

DETERGENT

Field of the Invention

[0001]

The present invention relates to a detergent.

Background of the Invention

[0002]

There is a demand for a hair cosmetic capable of reducing the time and effort in daily hair-care activities and leading a hair-care life without stress. In particular, in the field of hair detergents, in addition to the basic function of removing hair stains, research has been conducted on hair detergents having a good feeling of use, such as good lathering, and putting fingers through hair during washing and after rinsing.

For example, PTL 1 discloses that a hair cosmetic containing a reactive silicone-based block copolymer has good lathering and emulsifying properties, and when treating hair, has excellent adhesive effect of split ends, feel, and antistatic properties.

PTL 2 discloses that a hair cosmetic containing a reactive silicone-based block copolymer, cationic galactomannan, and an N-acyl-N-methyltaurine type anionic surfactant is excellent in lathering and finished velvet feeling.

Citation List

Patent Literature

[0003]

PTL 1: JP 9-151119 A

PTL 2: JP 2007-161597 A

Summary of the Invention

[0004]

The present invention relates to the following.

A detergent contains or prepared by blending:

(A) at least one selected from the group consisting of an alkyl sultaine, an alkyl hydroxysultaine, and a nonionic surfactant, and

(B) an aminopolyether-modified silicone containing a polyoxyalkylene structure and satisfying the following formula (I):

$$0.01 \leq \text{Si}/\text{AO} \leq 1.6 \quad (\text{I})$$

[in the formula (I), Si represents a molar number of a silicon atom in the component (B), and AO represents an oxyalkylene average addition molar number in the component (B)], wherein a mass ratio [(A)/(B)] of the component (A) to the component (B) is 0.1 or more and 1,000 or less.

Detailed Description of the Invention

[0005]

[Detergent]

The detergent of the present invention is one containing or one prepared by blending: (A) at least one selected from the group consisting of an alkyl sultaine, an alkyl hydroxysultaine, and a nonionic surfactant; and (B) an aminopolyether-modified silicone containing a polyoxyalkylene structure and satisfying the following formula (I):

$$0.01 \leq \text{Si}/\text{AO} \leq 1.6 \quad (\text{I})$$

[in the formula (I), Si represents a molar number of a silicon atom in the component (B), and AO represents an oxyalkylene average addition molar number in the component (B)], wherein a mass ratio [(A)/(B)] of the component (A) to the component (B) is 0.1 or more and 1,000 or less.

In view of the fact that the detergent of the present invention has the aforementioned constitution, it is favorable in lathering during washing and is able to effectively inhibit and solve the generation of entanglement of a washing object, such as hair and fibers, during washing and even after washing. For example, in the case where the detergent of the present invention is a hair detergent, only by washing the hair with the foregoing hair detergent, the entanglement of hair can be inhibited, and even when an operation of putting fingers through hair or the like to dissociate the hair is not performed, the entanglement of hair can be spontaneously dissociated. The expression "one containing the component (A) and the component (B)" also means "one prepared by blending the component (A) and the component (B)".

[0006]

The hair is damaged by the living environment (ultraviolet rays or heat of sunlight), the daily hair-care activities (friction by hair washing or brushing),

and the chemical treatment (coloring, perm, etc.). When the damaged hairs rub against each other, a large frictional force is generated on the surface, and entanglement is caused. The "entanglement of hair" is a cause of all of stresses in the hair-care activities, and there was involved such a problem that when the entanglement of hair is once generated, it is difficult to dissociate the entanglement. Although the entanglement of hair is possibly generated during hair washing, during conditioning, after towel drying, or during drying with a hair dryer or the like, according to the research made by the present inventor, it has been noted that when the entanglement of hair is generated at the stage of hair washing, even if a conditioning treatment is subsequently performed, it is difficult to completely dissociate the entanglement. Accordingly, it is preferred that the entanglement of hair can be inhibited or solved during hair washing.

In particular, when performing an action to allow hairs to rub against each other by, for example, towel drying, the hairs which have been dissociated through the conditioning treatment are again strongly entangled in cooperation with friction with the towel. Accordingly, massive time and effort are taken for the action to dissociate the entanglement in addition to drying, and a long time is required for drying.

[0007]

PTLs 1 and 2 do not disclose inhibition and solution of the entanglement of hair on the occasion of hair washing, in particular, spontaneous dissociation of the entanglement of hair without performing an operation of putting fingers through hair or the like.

[0008]

The present invention is concerned with a detergent that is favorable in lathering during washing and is able to inhibit and solve the generation of entanglement of a washing object, such as hair and fibers, even during washing and after washing without performing an operation of putting fingers through hair or the like.

[0009]

The present inventor has found that the aforementioned problem can be solved by a detergent containing or prepared by blending a predetermined ampholytic surfactant and/or nonionic surfactant and an aminopolyether-modified silicone containing a polyoxyalkylene structure and

satisfying a predetermined requirement in a predetermined proportion.

In accordance with the detergent of the present invention, lathering during washing is favorable, and the generation of entanglement of a washing object, such as hair and fibers, even during washing and after washing can be substantially inhibited and solved without performing an operation of putting fingers through hair or the like. For example, in the case where the detergent of the present invention is a hair detergent, the entanglement in hair after washing and towel drying is hardly generated, and therefore, the hair can be dried for a short time, and finish after drying becomes favorable.

[0010]

The reason why in view of the fact that the detergent of the present invention has the aforementioned constitution, the effects of the present invention are brought resides in the following matter.

In order to reveal such a state that the entanglement of hair or the like is spontaneously dissociated during washing and after washing of hair or fibers, it may be considered to be important that a frictional force working on the hair or between the fibers is lowered. In a hair detergent, a silicone is generally blended as an active ingredient; however, the present inventor has found that in order to lower the frictional force working on the hair or between the fibers, it is effective to use the component (B) that is a water-soluble silicone satisfying a predetermined requirement.

In addition, in order to impart detergency, an anionic component, such as an anionic surfactant, is typically blended in a detergent. However, since the component (B) is cationic, in the case where the component (B) and the anionic component, such as an anionic surfactant, are coexistent, charges are neutralized due to an electrostatic interaction, to cause insolubilization, so that the function to remove the entanglement cannot be exhibited.

In the detergent of the present invention, in view of the fact that the component (A) as the predetermined ampholytic surfactant and/or nonionic surfactant, which does not cause an electrostatic interaction with the cationic component, is used as the surfactant component in a predetermined proportion relative to the component (B), it may be considered that not only the detergency is imparted, but also the function due to the component (B) is effectively exhibited relative to a washing object, such as hair and fibers, so that the effects of the present invention can be revealed.

[0011]

When towel drying is performed in a state that the entanglement of hair is dissociated, a contact area between the hair and the towel increases so that the moisture of the hair is quickly absorbed onto the towel. In addition, it may be considered that a contact area between the hair and air increases during drying with a hair dryer or during natural drying, and the moisture in the hair is quickly transpired, so that a drying speed of the hair is improved.

[0012]

From the viewpoint of effectively obtaining the effects of the present invention, the detergent of the present invention is preferably a hair detergent or a detergent for fibers, and more preferably a hair detergent.

A dosage form of the detergent is not particularly limited, and it is possible to adopt an arbitrary dosage form, for example, a liquid form, a lathering form, a paste form, a cream form, a solid form, or a powder form. For example, in the case of a hair detergent, a liquid form, a paste form or a cream form is preferred, and a liquid form is more preferred.

[0013]

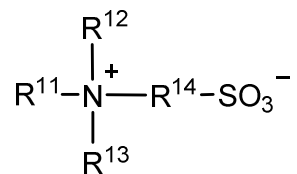
<Component (A)>

The detergent of the present invention contains, as the component (A), at least one selected from the group consisting of an alkyl sultaine, an alkyl hydroxysultaine, and a nonionic surfactant. The component (A) is used for the purpose of imparting detergency.

[0014]

(Alkyl Sultaine)

As the alkyl sultaine, there are exemplified alkyl sultaines having an alkyl group having preferably 8 or more and 22 or less carbon atoms, and more preferably 10 or more and 18 or less carbon atoms. Examples thereof include a compound represented by the following general formula.



