

TITLE OF THE INVENTION

5 DETERGENT COMPOSITION FOR WASHING HARD SURFACES

BACKGROUND OF THE INVENTIONField of the Invention:

The present invention relates to detergent compositions for washing hard surfaces and, more particularly, to detergent compositions for washing hard surfaces, which have excellent detergency and excellent foam producing ability, maintain their performance even after long-term storage at low temperatures, and are mild to the hands and skin.

15 Discussion of the Background:

In recent years, concern for the safety of the human body has increasingly risen, and therefore, in the field of detergent compositions such as detergents for household use and for kitchen use, which have many chances to come into contact with human skin, various attempts have been made to make them milder to the skin. In one attempt, the pH of detergent compositions is adjusted to 5-6 (weakly acidic), which is close to the pH of human skin, to make the action of the detergent compositions mild to skin. In another attempt, components which are possibly least irritating to the skin are used as a main component of the detergent base. As such components which are mild to the skin, amino acid type surfactants and alkyl phosphate type surfactants have been proposed (Japanese patent publications (kokoku) Nos. SHO

T-2210022

50-40125, SHO 51-426023, SHO 55-9033 and SHO 58-27319).

Although these surfactants are less irritating, they have drawbacks in that they do not have sufficient detergency and foam producing ability and are not stable at low temperatures.

5 Conventionally, sodium alkylbenzenesulfonates and sodium alkylethoxysulfates have been widely used as a main component due to their excellent detergency, but they also have a drawback of causing rough skin of the hands, due to their strong degreasing power.

10 To overcome the above-mentioned drawbacks, auxiliary surfactants such as tertiary amine oxides and higher fatty acid diethanolamides are incorporated along with the above-mentioned main detergent components to increase their performances and make their affect on the skin milder.

15 The affect of various detergent compositions on the skin has, therefore, become milder as compared to conventional ones, but such detergent compositions have not yet reached the level of satisfaction.

20 Accordingly, there remains a need for detergent compositions for washing hard surfaces, which have excellent detergency and excellent foam producing ability, maintain their performance even after long-term storage at low temperatures, and are mild to the hands and skin.

25 SUMMARY OF THE INVENTION

Accordingly, it is one object of the present invention to provide novel detergent compositions for washing hard

surfaces.

It is another object of the present invention to provide detergent compositions which have excellent detergency.

5 It is another object of the present invention to provide detergent compositions which exhibit excellent foam producing ability.

It is another object of the present invention to provide detergent compositions which maintain their performance even after long-term storage at low temperatures.

10 It is another object of the present invention to provide detergent compositions which are mild to the hands and skin.

These and other objects, which will become apparent during the following detailed description, have been achieved by the inventors' discovery that detergent compositions for
15 washing hard surfaces which comprise a specified amphoteric surfactant of the amidobetaine type, a nonionic surfactant, a water-soluble solvent and water, each in specified amounts respectively, and which have a pH of not less than 6.1, exhibit excellent detergency and foam producing ability,
20 maintain their performance even after long-term storage at low temperature, and are mild to the skin and hands.

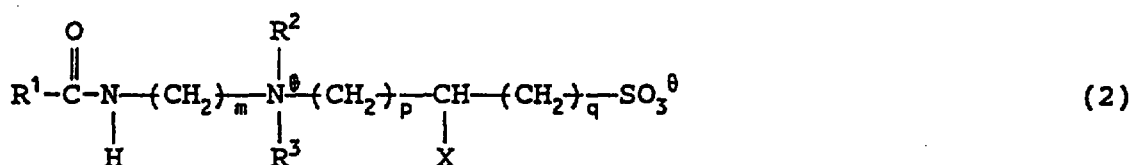
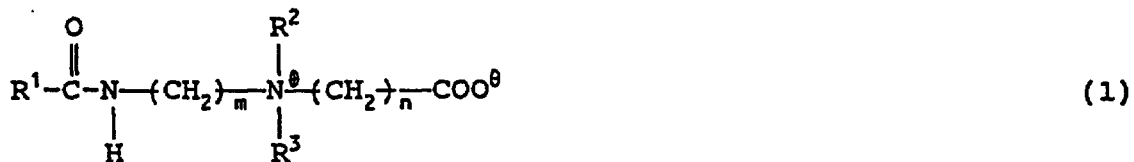
Accordingly, the present invention provides detergent compositions for hard surfaces which have a pH of not less than 6.1, and which comprise 0.1 to 30% by weight of the
25 following component (a), 0.1 to 30% by weight of the following component (b), 0.1 to 50% by weight of the following component (c) and water (d):

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- (a) an amphoteric surfactant of amidobetaine type represented by the formula (1) or (2):



wherein R^1 is a linear or branched alkyl or alkenyl group leaving 6 to 22 carbon atoms, R^2 and R^3 may be the same or different from each other and each represents an alkyl group having 1 to 5 carbon atoms, which may be substituted by a hydroxyl group, X is a hydrogen atom or a hydroxyl group, m is an integer of 0 to 5, n is an integer of not less than 1, p and q independently represent an integer whose sum is not less than 0 and not more than 4;

(b) a nonionic surfactant; and

(c) a water-soluble solvent.

The detergent compositions for washing hard surfaces according to the present invention have excellent detergency and excellent foam producing ability, maintain their performance even after a long-term storage at low temperatures, and are mild to the hands and skin. Therefore, they are suitable for household use and other uses for bathrooms, kitchen utensils, dish washing and the like.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

From the viewpoint of detergency and foam producing ability, R^1 of the formulae (1) and (2) which represent the aminobetaine-type amphoteric surfactant (a) to be used in the present invention is preferably an alkyl group having 10 to 16 carbon atoms. For the same reason, it is preferable that each of R^2 and R^3 is a methyl group, an ethyl group or a hydroxyethyl group, m is 2 or 3, and n, p and q are independently 1.

