10–20 carbon atoms, and alkyl ether sulfate (the alkyl radical having 10–20 carbon atoms; an adduct with 2–5 mols of ethylene oxide), and more preferably straight-chain alkyl-benzene sulfonate (the alkyl radical having 10–14 carbon atoms).

The alkanol amine preferable for use in the present invention includes diethanol amine and triethanol amine.

The water-softening builder applicable in the present invention includes nitrilotriacetate (NTA), ethylene diamine tetraacetate (EDTA), salt of tetracarboxy cyclopentane, etc., and the alkaline inorganic salt suitable for use in the present invention includes carbonate, phosphate, borate, etc.

The composition under the present invention can be also mixed with some nonionic surfactant as well as amphoteric active agent, and further mixed with such additives as the optical brightener, germicide, anti-redeposition agent, preventing agent for skin irritation, colorant, perfumer, foam booster, anti-foaming agent, etc.

The composition according to the present invention, when compared with conventional powdery or granular detergents, proves to be equal or rather superior to them in detergency and has good stability in separation at higher and lower temperature, and also has high foam producing power.

Hereunder will be given examples embodying the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Examples 1-6

	Example embodying the present invention						Comparative example						
Number of example or comparative example	1	2	3	4	5	6	1	2	3	4	5	6	7
Composition, percent: [1]													
Straight-chain alkylbenzene sulfonate	16	16	16	16	16	[2] 16	16	4	33	25	10	16	20
Number of carbon atoms of alkyl radical:	12.												
Nitrilotriacetate (NTA)	20	20	20	20	20	20	20	40	20	4	50	10	25
Borate	10	10	10	10	10	10	10	10	6	25	6	30	3
Optical brightener	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Ethanol	3	3	3	3	3	3	3	3	3	3	3	3	3
Ratio of diethanolamine/Na	100:0	90:10	80:20	75:25	70:30	90:10	65:35	90:10	90:10	90:10	90:10	90:10	90:10
Stability at low temperature	o	o	o	o	o	o	x	o	x	o	x	x	o
Properties:													
Detergency, percent	90	91	93	94	94	91	94	82	91	78	94	78	88
Foam height (mm.)	210	210	210	210	215	180	215	55	280	220	150	200	220
Viscosity (20° C., cp.)	100	108	120	150	180	120	360	385	320	180	420	155	290
Collective judgment	o	o	o	o	o	o	x	x	x	x	x	x	x

[1] Compositions were balanced by water.
[2] Alkyl sulfate.

REMARKS.—The mark o denotes 'good'; the mark x denotes 'inferior.'

Example 7

Composition (percent) [1]:	
Straight-chain alkylbenzene sulfonate	20
Ethylene-diamine tetracetate	20
Tripolyphosphate	10
Optical brightener	0.5
Ethanol	3
Ratio of diethanolamine/Na	90/10
Properties:	
Stability at low temperature	o
Detergency (percent)	88
Foam height (mm.)	215
Viscosity (20° C., cp.)	180
Collective judgment	o

[1] Compositions were balanced by water.

Example 8

Composition (percent) [1]:	
Straight-chain alkylbenzene sulfonate (alkyl: C_{12})	15
Nitrilotriacetate	20
Carbonate	10
Optical brightener	0.5
Ethanol	3
Ratio of diethanolamine/Na	90/10
Properties:	
Stability at low temperature	o
Detergency (percent)	90
Foam height (mm.)	210
Viscosity (20° C., cp.)	140
Collective judgment	o

[1] Compositions were balanced by water.

Example 9

Composition (percent) [1]:	
Paraffin sulfonate (C_{15})	25
Nitrilotriacetate	15
Borate	7
Optical brightener	0.5
Ethanol	5
Ratio of diethanolamine/Na	85/15
Properties:	
Stability at low temperature	o
Detergency (percent)	90
Foam height (mm.)	180
Viscosity (20° C., cp.)	130

[1] Compositions were balanced by water.