In the formula, R¹¹ represents an alkyl group having 8 or more and 22 or less carbon atoms. R¹² and R¹³ each independently represent an alkyl group having 1 or more and 3 or less carbon atoms. R¹⁴ represents an alkylene group

having 1 or more and 3 or less carbon atoms.

R¹¹ is an alkyl group having 8 or more and 22 or less carbon atoms, and preferably 10 or more and 18 carbon atoms. Examples of R¹¹ include a lauryl group, a myristyl group, a stearyl group, and a behenyl group. Of these, a lauryl group is preferred.

In R¹² and R¹³, examples of the alkyl group having 1 or more and 3 or less carbon atoms include a methyl group, an ethyl group, a n-propyl group, and an isopropyl group. Of these, a methyl group is preferred. In R¹⁴, examples of the alkylene group having 1 or more and 3 or less carbon atoms include a methylene group, an ethylene group, a propylene group, and a trimethylene group. Of these, a propylene group is preferred.

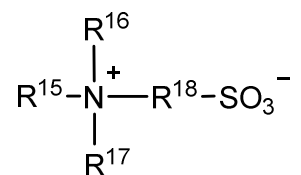
[0015]

Specific examples of the alkyl sultaine that is used in the present invention include lauryl dimethylsulfoethyl betaine, lauryl dimethylsulfopropyl betaine, myristyl dimethylsulfoethyl betaine, myristyl dimethylsulfopropyl betaine, stearyl dimethylsulfoethyl betaine, and stearyl dimethylsulfopropyl betaine. One or more of these compounds may be used.

[0016]

(Alkylhydroxy Sultaine)

As the alkylhydroxy sultaine, there are exemplified alkylhydroxy sultaines having an alkyl group having preferably 8 or more and 22 or less carbon atoms, and more preferably 10 or more and 18 or less carbon atoms and at least one hydroxy group. Examples thereof include a compound represented by the following general formula.



In the formula, R¹⁵ represents an alkyl group having 8 or more and 22 or less carbon atoms. R¹⁶ and R¹⁷ each independently represent an alkyl group having 1 or more and 3 or less carbon atoms and optionally having a hydroxy group. R¹⁸ represents an alkylene group having 1 or more and 3 or less carbon atoms and optionally having a hydroxy group. At least one of R¹⁶, R¹⁷, and R¹⁸ has a hydroxy group.

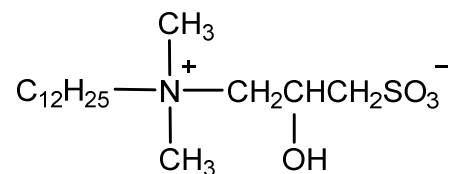
R¹⁵ is an alkyl group having 8 or more and 22 or less carbon atoms, and

preferably 10 or more and 18 or less carbon atoms. Examples of R¹⁵ include a lauryl group, a myristyl group, a stearyl group, and a behenyl group. Of these, a lauryl group is preferred.

In R¹⁶ and R¹⁷, examples of the alkyl group having 1 or more and 3 or less carbon atoms and optionally having a hydroxy group include a methyl group, a hydroxymethyl group, an ethyl group, a hydroxyethyl group, a n-propyl group, an isopropyl group, and a hydroxypropyl group. Of these, a methyl group, an ethyl group, or a hydroxyethyl group is preferred, and a methyl group is more preferred. In R¹⁸, examples of the alkylene group having 1 or more and 3 or less carbon atoms and optionally having a hydroxy group include a methylene group, an ethylene group, a propylene group, a trimethylene group, and -CH₂CH(OH)CH₂-. Of these, a propylene group or -CH₂CH(OH)CH₂- is preferred, and -CH₂CH(OH)CH₂- is more preferred.

[0017]

Specific examples of the alkyl hydroxysultaine that is used in the present invention include lauryl dimethylsulfo(hydroxyethyl)betaine, lauryl dimethylsulfo(hydroxypropyl)betaine [lauryl hydroxysultaine], myristyl dimethylsulfo(hydroxyethyl)betaine, myristyl dimethylsulfo(hydroxypropyl)betaine, stearyl dimethylsulfo(hydroxypropyl)betaine, bis-(2-hydroxy-ethyl)sulfoethyl betaine, and lauryl bis-(2-hydroxy-ethyl)sulfopropyl betaine. One or more of these compounds may be used. Of these, lauryl hydroxysultaine is preferred. The lauryl hydroxysultaine is a compound represented by the following formula.



[0018]

(Nonionic Surfactant)

Examples of the nonionic surfactant include a polyoxyalkylene alkyl ether, a polyoxyalkylene alkenyl ether, a polyoxyalkylene sorbitan fatty acid ester, a polyoxyalkylene fatty acid ester, an alkyl glucoside, an alkyl glyceryl ether, a higher fatty acid sugar ester, a polyglycerin fatty acid ester, a polyoxyethylene hydrogenated castor oil, an alkyl saccharide, an alkylamine oxide, and an alkylamidoamine oxide. Of these, as the nonionic surfactant, at

least one selected from the group consisting of a polyoxyalkylene alkyl ether, a polyoxyalkylene alkenyl ether, a polyoxyalkylene sorbitan fatty acid ester, a polyoxyalkylene fatty acid ester, an alkyl glucoside, and an alkyl glyceryl ether is preferred; and at least one selected from the group consisting of a polyoxyalkylene alkyl ether, an alkyl glucoside, and an alkyl glyceryl ether is more preferred.

The carbon number of each of the alkyl group in the polyoxyalkylene alkyl ether, the alkyl glucoside, the alkyl glyceryl ether, the alkyl saccharide, the alkylamine oxide, and the alkylamidoamine oxide; the alkenyl group in the polyoxyalkylene alkenyl ether; and the fatty acid in the polyoxyalkylene sorbitan fatty acid ester, the polyoxyalkylene fatty acid ester, the higher fatty acid sugar ester, and the polyglycerin fatty acid ester is preferably 8 or more and 22 or less, more preferably 8 or more and 18 or less, and still more preferably 8 or more and 12 or less.

[0019]

As the polyoxyalkylene alkyl ether, there are exemplified polyoxyethylene alkyl ethers or polyoxypropylene alkyl ethers having an alkyl group having preferably 8 or more and 22 or less carbon atoms, more preferably 8 or more and 18 or less carbon atoms, and still more preferably 8 or more and 12 or less carbon atoms. Specific examples thereof include "EMULGEN 103" (Laureth-3: PEG-3 lauryl ether), "EMULGEN 116" (Laureth-16: PEG-16 lauryl ether), and "KAO SOFCARE GP-1" (PPG-3 caprylyl ether), all of which are manufactured by Kao Corporation.

As the alkyl glucoside, there are exemplified alkyl glucosides having an alkyl group having preferably 8 or more and 22 or less carbon atoms, more preferably 8 or more and 18 or less carbon atoms, and still more preferably 8 or more and 12 or less carbon atoms. Specific examples thereof include "MYDOL 10", manufactured by Kao Corporation (decyl glucoside).

As the alkyl glyceryl ether, there are exemplified alkyl glyceryl ethers having an alkyl group having preferably 8 or more and 22 or less carbon atoms, more preferably 8 or more and 18 or less carbon atoms, and still more preferably 8 or more and 12 or less carbon atoms. Specific examples thereof include "PENETOL GE-ID", manufactured by Kao Corporation (isodecyl glyceryl ether). One or two or more of these compounds may be used.

[0020]

From the viewpoint of lathering during washing and inhibition and solution of entanglement of a washing object, such as hair, and the viewpoint of reduction in entanglement during hair rinsing, easiness of brushing after towel drying, and quick drying properties in the hair detergent, the content or blending amount of the component (A) in the detergent is preferably 1% by mass or more, more preferably 3% by mass or more, and still more preferably 5% by mass or more, and from the same viewpoints, it is preferably 30% by mass or less, more preferably 20% by mass or less, and still more preferably 18% by mass or less. A specific range of the content or blending amount of the component (A) in the detergent is preferably 1 to 30% by mass, more preferably 3 to 20% by mass, and still more preferably 5 to 18% by mass.