Examples of the component (a) include alkylamidepropyl-N,N-dimethylacetic acid betaine, alkylamidepropyl-N,N-dimethyl-2-hydroxypropylsulfobetaine and alkylamidepropyl-N,N-dimethylpropylsulfobetaine. Among them, lauramidepropyl-N,N-dimethylacetic acid betaine, myristamidepropyl-N,N-dimethylacetic acid betaine, cocamideamidepropyl-N,N-dimethylacetic acid betaine and the like are particularly preferable in terms of detergency, foam producing ability and rinsing property.

In the present invention, the above-mentioned amidobetaine-type amphoteric surfactants (a) can be used singly or in combination of two or more. They are incorporated in amounts of 0.1-30% by weight (hereinafter simply indicated by "%"), preferably 0.5-25%, more preferably 1-20% based on the total weight of the composition. When the amount of surfactant (a) is less than 0.1%, sufficient detergency cannot be obtained. On the other hand, amounts exceeding 30% are not economical, because the effects of the

amphoteric surfactant (a) are saturated and cannot be enhanced any more.

No particular limitation is imposed on nonionic surfactant (b) which is used in the present invention.

5 Preferable examples of the nonionic surfactant (b) are one or more members selected from the group consisting of polyoxyethylene alkyl- or alkenyl- ethers, polyoxyethylene alkylphenyl ethers, polyoxypropylene alkyl- or alkenyl- ethers, polyoxybutylene alkyl- or alkenyl- ethers, mixtures of
10 nonionic surfactants containing an alkylene oxide-added alkyl or alkenyl group, sucrose fatty acid esters, aliphatic alkanolamides, aliphatic glycerol monoesters, amine oxides, surfactants of ethylene oxide condensed-type and alkylglycosides.

15 Specific examples of the component (b) include the following components (1) to (11):

(1) Polyoxyethylene alkyl- or alkenyl- ethers which have an alkyl or alkenyl group having 10 to 20 carbon atoms on average, and have 1 to 30 moles on average of ethylene oxide
20 added thereto.

(2) Polyoxyethylene alkylphenyl ethers which have an alkyl group having 6 to 12 carbon atoms on average, and have 1 to 25 moles on average of ethylene oxide added thereto.

(3) Polyoxypropylene alkyl- or alkenyl- ethers which
25 have an alkyl or alkenyl group having 10 to 20 carbon atoms on average, and have 1 to 20 moles on average of propylene oxide added thereto.

(4) Polyoxybutylene alkyl- or alkenyl ethers which have an alkyl or alkenyl group having 10 to 20 carbon atoms on average, and have 1 to 20 moles on average of butylene oxide added thereto.

5 (5) Mixtures of nonionic surfactants which have an alkyl group or an alkenyl group, and have ethylene oxide and propylene oxide added thereto (molar ratio: 0.1:9.9 to 9.9:0.1), or ethylene oxide and butylene oxide added thereto (molar ratio: 0.1:9.9 to 9.9:0.1), with the average number of
10 carbon atoms of the alkyl or alkenyl group being from 10 to 20 and the number of moles of added alkylene oxide being from 1 to 30 on average per molecule.

(6) Sucrose fatty acid esters which have an aliphatic moiety having 10 to 20 carbon atoms.

15 (7) Aliphatic alkanolamides which have an aliphatic moiety having 10 to 20 carbon atoms (amide of mono- or di-C₂₋₄-alkanolamine and a C_{10 to 20}-fatty acid).

(8) Aliphatic glycerol monoesters which have an aliphatic moiety having 10 to 20 carbon atoms.

20 (9) Amine oxides such as alkyl- or alkenyl- amine oxides having a linear or branched alkyl or alkenyl group having 1 to 24 carbon atoms.

(10) Nonionic surfactant "Pluronic" (trademark) obtained by condensing ethylene oxide.

25 (11) Alkylglycosides such as those represented by formula (3):



(3)

wherein R^4 represents an alkyl group having 8 to 18 carbon atoms, R^5 represents an alkylene group having 2 to 4 carbon atoms and G represents a residue originated from a reducing sugar having 5 to 6 carbon atoms; x stands for a plurality of numbers whose average falls in the range of 0 to 5; and y stands for a plurality of numbers whose average falls in the range of 1 to 5.

A detailed explanation of the alkylglycosides represented by formula (3) will now be given. The average value of x in formula (3) is from 0 to 5, and by changing this value within this range, the water-solubility and crystal formation of the detergent compositions for hard surfaces of the present invention can be controlled. That is, greater values of x indicate higher solubility of the composition and lower degree of crystallization. Preferable values for x are from 0 to 2, and in particular, 0. Concerning y, if the average value of y is greater than 1, namely, the hydrophilic group contains a saccharide chain of di- or higher saccharides, it is possible that the saccharide chain bonding may be 1-2, 1-3, 1-4, 1-6, and further, alpha- and beta- pyranoside bonding or furanoside bonding, and arbitrary mixtures of them may be present. The average value of y in formula (3) is from 1 to 5, and preferably, from 1 to 1.5, and more preferably from 1.1 to 1.4. Measurement of y may be performed according to a proton NMR method.

From the viewpoint of solubility and detergency, R^4 of the formula (3) is preferably an alkyl group having 10 to 14

carbon atoms. Further, R⁵ is preferably an alkylene group having 2 to 3 carbon atoms in view of water-solubility. The structure of G varies depending on the starting material used, namely, a monosaccharide or a di- or higher saccharide.

5 Examples of G include glucose, fructose, galactose, xylose, mannose, lyxose, arabinose and their mixtures as monosaccharides, and maltose, xylobiose, isomaltose, cellobiose, gentiobiose, lactose, nigerose, turanose, raffinose, gentianose, melezitose and their mixtures as di- or
10 higher saccharides. Of these, preferable starting materials are glucose and fructose among monosaccharides, and maltose and sucrose among di- or higher saccharides in view of availability and cost. In particular, glucose is preferred because it is easily obtained.

15 Of these nonionic surfactants, aliphatic alkanolamides, alkylglycosides and amine oxides are particularly preferred from the viewpoint of stability of the detergent compositions at low temperatures.