Example 10

Composition (percent) [1]:	
Alkyl sulfate (C_{12})	20
Nitrilotriacetate	17
Borate	5
Optical brightener	0.5
Ethanol	7
Ratio of triethanolamine/Na	92/8
Properties:	
Stability at low temperature	o
Detergency (percent)	93
Foam height (mm.)	220
Viscosity (20° C., cp.)	150

[1] Compositions were balanced by water.

Example 11

Composition (percent) [1]:	
α-Olefin sulfonate	17
Pyrophosphate	10
Carbonate	7
Optical brightener	0.5
Ethanol	5
Paratoluene sulfonate	3
Ratio of triethanolamine/Na	90/10
Properties:	
Stability at low temperature	o
Detergency (percent)	90
Foam height (mm.)	190
Viscosity (20° C., cp.)	100

[1] Compositions were balanced by water.

Method of measurement:

Stability at low temperature: Stability upon storage at −10° C., for 100 hrs. The result was expressed as follows: composition showing freezing or separation was marked with x; composition retaining uniform transparency was marked with o.

Detergency: by Terg-O-Tometer method; 25° C., 0.167%.

Foam producing power: by Ross Miles method; 25° C., 0.1%.

Viscosity: by T-type viscosimeter No. 2; 20° C.

In this connection, the properties of the nonionic liquid detergent measured at the same time as the above examples were as follows.

Detergency	percent	80
Foam height	mm	92
Viscosity	cp	430

What is claimed is:

1. A transparent anionic liquid detergent composition consisting essentially of (A) 15 to 25 wt. percent of an anionic surface active agent selected from the group consisting of sulfonate and sulfate anionic surface active agents, (B) 15 to 30 wt. percent of water-softening builder selected from the group consisting of nitrilotriacetate, ethylene diamine tetraacetate and cyclopentane tetracarboxylate, (C) 7 to 15 wt. percent of water-soluble alkaline inorganic builder salt selected from the group consisting of carbonates, phosphates and borates, and the balance is water, wherein more than 70% of the total number of cations in said three compounds (A), (B) and (C) is alkanol ammonium ion selected from the group consisting of diethanol ammonium ion and triethanol ammonium ion.

2. A composition according to claim 1, wherin said surface active agent is selected from the group consisting of alkylbenzene sulfonate in which the alkyl radical has from 10 to 20 carbon atoms, alkyl sulfate having from 10 to 20 carbon atoms, α-olefin sulfonate having from 10 to 20 carbon atoms, alkane sulfonate having from 10 to 20 carbon atoms and alkyl ether sulfate containing from 2 to 5 mols of ethylene oxide and in which the alkyl has from 10 to 20 carbon atoms.

3. A composition according to claim 1, wherein 70 to 80% of the total number of cations is alkanol ammonium ion.

4. A transparent temperature-stable liquid detergent composition consisting essentially of a three-component composition consisting of (A) 15 to 25 wt. percent of a member of the group consisting of an (a) alkylbenzene sulfonate having 10 to 20 carbon atoms in the alkyl chain, (b) an alkyl sulfate having 10 to 20 carbon atoms, (c) an α-olefin sulfonate having 10 to 20 carbon atoms, (d) an alkane sulfonate having 10 to 20 carbon atoms, (e) an alkyl ether sulfate having 2 to 5 moles of ethylene oxide, and having 10 to 20 carbon atoms in the alkyl chain, (B) 15 to 30 wt. percent of a water-softening builder selected from the group consisting of nitrilotriacetate, ethylene diamine tetraacetate, and tetracarboxyl cyclopentane salt, and (C) 7 to 15 wt. percent of water-soluble inorganic builder salt selected from the group consisting of carbonates, phosphates and borates; and further, wherein 3 to 7 wt. percent is ethanol and the balance is water, the cations present are sodium and alkanol ammonium ions, at least 70 molar percent of said cations being alkanol ammonium ions.

5. The composition of claim 4, wherein (A) is a straight-chain alkylbenzene sulfonate having 10 to 14 carbon atoms in the alkyl chain, and the alkanol ammonium ions constitute 70 to 80 molar percent of said cations and are selected from the group consisting of diethanol ammonium and triethanol ammonium ions.

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