[0021]

<Component (B): Aminopolyether-modified Silicone Containing a Polyoxyalkylene Structure>

The detergent of the present invention contains, as the component (B), an aminopolyether-modified silicone containing a polyoxyalkylene structure and satisfying the following formula (I):

$$0.01 \leq \text{Si}/\text{AO} \leq 1.6 \quad (\text{I})$$

[in the formula (I), Si represents a molar number of a silicon atom in the component (B), and AO represents an oxyalkylene average addition molar number in the component (B)].

In view of the fact that the detergent of the present invention contains the component (B), in the washing object, such as hair and fibers, the generation of entanglement can be effectively inhibited and solved owing to the aforementioned mechanism of action even during washing and after washing.

From the viewpoint of inhibition and solution of entanglement of a washing object, such as hair, and reduction in entanglement during hair rinsing, easiness of brushing after towel drying, and quick drying properties in the hair detergent, the Si/AO in the formula (I) is 0.01 or more, preferably 0.05 or more, still more preferably 0.1 or more, yet still more preferably 0.3 or more, even yet still more preferably 0.5 or more, and even still more preferably 0.7 or more, and from the same viewpoint, it is 1.6 or less, preferably 1.4 or less, more preferably 1.2 or less, still more preferably 1.0 or less, and yet still more preferably 0.9 or less. When the Si/AO of the component (B) is 0.01 or more and 1.6 or less, the effect for inhibiting and solving the entanglement of a washing

object, such as hair, the easiness of brushing after towel drying, and the quick drying properties are favorable.

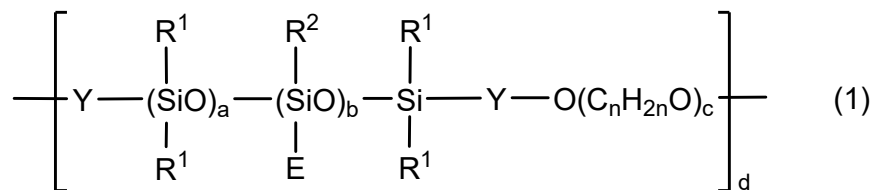
The Si/AO in the formula (I) can be calculated from an integrated value of hydrogen atoms bonded to silicon and H of the hydrocarbon group and an integrated value of H of the oxyalkylene group, as measured by the ^1H -NMR measurement. Specifically, the measurement may be performed by the method described in the section of Examples.

[0022]

From the viewpoint of lathering during washing, inhibition and solution of entanglement of a washing object, such as hair, and reduction in entanglement during hair rinsing, easiness of brushing after towel drying, and quick drying properties in the hair detergent, the nitrogen content of the component (B) is preferably 0.1% by mass or more, more preferably 0.2% by mass or more, still more preferably 0.5% by mass or more, and yet still more preferably 1.0% by mass or more, and it is preferably 2.5% by mass or less, more preferably 2.0% by mass or less, still more preferably 1.8% by mass or less, and yet still more preferably 1.5% by mass or less. A specific range of the nitrogen content of the component (B) is preferably 0.1 to 2.5% by mass, more preferably 0.2 to 2.0% by mass, still more preferably 0.5 to 1.8% by mass, and yet still more preferably 1.0 to 1.5% by mass. The nitrogen content of the component (B) is a value measured in conformity with the potentiometric titration method as prescribed in JIS K0113:2005.

[0023]

More specifically, the component (B) is preferably an aminopolyether-modified silicone having a repeating unit represented by the following general formula (1), and more preferably an aminopolyether-modified silicone constituted of a repeating unit represented by the following general formula (1):



In the formula (1), R^1 represents a hydrogen atom or a monovalent hydrocarbon group having 1 or more and 6 or less carbon atoms. R^2 represents either R^1 or E. E represents a monovalent group represented by $-\text{R}^3-\text{Z}$ (wherein

R^3 represents a single bond or a divalent hydrocarbon group having 1 or more and 20 or less carbon atoms; and Z represents a primary to tertiary amino group-containing group). Y represents an alkylene group having 1 or more and 6 or less carbon atoms. a represents a number of 2 or more; b represents a number of 1 or more; c represents a number of 4 or more and 100 or less; and d represents a number of 1 or more. n represents a number of 2 or more and 10 or less. The bonding order among the structural units within the bracket does not matter, and the bonding form may be a block form or a random form. The $(C_nH_{2n}O)$'s in the number of c may be the same as or different from each other. In addition, plural R^1 's, R^2 's, and E's may be the same as or different from each other, respectively.

In the case where the component (B) is constituted of the repeating unit represented by the general formula (1), the Si/AO in the foregoing formula (I) is represented by $(a + b + 1)/c$.

[0024]

In the general formula (1), R^1 represents a hydrogen atom or a monovalent hydrocarbon group having 1 or more and 6 or less carbon atoms. R^1 's are each independently preferably a hydrogen atom, an alkyl group having 1 or more and 6 or less carbon atoms, or a phenyl group, more preferably a methyl group or an ethyl group, and still more preferably a methyl group.

[0025]

In the general formula (1), R^2 represents either R^1 or E. E represents a monovalent group represented by $-R^3-Z$ (wherein R^3 represents a single bond or a divalent hydrocarbon group having 1 or more and 20 or less carbon atoms).

R^3 is preferably a divalent hydrocarbon group having 1 or more and 20 or less carbon atoms; more preferably an alkylene group having 1 or more and 20 or less carbon atoms; still more preferably a linear or branched alkylene group having 1 or more and 6 or less carbon atoms; yet still more preferably a methylene group, an ethylene group, a trimethylene group, a propylene group, a tetramethylene group, or a hexamethylene group; and even yet still more preferably a trimethylene group or a propylene group.

[0026]

Z is a primary to tertiary amino group-containing group, and preferably an amino group-containing group represented by $-N(R^4)_2$, $-NR^4(CH_2)_mN(R^4)_2$, or $-NR^4(CH_2)_mN(R^5)CO-R^6$. Here, R^4 and R^5 each independently represent a

hydrogen atom or an alkyl group having 1 or more and 3 or less carbon atoms, and preferably a hydrogen group or a methyl group. R^6 represents an alkyl group having 1 or more and 3 or less carbon atoms. m represents a number of 1 or more and 6 or less, and preferably a number of 2 or more and 4 or less.

[0027]

In the general formula (1), the E group is preferably $-(CH_2)_3-NH_2$, $-(CH_2)_3-N(CH_3)_2$, $-(CH_2)_3-NH-(CH_2)_2-NH_2$, or $-(CH_2)_2-NH-(CH_2)_2-N(CH_3)_2$, and more preferably $-(CH_2)_3-NH-(CH_2)_2-NH_2$.

[0028]

In the general formula (1), Y is an alkylene group having 1 or more and 6 or less carbon atoms, preferably an ethylene group, a propylene group, a trimethylene group, a n-butylene group (tetramethylene group), or an i-butylene group, and more preferably a n-butylene group or an i-butylene group. The i-butylene group as referred to herein includes $-CH(CH_3)CH_2CH_2-$, $-CH_2CH(CH_3)CH_2-$, and $-CH_2CH_2CH(CH_3)-$.

[0029]

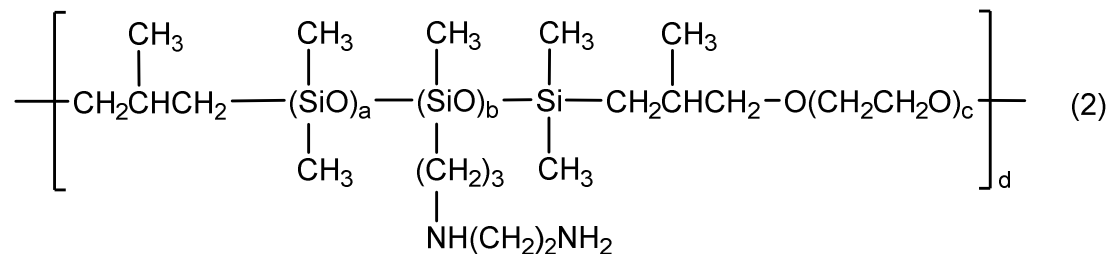
In the general formula (1), a represents a number of 2 or more; b represents a number of 1 or more; c represents a number of 4 or more and 100 or less; and d represents a number of 1 or more. a is preferably a number of 2 or more and 1,000 or less, and more preferably a number of 2 or more and 100 or less. b is preferably a number of 1 or more and 50 or less; c is preferably a number of 4 or more and 50 or less, and more preferably a number of 10 or more and 18 or less; and d is preferably a number of 1 or more and 100 or less.