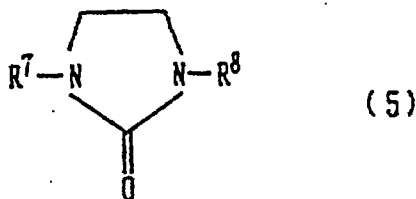
The above-described nonionic surfactants (b) may be used
20 singly or in combination of two or more. They are incorporated in amounts from 0.1 to 30%, preferably from 0.5 to 10%, based on the total weight of the composition. When the amount is less than 0.1%, deterioration of properties which may be caused during a long-term storage of the
25 compositions at low temperatures will scarcely be inhibited. On the other hand, amounts exceeding 40% are undesirable, because the rinsing ability will be lowered.

No particular limitation is imposed on component (c), water-soluble solvents. Preferable examples include the compounds represented by the following formulae (4) to (7):



wherein R^6 is a C3 to C8 linear or branched alkyl or alkenyl group, a phenyl group or a benzyl group, r and s each independently represents an integer of 0 to 4 and the sum of r and s is not less than 1 and not more than 4, with the proviso that the ethylene oxide groups and the propylene oxide groups to be added are arbitrarily positioned in cases where the product $r \times s$ is not equal to 0.

Specific examples of the solvents represented by formula (4) include diethylene glycol monobutylether, propylene glycol monobutylether, dipropylene glycol monobutylether, di-(propylene ethylene glycol)monobutylether, phenylglycol, phenyldiglycol, benzylglycol and benzyldiglycol.



wherein R^7 and R^8 may be the same or different from each other, and each independently represents an alkyl group having 1 to 6 carbon atoms.

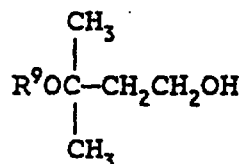
Specific examples of preferable water-soluble solvents

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represented by formula (5) include 1,3-dimethyl-2-imidazolidinone and 1,3-diethyl-2-imidazolidinone.



(6)

wherein R^9 represents an alkyl group having 1 to 6 carbon atoms.

Specific examples of preferable water-soluble solvents represented by formula (6) include 3-methoxy-3-methylbutanol and 3-ethoxy-3-methylbutanol.



(7)

wherein R^{10} represents a hydrocarbon group, preferably a linear or branched alkylene or alkenylene group, having 4 to 12 carbon atoms.

Specific examples of preferable water-soluble solvents represented by formula (7) include 3-methyl-1,3-butanediol, 2,2,4-trimethyl-1,3-pentanediol, 2-ethyl-1,3-hexanediol, 1,9-nonanediol and 1,8-octanediol.

The above-described water-soluble solvents (c) may be used singly or in combination of two or more. They are incorporated in amounts from 0.1 to 50%, preferably from 0.5 to 20%, and particularly preferably from 3 to 20%, based on the total weight of the composition. Any amounts less than 0.1% result in a detergent composition of insufficient

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detergency. On the other hand, amounts exceeding 50% are undesirable because of the difficulty of blending.

Further, component (d), water, is preferably incorporated into the compositions of the invention in amounts from 10 to 5 98%, especially 30 to 90% by weight, based on the total weight of the composition.

It is particularly preferable that, besides the above-described components (a), (b), (c) and (d), metal ion sequestering agents are contained as component (e) in the 10 compositions of the present invention for enhancing the detergency.

No particular limitation is imposed on the metal ion sequestering agents as long as they are generally used in this technical field, and examples of them include the following 15 compounds listed in (1) to (7) below:

(1) Alkali metal salts or alkanolamine salts of phosphoric compounds such as orthophosphoric acid, pyrophosphoric acid, tripolyphosphoric acid, metaphosphoric acid, hexametaphosphoric acid and phytic acid.

20 (2) Alkali metal salts or alkanolamine salts of phosphonic acids such as ethane-1,1-diphosphonic acid, ethane-1,1,2-triphosphonic acid, ethane-1-hydroxy-1,1-diphosphonic acid, ethanehydroxy-1,1,2-triphosphonic acid, ethane-1,2-dicarboxy-1,2-diphosphonic acid and 25 methanehydroxyphosphonic acid.

(3) Alkali metal salts or alkanolamine salts of phosphonocarboxylic acids such as 2-phosphonobutane-1,2-

dicarboxylic acid, 1-phosphonobutane-2,3,4-tricarboxylic acid and alpha-methylphosphonosuccinic acid.

(4) Alkali metal salts or alkanolamine salts of amino acids such as aspartic acid, glutamic acid and glycine.

5 (5) Alkali metal salts or alkanolamine salts of aminopolyacetic acids such as nitrilotriacetic acid, iminodiacetic acid, ethylenediaminetetraacetic acid, hydroxyethylenediamineacetic acid, diethylenetri-
aminepentaacetic acid, glycoletherdiaminetetraacetic acid,
10 hydroxyethyliminodiacetic acid, triethylenetetraminehexaacetic acid and djenkolic acid.

(6) Alkali metal salts or alkanolamine salts of organic acids such as diglycolic acid, hydroxydisuccinic acid, carboxymethyloxysuccinic acid, citric acid, lactic acid,
15 tartaric acid, oxalic acid, malic acid, hydroxydisuccinic acid, gluconic acid, carboxymethylsuccinic acid and carboxymethyltartaric acid.

(7) Aminopoly(methylenephosphonic acid) and its alkali metal salts or alkanolamine salts, and polyethylene-
20 polyaminepoly(methylenephosphonic acid) and its alkali metal salts or alkanolamine salts.

In the context of the metal ion sequestering agent (e), the preferred alkanol amine salts include mono-, di-, and tri-
C₂₋₄-alkanolamine salts, particularly, salts of
25 monoethanolamine, diethanolamine, and triethanolamine.

Of these metal ion sequestering agents, especially preferable examples include hydroxycarboxylic acids such as

citric acid and malic acid, condensed phosphates such as pyrophosphoric acid, aminocarboxylic acids such as ethylenediaminetetraacetic acid and hydroxyethylene-diamineacetic acid, and alkali metal salts such as sodium salts and potassium salts, ammonium salts and alkanolamine salts of them, and water-soluble salts of them.