[0030]

In the general formula (1), n represents a number of 2 or more and 10 or less, preferably a number of 2 or more and 6 or less, and more preferably a number of 2 or more and 4 or less.

[0031]

The component (B) is more preferably an aminopolyether-modified silicone having a repeating unit represented by the following general formula (2), and still more preferably an aminopolyether-modified silicone constituted of a repeating unit represented by the following general formula (2). Even in the case where the component (B) is constituted of a repeating unit represented by the general formula (2), the Si/AO in the aforementioned formula (I) is represented by $(a + b + 1)/c$.



In the formula (2), a to d are the same as those mentioned above.

[0032]

Although the component (B) may be any form of an oil, an emulsion, and so on, it is preferably an oil.

In the case where the component (B) is an oil, from the viewpoint of allowing it to efficiently remain in the hair or the like to exhibit the effects of the present invention, its kinematic viscosity at 25°C is preferably 50 mm²/s or more, more preferably 100 mm²/s or more, still more preferably 300 mm²/s or more, yet still more preferably 500 mm²/s or more, and even yet still more preferably 700 mm²/s or more, and from the viewpoint of water solubility, it is preferably 50,000 mm²/s or less, more preferably 20,000 mm²/s or less, still more preferably 10,000 mm²/s or less, yet still more preferably 5,000 mm²/s or less, even yet still more preferably 3,000 mm²/s or less, even still more preferably 1,400 mm²/s or less, and even still more further preferably 1,200 mm²/s or less. A specific range of the kinematic viscosity at 25°C of the component (B) is preferably 50 to 50,000 mm²/s, more preferably 100 to 20,000 mm²/s, still more preferably 300 to 10,000 mm²/s, yet still more preferably 500 to 5,000 mm²/s, even yet still more preferably 500 to 3,000 mm²/s, even still more preferably 500 to 1,500 mm²/s, and even still more further preferably 700 to 1,400 mm²/s.

The kinematic viscosity at 25°C of the component (B) is a value measured in conformity with the "Viscosity Measurement Methods for Liquids" as prescribed in JIS Z8803:2011 or ASTM D445-46T, and may be, for example, measured with an Ubbelohde viscometer.

[0033]

The component (B) may be used alone or in combination of two or more thereof.

As the component (B), a commercially available aminopolyether-modified silicone may be used, too. Examples of the

aminopolyether-modified silicone having a repeating unit represented by the general formula (2) include "SILSTYLE 201", manufactured by Dow Corning Toray Co., Ltd. ((bisisobutyl PEG-14/amodimethicone) copolymer, nitrogen content: 1.2% by mass, viscosity: 1,000 mm²/s, Si/AO = 0.80).

[0034]

In the detergent of the present invention, from the viewpoint of lathering during washing and inhibition and solution of entanglement of a washing object, such as hair, and the viewpoint of reduction in entanglement during hair rinsing, easiness of brushing after towel drying, quick drying properties, and easiness of blending in the hair detergent, a mass ratio [(A)/(B)] of the component (A) to the component (B) is 0.1 or more, preferably 0.3 or more, more preferably 1 or more, still more preferably 2 or more, yet still more preferably 10 or more, and even yet still more preferably 30 or more, and it is 1,000 or less, preferably 500 or less, more preferably 100 or less, and still more preferably 70 or less. A specific range of the mass ratio [(A)/(B)] of the component (A) to the composition (B) in the detergent is 0.1 to 1,000, preferably 0.3 to 1,000, more preferably 1 to 1,000, still more preferably 2 to 1,000, yet still more preferably 10 to 1,000, even yet still more preferably 30 to 1,000, even still more preferably 10 to 500, and even still more further preferably 30 to 100.

[0035]

Although the content or blending amount of the component (B) in the detergent may be the amount at which the mass ratio [(A)/(B)] is 0.1 or more and 1,000 or less, from the viewpoint of inhibition and solution of entanglement of a washing object, such as hair, and the viewpoint of reduction in entanglement during hair rinsing, easiness of brushing after towel drying, and quick drying properties in the hair detergent, it is preferably 0.01% by mass or more, more preferably 0.05% by mass or more, and still more preferably 0.1% by mass or more, and from the viewpoint of lathering during washing, it is preferably 10% by mass or less, more preferably 7% by mass or less, and still more preferably 5% by mass or less. A specific range of the content or blending amount of the component (B) in the detergent is preferably 0.01 to 10% by mass, more preferably 0.01 to 7% by mass, still more preferably 0.01 to 5% by mass, yet still more preferably 0.05 to 5% by mass, and even yet still more preferably 0.1 to 5% by mass.

[0036]

<Component (A)': Ampholytic Surfactant Other Than Component (A)>

For the purpose of lathering during washing and strengthening reduction in entanglement during hair rinsing, easiness of brushing after towel drying, and quick drying properties in the hair detergent, the detergent of the present invention may further contain, as a component (A)', an ampholytic surfactant other than the alkyl sultaine and the alkyl hydroxysultaine.

As the component (A)', there are exemplified imidazoline-based betaines, alkyldimethylamino acetic acid betaines, fatty acid amidopropyl betaines, alkylamidosultaines, and alkylamidohydroxy sultaines.

Of these, at least one selected from the group consisting of an imidazoline-based betaine, an alkyldimethylamino acetic acid betaine, and a fatty acid amidopropyl betaine is preferred, and at least one selected from the group consisting of an imidazoline-based betaine and a fatty acid amidopropyl betaine is more preferred.

Examples of the imidazoline-based betaine include a 2-alkyl-N-carboxymethyl-N-hydroxyethyl imidazolium betaine (sodium cocoamphoacetate) and sodium N-lauroyl-N'-carboxymethyl-N'-hydroxyethyl ethylenediamine (sodium lauroamphoacetate).

The fatty acid amidopropyl betaine is preferably one having an acyl group having 8 or more and 22 or less carbon atoms, and furthermore, 10 or more and 18 or less carbon atoms; more preferably at least one selected from the group consisting of lauric acid amidopropyl betaine (lauramidopropyl betaine), palm kernelamidopropyl betaine, and cocamidopropyl betaine; and still more preferably lauric acid amidopropyl betaine.

As the component (A)', one or more of those mentioned above may be used.

[0037]

In the case of using the component (A)', from the viewpoint of lathering during washing, the content or blending amount of the component (A)' in the detergent is preferably 0.01% by mass or more, more preferably 0.05% by mass or more, still more preferably 0.1% by mass or more, and yet still more preferably 0.3% by mass or more, and from the viewpoint of reduction in entanglement during hair rinsing, easiness of brushing after towel drying, and easiness of blending in the hair detergent, it is preferably 10% by mass or less, more preferably 5% by mass or less, still more preferably 3% by mass or less,

and yet still more preferably 2% by mass or less.

A specific range of the content or blending amount of the component (A)' in the detergent is preferably 0.01 to 10% by mass, more preferably 0.05 to 5% by mass, still more preferably 0.1 to 3% by mass, and yet still more preferably 0.3 to 2% by mass.

[0038]

In the case of using the component (A)', from the viewpoint of lathering during washing and reduction in entanglement during hair rinsing, easiness of brushing after towel drying, quick drying properties, and easiness of blending in the hair detergent, a mass ratio [(A)/(A)'] of the component (A) to the component (A)' in the detergent is preferably 0.1 or more, more preferably 0.5 or more, still more preferably 1 or more, yet still more preferably 3 or more, and even yet still more preferably 5 or more, and it is preferably 1,000 or less, more preferably 500 or less, still more preferably 300 or less, yet still more preferably 100 or less, even yet still more preferably 50 or less, and even still more preferably 30 or less.

A specific range of the mass ratio [(A)/(A)'] of the component (A) to the component (A)' in the detergent is preferably 0.1 to 1,000, more preferably 0.5 to 500, still more preferably 1 to 300, yet still more preferably 3 to 100, even yet still more preferably 5 to 50, and even still more preferably 5 to 30.