The metal ion sequestering agents (e) may be used singly or in combination of two or more. They are incorporated in amounts from 0.1 to 50%, preferably from 0.5 to 20%, and particularly preferably from 3 to 20%, based on the total weight of the composition. Amounts less than 0.1% result in a detergent composition of insufficient detergency. On the other hand, amounts exceeding 50% are undesirable, because of the difficulty of blending with other components.

Further, anionic surfactants and/or amphoteric surfactants other than component (a) may be incorporated into the compositions of the present invention as component (f) for enhancing the detergency.

Examples of anionic surfactants which are useful as component (f) include C_{6-12} alkylbenzenesulfonic acid and its salts, alkylene oxide (1 to 10 moles of C_{2-4} -alkylene oxide) added C_{10-22} alkyl- or alkenyl- ether sulfuric acid and its salts, C_{10-22} olefinsulfonic acid and its salts, C_{10-22} alkane-sulfonic acid and its salts, saturated or unsaturated fatty acid or its salts, alkylene oxide (1 to 10 moles of C_{2-4} -alkylene oxide) added C_{10-22} alkyl- or alkenyl- ether carboxylic acid and its salts and alpha-sulfo- C_{10-22} -fatty acid

and its salts, and esters of these.

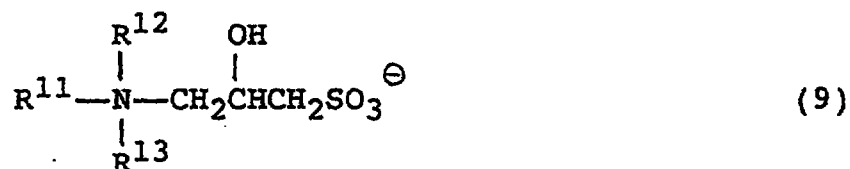
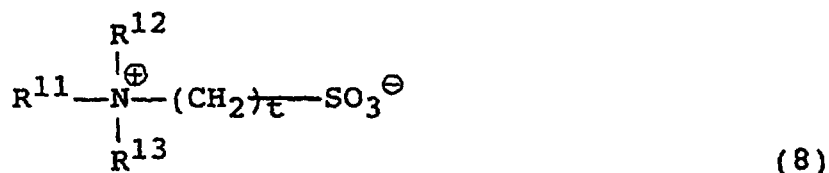
Examples of counter ions of these anionic surfactants include alkali metal ions such as sodium ion and potassium ion, ammonium ion, and alkanolamines such as monoethanolamine, diethanolamine and triethanolamine.

A further explanation will be given on the saturated or unsaturated fatty acids and their salts referred to as component (f). They are fatty acids which have a linear or branched alkyl or alkenyl group having 8 to 24 on average, more preferably from 10 to 18 carbon atoms and their salts. Specific examples are lauric acid, myristic acid, palmitic acid, stearic acid, oleic acid, linoleic acid, coco acid, palm kernel acid, beef tallow acid, "Emasol 871" and "Emasol 875" (both products of Emery Co.), both of which are methyl-branched acids, and their water-soluble salts.

From the viewpoint of rinsing property and easiness of blending, the most preferable fatty acids and their salts are saturated fatty acids having an alkyl chain having 12 to 16 carbon atoms, and their salts. Examples thereof include linear or branched myristic acid and its salts. In particular, the content of myristic acid in the entire fatty acid composition is preferably not less than 30%, and more preferably not less than 60%.

Specific examples of amphoteric surfactants other than component (a) include alkylcarbobetaine, alkylsulfobetaine, alkylhydroxysulfobetaine, alkylamideamine-type betaine and alkylimidazoline-type betaine.

Of these amphoteric surfactants, preferable examples include those of sulfobetaine type represented by the formula (8) or (9):



15

wherein R^{11} represents an alkyl group having 8 to 22 carbon atoms, R^{12} and R^{13} may be the same or different from each other and each represents an alkyl group having 1 or 2 carbon atoms and t is an integer of 2 or 3.

In particular, the amphoteric surfactants represented by the formula (8) wherein t is 2 or represented by the formula (9) are most preferred.

25

The components (f) may be used singly or in combination of two or more. They are incorporated in amounts from 0.1 to 50%, and particularly preferably from 0.5 to 30%, based on the total weight of the composition. Amounts exceeding 50% are undesirable, because the balancing among various components for providing detergent compositions is hindered.

Further, when the above-mentioned saturated or unsaturated fatty acids or their salts are used as components (f), it is preferred that the proportion between the amidebetaine-type amphoteric surfactants (a) and the saturated or unsaturated fatty acids or their salts be from 20:1 to 1:1, particularly, from 20:1 to 2:1, on a weight basis, in view of detergency and rinsing ability.

In order to maintain the stability of the present compositions, the detergent compositions of the present invention may further contain amine compounds such as ammonia and alkanolamine. Any of mono-, di- or trialkanolamines may be used for this purpose, among which monoethanolamine and diethanolamine are particularly preferred in view of detergency and odor.

Alkanolamines are preferably incorporated into the compositions of the present invention in amounts from 0.5 to 20%, more preferably from 1 to 10%, based on the total weight of the composition. Amounts less than 0.5% result in detergent compositions of insufficient stability, whereas amounts exceeding 20% can no more enhance the stabilizing effect.

The present detergent compositions can further contain lower alcohols such as ethanol, lower glycol such as ethylene glycol, and lower alkylbenzene sulfonates such as benzenesulfonate and toluenesulfonate as a stabilizer at low temperatures. Moreover, the liquid detergent compositions of the present invention can contain smectite-type clay minerals containing, as their main components, montmorillonite, hectorite, vermiculite, attapulgite, sepiolite and their mixtures, acrylic homopolymer and copolymers such as sodium polyacrylate, cross-linked polyacrylic acid and polyacrylic alkylesters, polyvinyl alcohol, hydroxyethylcellulose, carboxymethylcellulose, polyvinylpyrrolidone and maleic anhydride polymers as a viscosity modifier. Furthermore, in order to increase the value of articles, arbitrary components such as perfumes, colorants, preservatives, antioxidants, thickeners and the like may also be incorporated into the compositions of the present invention.

It is preferred that the pH of the detergent compositions of the present invention be 6.1 or more. From the viewpoint of detergency, a pH range from 6.5 to 8.5 is particularly preferred. If the pH is lower than 6.1, the blendability of components is not satisfactory, and when bleaching agents containing chlorine happen to come into contact with the composition, poisonous gas will be generated.

The detergent compositions of the present invention can be prepared into various aqueous solutions by blending components (a), (b), (c) and (d), and if needed, components

(e), (f) and other arbitrary components, too.

Other features of the invention will become apparent in the course of the following descriptions of exemplary embodiments which are given for illustration of the invention and are not intended to be limiting thereof.

EXAMPLES

Examples 1-4 and Comparative Examples 1-4:

Detergent compositions for hard surfaces which contain the components shown in Table 1 were prepared by the conventional method. Their detergency, foam producing ability, storage stability, and ability to prevent rough skin of hands were evaluated according to the following methods, respectively.

Detergency

A bathtub made of cast iron and coated with enamel (zircon type), to which smudge had been deposited to such a degree that the smudge could not be removed by mechanical scrubbing alone, was scrubbed five times with a sponge made of urethane soaked with a detergent composition to be tested, with a load of about 500 g being applied to the sponge. Thereafter, the surface of the bathtub was visually checked to evaluate the detergency of the composition based on the following criteria:

5: Smudge removed very well

4: Smudge removed well

3: Smudge unevenly removed

2: Smudge slightly removed

1: Smudge hardly removed

Foam producing ability

Each of the detergent compositions was diluted with water having German hardness of 4°DH to have a concentration of 5%, and the temperature was maintained at 25°C. The height (mm) of the foams produced was measured by a Ross and Miles lathering performance measuring apparatus in accordance with the Japanese Industrial Standard No. JISK 3362.

10 Storage stability

Each sample was stored at -5°C for 10 days and formation of precipitates was observed. The evaluation was made based on the following criteria:

A: No change occurred in appearance

15 B: Slight precipitates observed

C: Precipitates observed clearly

Prevention of rough skin of hands

A detergent solution containing 20% by weight of each detergent composition was prepared. Each of 12 panelists put his or her hands in the detergent solution for 30 minutes while maintaining the temperature of the detergent solution at 35°C, and subsequently, hands were washed with water thoroughly. This procedure was repeated for three days. On the fourth day, the hands of each panelist were visually checked to evaluate the roughness of the skin of hands based on the following criteria:

25 5: Roughness hardly observed

4: Roughness slightly observed

3: Roughness observed in a certain amount

2: Considerable roughness observed

1: Significant roughness observed

5 The average values are shown in Table 1 as results. In this test, average values of not less than 4 are preferred.

Table 1 (% by weight)

	Compositions of invention				Comparative compositions			
	1	2	3	4	1	2	3	4
Lauramidepropyl-N,N-dimethyl-2-hydroxypropylsulfobetaine	5	-	-	-	-	5	-	-
Lauramidepropyl-N,N-dimethyl-acetic acid betaine	-	5	5	5	-	-	5	5
Dodecylbenzenesulfonic acid	-	-	-	-	5	-	-	-
Diethyleneglycol monobutylether	10	10	10	10	10	10	10	10
Citric acid	3	3	3	3	3	3	3	3
Ethylenediaminetetraacetic acid	2	2	2	2	2	2	2	2
Coco acid diethanolamide	2	-	2	-	-	-	-	2
Coco acid monoethanolamide	-	2	-	-	-	-	-	-
Alkylglucoside*1	-	-	-	2	-	-	-	-
Water*2	B	B	B	B	B	B	B	B
pH*3	7.5	7.5	7.5	7.5	7.5	7.5	7.5	4.5
Detergency (Average of 5 times)	4.7	4.9	4.9	4.9	4.9	4.7	4.8	4.9
Foam producing ability (Average of 5 times)	256	280	290	290	250	254	278	265
Stability during storage (-5°C, 10 days)	A	A	A	A	C	B	B	B
Prevention of rough skin of hands	4.3	4.3	4.3	4.5	3.5	3.8	3.8	3.5

*1 : In formula (3), $R^4=C_{12}$, $x=0$, $y=1.4$

*2 : B means "balance"

*3 : Adjusted with sodium hydroxide

From the results shown in Table 1, it is apparent that the products (Examples 1-4) of the present invention are superior to the comparative products (Comparative examples 1-4) in terms of detergency, foam producing ability and ability of preventing the rough skin of hands.

Example 5:

Compositions were prepared by replacing part of the water of the compositions of Examples 1-4 listed in Table 1 by 1.5% by weight of myristic acid. The rinsing ability of the compositions thus obtained was evaluated by the following method described hereinbelow. As a result, it was revealed that the number of rinsings decreased, which indicated improved rinsing ability.

Test method for evaluating rinsing ability

Using each of the compositions, 100 cc of an aqueous detergent solution having a detergent concentration of 0.25% (temperature: 20°C, German hardness: 4°DH) was prepared, and was poured into a 500 cc separating funnel, followed by shaking for predetermined times. The detergent solution was then drained to measure the volume of the foam produced. Next, 50 cc of rinse water (temperature: 20°C, German hardness: 4°DH) was poured into the separating funnel, which was then slowly rotated 10 times, followed by draining the detergent solution.

This procedure was repeated to count the number of rinsings required for eliminating foam.

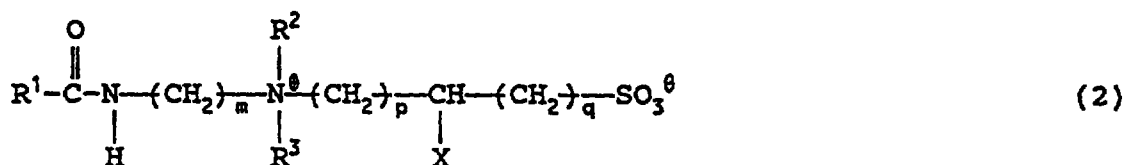
Obviously, numerous modifications and variations of the present invention are possible in light of the above teachings. It is therefore to be understood that, within the scope of the appended claims, the invention may be practiced
5 otherwise than as specifically described herein.