[0039]

<Component (B)': Aminopolyether-modified Silicone Other Than Component (B)>

From the viewpoint of strengthening reduction in entanglement during hair rinsing in the hair detergent, the detergent of the present invention may be one further containing or prepared by further blending, as a component (B)', an aminopolyether-modified silicone other than the component (B). It is preferred that the component (B)' is water-insoluble. In this specification, the expression "water-insoluble" means that the solubility in 100 g of water at 25°C is 0.1 g or less.

[0040]

The component (B)' is preferably an aminopolyether-modified silicone (B1)' containing a polyoxyalkylene structure and satisfying the following formula (II) (hereinafter also referred to simply as "component (B1)'"):

$$1.6 < \text{Si/AO} \leq 3.0 \quad (\text{II})$$

In the formula (II), Si represents a molar number of a silicon atom in the component (B1)', and AO represents an oxyalkylene average addition molar number in the component (B1)'.

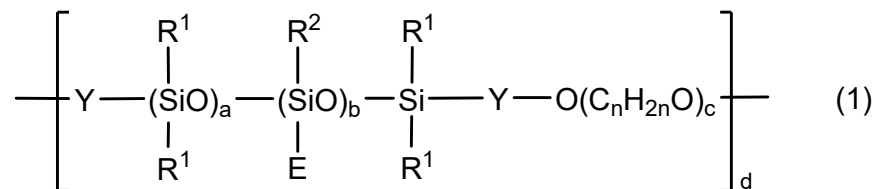
In the formula (II), from the viewpoint of water-insolubility, the Si/AO is preferably 1.8 or more, more preferably 2.0 or more, and still more preferably 2.2 or more, and from the viewpoint of blending stability, it is preferably 2.8 or less, and more preferably 2.6 or less. The Si/AO may be determined by the same method as that mentioned above.

[0041]

From the viewpoint of lathering during washing and reduction in entanglement during hair rinsing, easiness of brushing after towel drying, and quick drying properties in the hair detergent, the nitrogen content of the component (B1)' is preferably 0.1% by mass or more, more preferably 0.2% by mass or more, still more preferably 0.5% by mass or more, and yet still more preferably 0.8% by mass or more, and it is preferably 2.5% by mass or less, more preferably 2.0% by mass or less, still more preferably 1.8% by mass or less, and yet still more preferably 1.5% by mass or less. A specific range of the nitrogen content of the component (B1)' is preferably 0.1 to 2.5% by mass, more preferably 0.2 to 2.0% by mass, still more preferably 0.5 to 1.8% by mass, and yet still more preferably 0.8 to 1.5% by mass. The nitrogen content may be determined by the same method as that mentioned above.

[0042]

It is more preferred that the component (B1)' has a repeating unit represented by the following general formula (1). More preferably, the component (B1)' is an aminopolyether-modified silicone constituted of a repeating unit represented by the following general formula (1).



In the formula (1), R¹, R², E, Y, a to d, and n are the same as those mentioned above.

In the case where the component (B1)' is constituted of the repeating unit represented by the general formula (1), the Si/AO in the foregoing formula (II) is represented by (a + b + 1)/c.

In the component (B1)', R^1 , R^2 , E, Y, a to d, and n in the formula (1) and preferred ranges thereof are the same as those in the component (B) except for the range of Si/AO. That is, the component (B1)' is more preferably an aminopolyether-modified silicone having the repeating unit represented by the foregoing general formula (2), and still more preferably an aminopolyether-modified silicone constituted of the repeating unit represented by the foregoing general formula (2).

[0043]

Although the component (B1)' may be any form of an oil, an emulsion, and so on, it is preferably an oil.

In the case where the component (B1)' is an oil, from the viewpoint of water-insolubility, its kinematic viscosity at 25°C is preferably 2,000 mm²/s or more, more preferably 3,000 mm²/s or more, and still more preferably 5,000 mm²/s or more, and from the viewpoint of easiness of blending, it is preferably 200,000 mm²/s or less, more preferably 100,000 mm²/s or less, and still more preferably 50,000 mm²/s or less. In the case where the component (B1)' is an oil, a specific range of the kinematic viscosity at 25°C is preferably 2,000 to 200,000 mm²/s, more preferably 3,000 to 100,000 mm²/s, and still more preferably 5,000 to 50,000 mm²/s. The kinematic viscosity may be measured by the same method as that mentioned above.

[0044]

As the component (B1)', a commercially available aminopolyether-modified silicone may be used, too. Examples thereof include "SILSTYLE 104", manufactured by Dow Corning Toray Co., Ltd. ((bisisobutyl PEG-14/amodimethicone) copolymer having the repeating unit represented by the general formula (2), nitrogen content: 1.2% by mass, kinematic viscosity at 25°C: 12,000 mm²/s, Si/AO = 2.46); "SS-3588", manufactured by Dow Corning Toray Co., Ltd. ((bisisobutyl PEG-15/amodimethicone) copolymer having the repeating unit represented by the foregoing general formula (2), nitrogen content: 1.0% by mass, Si/AO = 2.39); and "SILSTYLE 401", manufactured by Dow Corning Toray Co., Ltd. ((bisisobutyl PEG/PPG-20/35/amodimethicone) copolymer, nitrogen content: 0.2% by mass).

[0045]

In the case of using the component (B)', from the viewpoint of reduction in entanglement during hair rinsing, easiness of brushing after towel drying,

and quick drying properties in the hair detergent, the content or blending amount of the component (B)' in the detergent is preferably 0.01% by mass or more, more preferably 0.05% by mass or more, and still more preferably 0.1% by mass or more, and from the viewpoint of lathering during washing, it is preferably 10% by mass or less, more preferably 5% by mass or less, still more preferably 3% by mass or less, and yet still more preferably 1% by mass or less.

A specific range of the content or blending amount of the component (B)' in the detergent is preferably 0.01 to 10% by mass, more preferably 0.05 to 5% by mass, still more preferably 0.1 to 3% by mass, and yet still more preferably 0.1 to 1% by mass.

[0046]

<Component (C): Silicone Other Than Component (B) and Component (B)'>

From the viewpoint of reducing the entanglement during hair rinsing and the viewpoint of strengthening easiness of brushing after towel drying and quick drying properties in the hair detergent, the detergent of the present invention may further contain or be prepared by further blending, as a component (C), a silicone other than the component (B) and the component (B)'. It is preferred that the component (C) is a water-insoluble silicone.

Examples of the component (C) include at least one selected from the group consisting of an amino-modified silicone, a polyether-modified silicone, a dimethylpolysiloxane (dimethicone), a methylphenylpolysiloxane, a fatty acid-modified silicone, an alkoxy-modified silicone, and an alkyl-modified silicone. Of these, at least one selected from the group consisting of an amino-modified silicone and a dimethylpolysiloxane is preferred. It is more preferred to use a dimethylpolysiloxane alone or a combination of an amino-modified silicone and a dimethylpolysiloxane.

[0047]

The amino-modified silicone may be any form of an oil, an emulsion, a solution prepared by diluting with a low-viscosity silicone or a liquid paraffin, and so on. The amino-modified silicone is preferably an aminoethylaminopropylsiloxane-dimethylsiloxane copolymer (amodimethicone). Examples of a commercially available product of the amodimethicone include "SM8904" and "CB-1002" (all of which are manufactured by Dow Corning Toray Co., Ltd.) and "KT-0032" and "XF42-B8922" (all of which are manufactured by Momentive Performance

Materials Inc.).

[0048]

The dimethylpolysiloxane may be any form of an oil, an emulsion, a solution prepared by diluting a highly polymerized dimethylpolysiloxane with a low-viscosity silicone or a liquid paraffin, and so on.

Examples of a commercially available product of the dimethylpolysiloxane include SH200 Series (such as SH200C Fluid 1CS, SH200C Fluid 2CS, SH200C Fluid 5CS, SH200C Fluid 10CS, SH200C Fluid 20CS, SH200C Fluid 30CS, SH200C Fluid 50CS, SH200C Fluid 100CS, SH200C Fluid 200CS, SH200C Fluid 350CS, SH200C Fluid 500CS, SH200C Fluid 1,000CS, SH200C Fluid 5,000CS, SH200 Fluid 1.5CS, SH200 Fluid 3,000CS, SH200 Fluid 10,000CS, SH200 Fluid 12,500CS, SH200 Fluid 30,000CS, SH200 Fluid 60,000CS, SH200 Fluid 100,000CS, and SH200 Fluid 1,000,000CS), BY11-026, BY22-020, BY22-029, BY22-050A, and BY22-060 (all of which are manufactured by Dow Corning Toray Co., Ltd.); TSF-451 Series (manufactured by Momentive Performance Materials Inc.); KF-96 Series, KF9008, and KM904 (all of which are manufactured by Shin-Etsu Chemical Co., Ltd.).