WHAT IS CLAIMED AS NEW AND DESIRED TO BE SECURED BY LETTERS
PATENT OF THE UNITED STATES IS:

1. A detergent composition for hard surfaces having a
pH of not less than 6.1, and comprising

(a) 0.1 to 30% by weight of an amidebetaine amphoteric
surfactant represented by the formula (1) or (2):



wherein R¹ is a linear or branched alkyl or alkenyl group
leaving 6 to 22 carbon atoms, R² and R³ may be the same or
different from each other and each represents an alkyl group
having 1 to 5 carbon atoms, which may be substituted by a
hydroxyl group, X is a hydrogen atom or a hydroxyl group, m is
an integer of 0 to 5, n is an integer of not less than 1, p
and q independently represent an integer whose sum is not less
than 0 and not more than 4;

(b) 0.1 to 30% by weight of a nonionic surfactant; and
(c) 0.1 to 50% by weight of a water-soluble solvent.

2. The composition of Claim 1, further comprising 0.1
to 50% by weight of (e) a metal ion sequestering agent.

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3. The composition of Claim 1, further comprising 0.1 to 50% by weight of (f) a member selected from the group consisting of anionic surfactants, amphoteric surfactants other than component (a), and mixtures thereof.

4. The composition of Claim 1, further comprising 0.1 to 50% by weight of (e) a metal ion sequestering agent; and 0.1 to 50% by weight of (f) a member selected from the group consisting of anionic surfactants, amphoteric surfactants other than component (a), and mixtures thereof.

5. The composition of Claim 1, wherein said nonionic surfactant (b) is selected from the group consisting of polyoxyethylene alkyl- or alkenyl- ethers, polyoxyethylene alkylphenyl ethers, polyoxypropylene alkyl- or alkenylethers, polyoxybutylene alkyl- or alkenyl- ethers, mixtures of nonionic surfactants containing an alkylene oxide-added alkyl group or alkenyl group, sucrose fatty acid esters, aliphatic alkanolamides, aliphatic glycerol monoesters, amine oxides, condensed ethylene oxide surfactants, alkylglycosides, and mixtures thereof.

6. The composition of Claim 1, wherein said water-soluble solvent (c) is selected from the group consisting of the compounds represented by the following formulae (4) to (7):



wherein R^6 is a C3 to C8 linear or branched alkyl or alkenyl

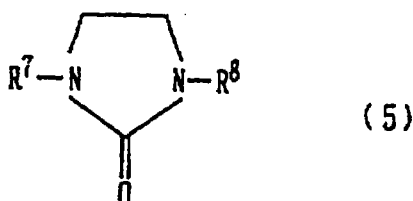
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group, a phenyl group or a benzyl group, r and s each independently represents an integer of 0 to 4 and the sum of r and s is not more than 1 and not more than 4, with the proviso that the ethylene oxide groups and the propylene oxide groups to be added are arbitrarily positioned in cases where the product $r \times s$ is not equal to 0;



wherein R^7 and R^8 may be the same or different from each other, and each independently represents an alkyl group having 1 to 6 carbon atoms;



wherein R^9 represents an alkyl group having 1 to 6 carbon atoms; and



wherein R^{10} represents a hydrocarbon group having 4 to 12 carbon atoms.

7. The composition of Claim 1, further comprising (f) 0.1 to 50% by weight of a saturated or unsaturated fatty acid or a salt thereof.

8. The composition of Claim 7, wherein the proportion between said amphoteric surfactant (a) and said unsaturated





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fatty acid (f) is from 20:1 to 1:1 on a weight basis.

9. The composition of Claim 1, further comprising 0.1 to 50% by weight of (e) a metal ion sequestering agent; and (f) 0.1 to 50% by weight of a saturated or unsaturated fatty acid or a salt thereof.

10. The composition of Claim 9, wherein the proportion between said amphoteric surfactant component (a) and said unsaturated fatty acid (f) is from 20:1 to 1:1 on a weight basis.

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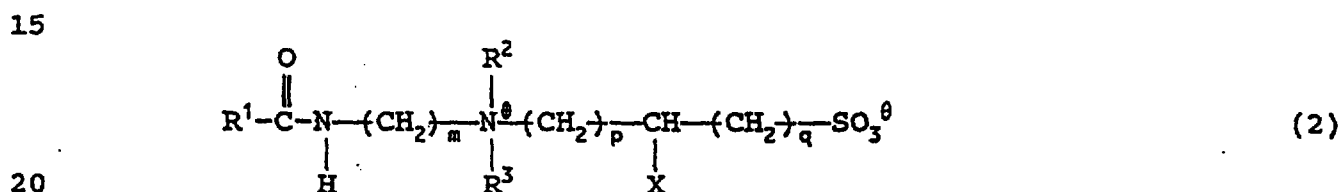
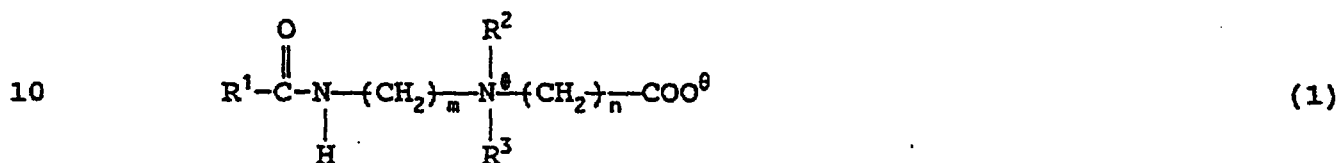
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DETERGENT COMPOSITION FOR WASHING HARD SURFACES

ABSTRACT OF DISCLOSURE

Detergent compositions for hard surfaces having a pH of 6.1 or more, and containing