[0049]

In the case of using the component (C), from the viewpoint of reduction in entanglement during hair rinsing, easiness of brushing after towel drying, and quick drying properties in the hair detergent, the content or blending amount of the component (C) in the detergent is preferably 0.001% by mass or more, more preferably 0.005% by mass or more, still more preferably 0.01% by mass or more, and yet still more preferably 0.05% by mass or more, and from the viewpoint of lathering during washing and reduction in entanglement during hair rinsing, easiness of brushing after towel drying, quick drying properties, and easiness of blending in the hair detergent, it is preferably 10% by mass or less, more preferably 7% by mass or less, still more preferably 5% by mass or less, and yet still more preferably 2% by mass or less.

A specific range of the content or blending amount of the component (C) in the detergent is preferably 0.001 to 10% by mass, more preferably 0.005 to 7% by mass, still more preferably 0.01 to 5% by mass, and yet still more preferably 0.05 to 2% by mass.

[0050]

In the case of using the component (C) in the detergent of the present invention, from the viewpoint of lathering during washing and reduction in entanglement during hair rinsing, easiness of brushing after towel drying, quick drying properties, and easiness of blending in the hair detergent, a mass ratio [(A)/(C)] of the component (A) to the component (C) is preferably 0.1 or more, more preferably 0.3 or more, still more preferably 0.5 or more, and yet still more preferably 1 or more, and it is preferably 500 or less, more preferably 300 or less, and still more preferably 200 or less.

A specific range of the mass ratio [(A)/(C)] of the component (A) to the component (C) is preferably 0.1 to 500, more preferably 0.3 to 300, still more preferably 0.5 to 200, and yet still more preferably 1 to 200.

[0051]

<Component (D): Cationic Surfactant>

From the viewpoint of lathering during washing and strengthening reduction in entanglement during hair rinsing in the hair detergent, the detergent of the present invention may be one further containing or prepared by further blending, as a component (D), a cationic surfactant.

Examples of the cationic surfactant include (i) an alkyltrimethylammonium salt, (ii) an alkoxyalkyltrimethylammonium salt, (iii) a dialkyldimethylammonium salt, (iv) an alkyldimethylamine and its salt, (v) an alkoxyalkyldimethylamine and its salt, and (vi) an alkylamidoalkyldimethylamine and its salt.

[0052]

As the alkyltrimethylammonium salt (i), there are exemplified alkyltrimethylammonium salts having an alkyl group having preferably 12 or more and 22 or less carbon atoms, and more preferably 16 or more and 20 or less carbon atoms. Specifically, examples thereof include cetyltrimethylammonium chloride (cetrimonium chloride), stearyltrimethylammonium chloride, and behenyltrimethylammonium chloride.

As the alkoxyalkyltrimethylammonium salt (ii), there are exemplified alkoxyalkyltrimethylammonium salts having an alkoxy group having preferably 12 or more and 22 or less carbon atoms, and more preferably 16 or more and 20 or less carbon atoms. Specifically, examples thereof include stearoxypropyltrimethylammonium chloride,

stearoxyethyltrimethylammonium chloride, and stearoxyhydroxypropyltrimethylammonium chloride.

As the dialkyldimethylammonium salt (iii), there are exemplified dialkyldimethylammonium salts having an alkyl group having preferably 12 or more and 22 or less carbon atoms, and more preferably 16 or more and 20 or less carbon atoms. Specifically, examples thereof include distearyldimethylammonium chloride.

[0053]

Each of the alkyldimethylamine, the alkoxyalkyldimethylamine, and the alkylamidoalkyldimethylamine reacts with an acid to become a quaternary ammonium salt and works as a surfactant. In consequence, here, the aforementioned amines and salts thereof are each defined as a cationic surfactant. In addition, the content thereof is expressed in terms of a mass of each of the aforementioned amines.

[0054]

The alkyl group in each of the alkyldimethylamine and its salt (iv) and the alkoxyalkyldimethylamine and its salt (v) is an alkyl group having preferably 12 or more and 22 or less carbon atoms, and more preferably 16 or more and 20 or less carbon atoms.

Examples of the salt include a salt by an organic acid or an inorganic acid. Examples of the organic acid include monocarboxylic acids, such as acetic acid and propionic acid; dicarboxylic acids, such as malonic acid, succinic acid, glutaric acid, adipic acid, maleic acid, fumaric acid, and phthalic acid; polycarboxylic acids, such as polyglutamic acid; hydroxycarboxylic acids, such as glycolic acid, lactic acid, hydroxyacrylic acid, glyceric acid, malic acid, tartaric acid, and citric acid; and acidic amino acids, such as glutamic acid and aspartic acid. Examples of the inorganic acid include hydrochloric acid, sulfuric acid, and phosphoric acid. Of these, organic acids are preferred, and at least one selected from the group consisting of dicarboxylic acids, hydroxycarboxylic acids, and acidic amino acids is more preferred. As the dicarboxylic acid, at least one selected from the group consisting of maleic acid and succinic acid is more preferred. As the hydroxycarboxylic acid, at least one selected from the group consisting of glycolic acid, lactic acid, and malic acid is more preferred. As the acidic amino acid, glutamic acid is more preferred.

[0055]

As the alkyldimethylamine and its salt (iv), there are exemplified N,N-dimethylbehenylamine, N,N-dimethylstearylamine, and organic acid salts thereof. Of these, a lactic acid salt of N,N-dimethylbehenylamine, a glycolic acid salt of N,N-dimethylstearylamine, and so on are preferred.

As the alkoxyalkyldimethylamine and its salt (v), there are exemplified N,N-dimethyl-3-hexadecyloxypropylamine, N,N-dimethyl-3-octadecyloxypropylamine, and organic acid salts thereof. Of these, N,N-dimethyl-3-hexadecyloxypropylamine or its salt, N,N-dimethyl-3-octadecyloxypropylamine (stearoxypropyldimethylamine) or its salt, and N,N-dimethyl-3-octadecyloxypropylamine or its salt are preferred. [0056]

The alkyl group in the alkylamidoalkyldimethylamine and its salt (vi) is an alkyl group having preferably 11 or more and 21 or less carbon atoms, and more preferably 15 or more and 19 or less carbon atoms. Examples of the salt include a salt by an organic acid or an inorganic acid.

Specific examples of the alkylamidoalkyldimethylamine and its salt include N-[3-(dimethylamino)propyl]docosanamide, N-[3-(dimethylamino)propyl]stearamide, and organic acid salts thereof, and a lactic acid salt of N-[3-(dimethylamino)propyl]docosanamide and a glycolic acid salt of N-[3-(dimethylamino)propyl]stearamide are preferred. [0057]

One or two or more of the component (D) may be used.

Of those mentioned above, the component (D) is preferably at least one selected from the group consisting of an alkyltrimethylammonium salt, an alkoxyalkyltrimethylammonium salt, a dialkyldimethylammonium salt, an alkyldimethylamine and its salt, an alkoxyalkyldimethylamine and its salt, and an alkylamidoalkyldimethylamine and its salt, and more preferably at least one selected from the group consisting of an alkyltrimethylammonium salt and an alkoxyalkyldimethylamine and its salt. [0058]

In the case of using the component (D), from the viewpoint of lathering during washing and reduction in entanglement during hair rinsing in the hair detergent, the content or blending amount of the component (D) in the detergent is preferably 0.01% by mass or more, more preferably 0.05% by mass or more, still more preferably 0.1% by mass or more, and yet still more

preferably 0.5% by mass or more, and from the viewpoint of lathering during washing and reduction in entanglement during hair rinsing, easiness of brushing after towel drying, quick drying properties, and easiness of blending in the hair detergent, it is preferably 5% by mass or less, more preferably 4% by mass or less, still more preferably 3% by mass or less, and yet still more preferably 2% by mass or less.

A specific range of the content or blending amount of the component (D) in the detergent is preferably 0.01 to 5% by mass, more preferably 0.05 to 4% by mass, still more preferably 0.1 to 3% by mass, and yet still more preferably 0.5 to 2% by mass.

[0059]

In the case of using the component (D) in the detergent of the present invention, from the viewpoint of lathering during washing and reduction in entanglement during hair rinsing, easiness of brushing after towel drying, quick drying properties, and easiness of blending in the hair detergent, a mass ratio [(A)/(D)] of the component (A) to the component (D) is preferably 1 or more, more preferably 3 or more, still more preferably 4 or more, and yet still more preferably 5 or more, and it is preferably 100 or less, more preferably 50 or less, still more preferably 30 or less, and yet still more preferably 20 or less.

A specific range of the mass ratio [(A)/(D)] of the component (A) to the component (D) is preferably 1 to 100, more preferably 3 to 50, still more preferably 4 to 30, and yet still more preferably 5 to 20.

[0060]

<Anionic Surfactant>

The detergent of the present invention may further contain or be prepared by further blending an anionic surfactant. Examples of the anionic surfactant include alkylbenzenesulfonic acid salts, alkyl or alkenyl ether sulfuric acid salts, alkyl or alkenyl sulfuric acid salts, alkylsulfonic acid salts, saturated or unsaturated fatty acid salts, alkyl or alkenyl ether carboxylic acid salts, α -sulfo fatty acid salts, N-acylamino acids, phosphoric acid mono- or diesters, and sulfosuccinic acid esters. Of these, one or more thereof may be used.

Examples of a counter ion of the anionic group of the anionic surfactant include alkali metal ions, such as a sodium ion and a potassium ion; alkaline earth metal ions, such as a calcium ion and a magnesium ion; an ammonium

ion; and alkanol ammoniums having 1 to 3 alkanol groups having 2 or 3 carbon atoms (for example, monoethanolammonium, diethanolammonium, triethanolammonium, and triisopropanolammonium).

Above all, the anionic surfactant is preferably at least one selected from the group consisting of alkyl sulfuric acid salts, alkyl ether sulfuric acid salts, and alkyl ether carboxylic acid salts. Examples of the alkyl ether sulfuric acid salt include polyoxyethylene alkyl ether sulfuric acid salts, such as ammonium laureth sulfate; and examples of the alkyl ether carboxylic acid salts include polyoxyethylene alkyl ether acetic acid salts, such as sodium laureth acetate.

The anionic surfactant is more preferably at least one selected from the group consisting of alkyl ether sulfuric acid salts and alkyl ether carboxylic acid salts, and still more preferably at least one selected from the group consisting of polyoxyethylene alkyl ether sulfuric acid salts and polyoxyethylene alkyl ether acetic acid salts.

[0061]

The content or blending amount of the anionic surfactant in the detergent is preferably 5% by mass or less, more preferably 4% by mass or less, still more preferably 3% by mass or less, yet still more preferably 2% by mass or less, even yet still more preferably 1% by mass or less, even still more preferably 0.5% by mass or less, and even still more further preferably 0% by mass.

[0062]

<Aqueous Medium>

The detergent of the present invention is one typically containing or prepared by blending an aqueous medium. Examples of the aqueous medium include water; lower alcohols, such as ethanol and isopropanol; and low-molecular diols and triols having 6 or less carbon atoms, such as 1,3-butylene glycol, glycerin, ethylene glycol, and propylene glycol. Of these, water is preferred. Although the content or blending amount of the aqueous medium in the detergent may be appropriately selected according to the dosage form of the detergent, it is typically in a range of 5 to 99% by mass, and preferably in a range of 30 to 98% by mass.

[0063]

<Other Component>

The detergent of the present invention may appropriately contain or be

prepared by blending the other component within a range where the object of the present invention is not impaired. Examples of the foregoing other component include compounds that are typically blended in a hair detergent, such as an antioxidant, an oil agent, an anti-dandruff agent, a vitamin agent, a disinfectant, an anti-inflammatory agent, an antiseptic, a chelating agent, a moisturizer, a pearlescent agent, a ceramide, a fragrance, and a UV absorber.

[0064]

<pH>

From the viewpoint of lathering during washing, a pH of the detergent of the present invention is preferably 3.0 or higher, more preferably 3.2 or higher, and still more preferably 4.3 or higher in terms of a pH of a 5% aqueous dispersion, and from the viewpoint of inhibition of entanglement of hair or the like, it is preferably 7.0 or lower, more preferably 6.5 or lower, still more preferably 6.0 or lower, and yet still more preferably 5.6 or lower in terms of a pH of a 5% aqueous dispersion. A specific range of the pH of the 5% aqueous solution of the detergent of the present invention is preferably 3.0 to 7.0, more preferably 3.2 to 6.5, still more preferably 4.3 to 6.0, and yet still more preferably 4.3 to 5.6.

The aforementioned pH is a measured value at 25°C, and specifically, it may be measured by the method described in the section of Examples.

[0065]

A production method of the detergent of the present invention is not particularly limited. For examples, the detergent of the present invention may be produced by blending the components (A) and (B) and other components to be used, if desired by the method described in the section of Examples and mixing the contents by using a known agitation apparatus or the like.

[0066]

A use method of the detergent of the present invention is not particularly limited, too. The entanglement of hair or fibers during washing and after washing can be prevented through a step of washing a washing object, such as hair and fibers, by a known method by using the detergent of the present invention.

[0067]

Regarding the aforementioned embodiments, the present invention discloses a detergent and a method of preventing entanglement of hair or

fibers.

<1>

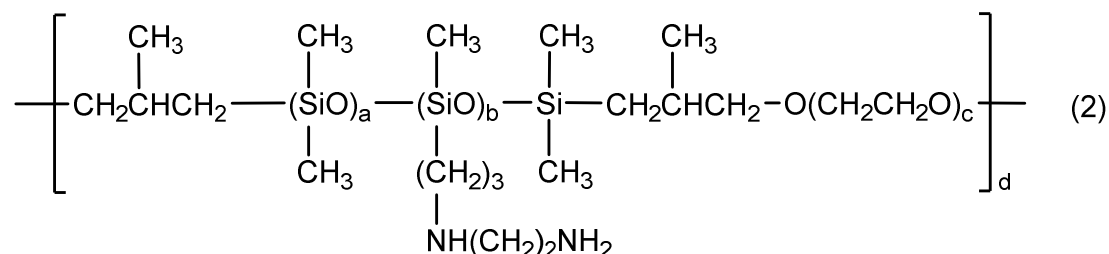
A detergent containing or prepared by blending:

(A) at least one selected from the group consisting of an alkyl sultaine, an alkyl hydroxysultaine, and a nonionic surfactant, and

(B) an aminopolyether-modified silicone satisfying the following formula (I) and containing a polyoxyalkylene structure having a repeating unit represented by the general formula (2):

$$0.5 \leq \text{Si/AO} \leq 1.2 \quad (\text{I})$$

[in the formula (I), Si represents a molar number of a silicon atom in the component (B), and AO represents an oxyalkylene average addition molar number in the component (B)], and



[in the formula (2), a represents a number of 2 or more and 100 or less; b represents a number of 1 or more and 50 or less; c represents a number of 10 or more and 18 or less; d represents a number of 1 or more and 100 or less; and the bonding order among the structural units within the bracket does not matter, and the bonding form may be a block form or a random form], wherein,

the content or blending amount of the component (A) is 1 to 30% by mass,

a kinematic viscosity at 25°C of the component (B) is 500 to 1,500 mm²/s, and

a mass ratio [(A)/(B)] of the component (A) to the component (B) is 2 to 1,000.

<2>

The detergent as set forth in <1>, wherein the Si/AO in the formula (I) is 0.7 or more and 0.9 or less.

<3>

The detergent as set forth in <1> or <2>, wherein the kinematic

viscosity at 25°C of the component (B) is 700 to 1,400 mm²/s.

<4>

The detergent as set forth in any one of <1> to <3>, wherein the content or blending amount of the component (A) is 5 to 18% by mass.

<5>

The detergent as set forth in any one of <1> to <4>, wherein the content or blending amount of the component (B) is 0.01 to 10% by mass.