- (a) 0.1 to 30% by weight of an amphoteric surfactant of the amidobetaine type represented by the formula (1) or (2):



wherein R¹ is a linear or branched alkyl or alkenyl group having 6 to 22 carbon atoms, R² and R³ may be the same or different from each other and each represents an alkyl group having 1 to 5 carbon atoms, which may be substituted by a hydroxyl group, X is a hydrogen atom or a hydroxyl group, m is an integer of 0 to 5, n is an integer of not less than 1, p and q independently represent an integer whose sum is not less than 0 and not more than 4;

- (b) 0.1 to 30% by weight of a nonionic surfactant;
(c) 0.1 to 50% by weight of a water-soluble solvent; and
(d) water,

exhibit excellent detergency and excellent foam producing ability, maintain their performance even after long-term

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storage at low temperatures, and are mild to the hands and skin. Such detergent compositions are suitable for household use and other uses for bathrooms, kitchen utensils, dish washing and the like.

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DETERGENT COMPOSITION FOR WASHING HARD SURFACES

ABSTRACT

A detergent composition for hard surfaces having a pH of not less than 6.1, and including:

- (a) 0.1 to 30% by weight of an amidebetaine amphoteric surfactant;
- (b) 0.1 to 30% by weight of a non-ionic surfactant;
- (c) 0.1 to 50% by weight of a water-soluble solvent; and
- (d) optionally water.

The detergent exhibits excellent detergency and excellent foam producing ability. Such detergent compositions are suitable for household use and other uses for bathrooms, kitchen utensils, dish washing and the like.

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surfaces.

It is another object of the present invention to provide detergent compositions which have excellent detergency.

It is another object of the present invention to provide
5 detergent compositions which exhibit excellent foam producing ability.

It is another object of the present invention to provide detergent compositions which maintain their performance even after long-term storage at low temperatures.

10 It is another object of the present invention to provide detergent compositions which are mild to the hands and skin.

These and other objects, which will become apparent during the following detailed description, have been achieved by the inventors' discovery that detergent compositions for
15 washing hard surfaces which comprise a specified amphoteric surfactant of the amidobetaine type, a nonionic surfactant, a water-soluble solvent and water, each in specified amounts respectively, and which have a pH of not less than 6.1, exhibit excellent detergency and foam producing ability,
20 maintain their performance even after long-term storage at low temperature, and are mild to the skin and hands.

Accordingly, the present invention provides detergent compositions for hard surfaces which have a pH of not less than 6.1, and which comprise 0.1 to 30% by weight of the
25 following component (a), 0.1 to 30% by weight of the following component (b), 0.1 to 50% by weight of the following component (c) and water (d):

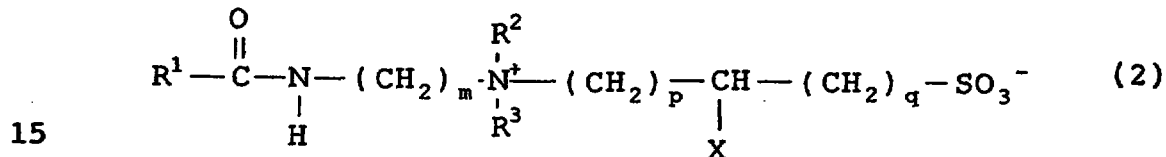
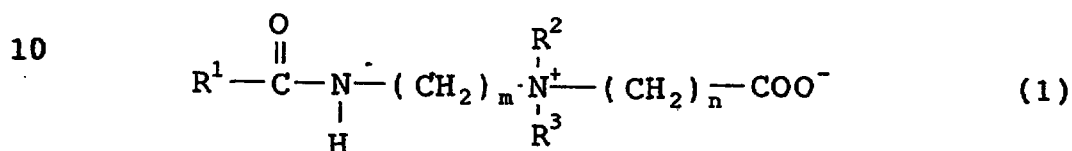
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Accordingly, the present invention provides a detergent composition for hard surfaces having a pH of not less than 6.1, and comprising

- 5 (a) 0.1 to 30% by weight of an amidebetaine amphoteric surfactant represented by the formula (1) or (2):



wherein R^1 is a linear or branched alkyl or alkenyl group having 6 to 22 carbon atoms, R^2 and R^3 may be the same or different from each other and each represents an alkyl group having 1 to 5 carbon atoms, which may be substituted by a hydroxyl group, X is a hydrogen atom or a hydroxyl group, m is an integer of 0 to 5, n is an integer of not less than 1, p and q independently represent an integer whose sum is not less than 0 and not more than 4;

20

25

- (b) 0.1 to 30% by weight of a nonionic surfactant;

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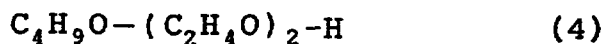
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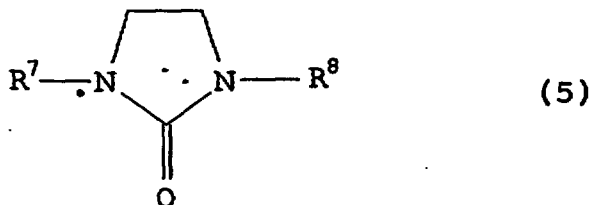
and

(c) 0.1 to 50% by weight of a water-soluble solvent that is selected from the compounds represented by the following formula (4) to (7):

5

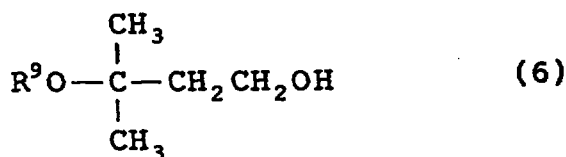


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wherein R^7 and R^8 may be the same or different from each other, and each independently represents an alkyl group having 1 to 6 carbon atoms;

20



wherein R^9 represents an alkyl group having 1 to 6 carbon atoms; and

25



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4b

wherein R¹⁰ represents a hydrocarbon group having 4 to 12 carbon atoms.

The detergent compositions for washing hard surfaces
5 according to the present invention have excellent
detergency and excellent foam producing ability, maintain
their performance even after a long-term storage at low
temperatures, and are mild to the hands and skin.
Therefore, they are suitable for household use and other
10 uses for bathrooms, kitchen utensils, dish washing and
the like.

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Specific examples of preferable water-soluble solvents represented by formula (5) include 1,3-dimethyl-2-imidazolidinone and 1,3-diethyl-2-imidazolidinone.

5

Specific examples of preferable water-soluble solvents represented by formula (6) include 3-methoxy-3-methylbutanol and 3-ethoxy-3-methylbutanol.

10 Specific examples of preferable water-soluble solvents represented by formula (7) include 3-methyl-1,3-butanediol, 2,2,4-trimethyl-1,3-pentanediol, 2-ethyl-1,3-hexanediol, 1,9-nonanediol and 1,8-octanediol.

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The water-soluble solvents (c) may be used singly or in combination of two or more. They are incorporated in amounts from 0.1 to 50%, preferably from 0.5 to 20%, and particularly preferably from 3 to 20%, based on the total weight of the composition. Any amounts less than 0.1% result in a detergent composition of insufficient.

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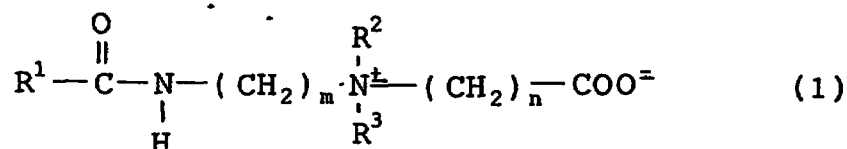


CLAIMS

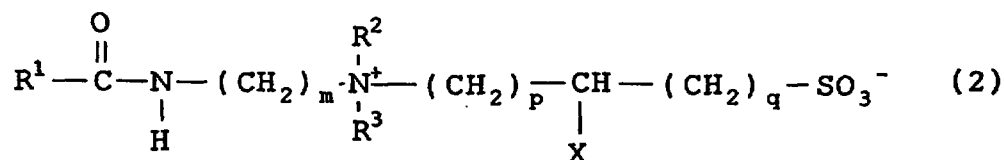
1. A detergent composition for hard surfaces having a
5 pH of not less than 6.1, and comprising

(a) 0.1 to 30% by weight of an amidebetaine
amphoteric surfactant represented by the formula (1) or
(2):

10



15



wherein R^1 is a linear or branched alkyl or alkenyl group
having 6 to 22 carbon atoms, R^2 and R^3 may be the same or
20 different from each other and each represents an alkyl
group having 1 to 5 carbon atoms, which may be
substituted by a hydroxyl group, X is a hydrogen atom or
a hydroxyl group, m is an integer of 0 to 5, n is an
integer of not less than 1, p and q independently
25 represent an integer whose sum is not less than 0 and not
more than 4;

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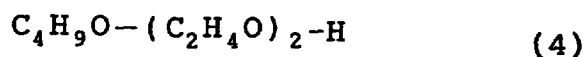
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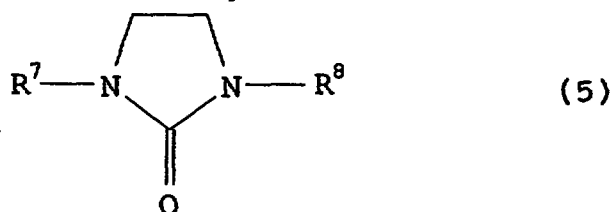


(b) 0.1 to 30% by weight of a nonionic surfactant;
and

(c) 0.1 to 50% by weight of a water-soluble solvent
that is selected from the compounds represented by the
5 following formula (4) to (7):

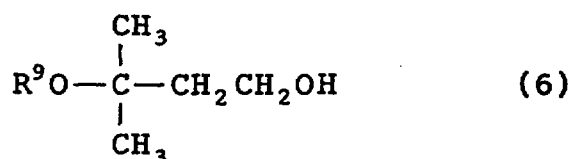


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15 wherein R^7 and R^8 may be the same or different from each
other, and each independently represents an alkyl group
having 1 to 6 carbon atoms;

20



wherein R^9 represents an alkyl group having 1 to 6 carbon
atoms; and

25



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wherein R¹⁰ represents a hydrocarbon group having 4 to 12 carbon atoms.

2. The composition of claim 1, further comprising 0.1
5 to 50% by weight of (e) a metal ion sequestering agent.

3. The composition of claim 1, or claim 2 further
comprising 0.1 to 50% by weight of (f) a member selected
from anionic surfactants, amphoteric surfactants other
10 than component (a), and mixtures thereof.

4. The composition of claim 1, claim 2 or claim 3
wherein said nonionic surfactant (b) is selected from
polyoxyethylene alkyl- or alkenyl- ethers,
15 polyoxyethylene alkylphenyl ethers, polyoxypropylene
alkyl- or alkenylethers, polyoxybutylene alkyl- or
alkenyl- ethers, mixtures of nonionic surfactants
containing an alkylene oxide-added alkyl group or alkenyl
group, sucrose fatty acid esters, aliphatic
20 alkanolamides, aliphatic glycerol monoesters, amine
oxides, condensed ethylene oxide surfactants,
alkylglycosides, and mixtures thereof.

5. The composition of claim 1, further comprising (f)
25 0.1 to 50% by weight of a saturated or unsaturated fatty
acid or a salt thereof.

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6. The composition of claim 5, wherein the proportion between said amphoteric surfactant (a) and said unsaturated fatty acid (f) is from 20:1 to 1:1 on a weight basis.

5

7. The composition of claim 1, further comprising 0.1 to 50% by weight of (e) a metal ion sequestering agent; and (f) 0.1 to 50% by weight of a saturated or unsaturated fatty acid or a salt thereof.

10

8. The composition of claim 7, wherein the proportion between said amphoteric surfactant component (a) and said unsaturated fatty acid (f) is from 20:1 to 1:1 on a weight basis.

15

9. A detergent composition as claimed in claim 1 and substantially as described in any one of the examples herein.

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