<6>

The detergent as set forth in any one of <1> to <5>, wherein the mass ratio [(A)/(B)] of the component (A) to the component (B) is 10 to 1,000.

<7>

The detergent as set forth in any one of <1> to <6>, wherein the mass ratio [(A)/(B)] of the component (A) to the component (B) is 30 to 100.

<8>

The detergent as set forth in any one of <1> to <7>, which is a hair detergent.

<9>

A method for preventing entanglement of hair or fibers, the method including a step of washing hair or fibers by using the detergent as set forth in any one of <1> to <8>.

Examples

[0068]

The present invention is hereunder described by reference to Examples, but it should be construed that the present invention is not limited to the scope of the Examples. In the present Examples, various measurements and evaluations were performed by the following methods.

[0069]

(pH Measurement)

The pH at 25°C was measured using a pH meter (F-51, manufactured by Horiba, Ltd.). For the pH measurement of a hair detergent, an aqueous dispersion having a hair detergent diluted with purified water to 5% was used.

[0070]

(Measurement of Si/AO in Component (B) and Component (B1)')

10 mg of each of the component (B) and the component (B1)'

(aminopolyether-modified silicones 1 to 3) used in each of the Examples was weighed in a No. 3 screw vial and dried overnight in a nitrogen atmosphere. The obtained dried material was added with and dissolved in 1 mL of deuterated chloroform (manufactured by Wako Pure Chemical Industries, Ltd., Chloroform-d, 99.8%). Using ^1H -NMR (manufactured by Bruker Japan K.K., JH074504 AV400), a unit ratio of Si/AO was calculated from an integrated value of the dimethylsilyl group bonded to silicon (6H: δ -0.3 to 0.3 ppm) and an integrated value of the oxyethylene (EO) chain (4H: δ 3.3 to 3.9 ppm) according to the following equation.

$$(\text{Si/AO}) = [(\text{Integrated value at } -0.3 \text{ to } 0.3 \text{ ppm})/6]/[(\text{Integrated value at } 3.3 \text{ to } 3.9 \text{ ppm})/4]$$

[0071]

(Lathering Evaluation)

A hair bundle of untreated hairs of a Chinese person having a mass of 20 g and a length of 20 cm was damaged through a bleach treatment with the following hair bleach and then washed with the following plain shampoo, to obtain a hair bundle for lathering evaluation. This hair bundle for evaluation was thoroughly damped with warm water at 35 to 40°C and then coated with 1 g of a hair detergent of each of the Examples, followed by washing for 1 minute.

The lathering evaluation was performed by five panelists, and by scoring the lowest as "1" and the highest as "5", respectively, a 5-grade evaluation was performed while defining Comparative Example 1 as a standard score 2. An average grade (rounded off to the first decimal place) of the evaluation by the five panelists was tabulated. When the average grade by the five panelists is score 3 or above, it may be said that an explicitly excellent performance is revealed in that evaluation.

(Evaluation Criteria)

5: Lathering is very good.

4: Lathering is good.

3: Lathering is moderate.

2: Lathering is bad.

1: Lathering is very bad.

[0072]

(Composition of Plain Shampoo)

Component	(% by mass)	
Polyoxyethylene lauryl ether sulfuric acid Na	11.3	(*1)
Coconut fatty acid N-methylethanolamide (*2)	3.0	
Citric acid	0.2	
Methyl paraben	0.3	
Purified water	Balance	
total	100.0	

*1: 42.0% by mass as EMAL E-27C (manufactured by Kao Corporation, active ingredient: 27% by mass)

*2: AMION C-11S (manufactured by Kao Corporation)

[0073]

(Composition of Hair Bleach)

Component	(% by mass)	
Monoethanolamine	1.5	
28% by mass ammonia water	4.0	
Ammonium bicarbonate	1.0	
35% by mass hydrogen peroxide water	8.2	
Purified water	Balance	
total	100.0	

[0074]

(Bleach Treatment Method)

A hair bundle of untreated hairs of a Chinese person having a mass of 20 g was coated with 20 g of the hair bleach, allowed to stand for 30 minutes, and then thoroughly rinsed with warm water at 35 to 40°C. This operation was repeated four times, thereby preparing a bleach-treated hair bundle.

[0075]

(Measurement of Combing Load)

The aforementioned hair bundle for lathering evaluation was prepared, thoroughly damped with warm water at 35 to 40°C, and then coated with 1 g of a hair detergent of each of the Examples. The resulting hair bundle was lightly put between palms of both hands and washed for 1 minute while moving the hands so as to rub together. Thereafter, the hair bundle was rinsed with warm

water for 30 seconds without allowing the fingers to pass therethrough, thereby obtaining a hair bundle for measurement of combing load.

The aforementioned hair bundle was set on a combing force measuring apparatus (manufactured by Utsunomiyaseiki Co., Ltd., "KOT-0303"), a comb (one in which ten pins having a diameter of 2 mm were linearly arranged at intervals of 4 mm) was allowed to pass through the uppermost part of the hair bundle, and a load (gf) applied when passing the comb through the hair ends was measured. The load was calculated at 200 points of the hair bundle having a length of 20 cm, and a total value of the 200 points in total was designated as "combing load".

[0076]

(Easiness of Brushing after Towel Drying)

The aforementioned hair bundle for lathering evaluation was prepared, thoroughly damped with warm water at 35 to 40°C, and then coated with 1 g of a hair detergent of each of the Examples. The resulting hair bundle was lightly put between palms of both hands and washed for 1 minute while moving the hands so as to rub together. Thereafter, the hair bundle was rinsed with warm water for 30 seconds. The obtained hair bundle was placed on a towel, and the both surfaces of the hair bundle were covered by the towel and subjected to towel drying so as to rub together, thereby obtaining a hair bundle for brushing evaluation.

The aforementioned hair bundle was set on a combing force measuring apparatus (manufactured by Utsunomiyaseiki Co., Ltd., "KOT-0303"), the root of the hair bundle was put from both sides between two brushes, and an action of simultaneously stroking the brushes towards the hair end was repeated 10 times. A maximum load during one stroke was measured, and the number of strokes required until the load became not more than 400 gf was evaluated. It is meant that as the number of strokes shown in the table is small, after towel drying, the entanglement of hair is small, too, and the brushing is readily performed.

[0077]

(Evaluation of Quick Drying Properties)

The aforementioned hair bundle for brushing evaluation was prepared, dried by blowing hot air with a hair dryer (manufactured by Can Co., Ltd., "Sobis TYPE 315", air volume setting: High) at a distance of 5 to 15 cm from the

hair bundle while combing fingers, and a time until the wet hair returned to the weight in a dry state was measured. It is meant that as the drying time is short, the quick drying properties are high.

[0078]

Examples 1 to 20 and Comparative Examples 1 to 4 (Preparation and Evaluation of Hair Detergent)

A hair detergent of each of the Examples was prepared in the following way according to the blending shown in each table and evaluated.

With respect to Examples 1 to 7 and 11 to 17 and Comparative Examples 1 to 4, the components other than the component (B) were uniformly dissolved in an appropriate amount of water, to which was then added the component (B) (except for Comparative Example 4), and the contents were uniformly mixed.

With respect to Examples 8 to 10 and 18 to 20, the components other than the components (B), (B1)', and (C) were uniformly dissolved in an appropriate amount of water, to which were then added the component (B) and optionally the components (B1)' and (C), and the contents were uniformly mixed.

Using this hair detergent, the lathering evaluation and the measurement of combing load were carried out by the aforementioned methods.

In addition, with respect to Examples 5, 6, 8 to 10, 15, 16, and 18 to 20 and Comparative Examples 1, 3, and 4, the easiness of brushing after towel drying was evaluated by the aforementioned method, and with respect to Examples 2, 6, 8 to 10, 12, 16, and 18 to 20 and Comparative Examples 1 and 3, the evaluation of quick drying properties was carried out by the aforementioned method. The results are shown in Tables 1 to 4. The blending amounts shown in the tables are the active ingredient amount (% by mass) of each of the components.

[0079]

Table 1

			Example							Comparative Example	
			1	2	3	4	5	6	7	1	2
Blending (% by mass)	(A)	Lauryl hydroxysultaine	*1	1	5	10	10	10	10		
	(A)'	Lauramidopropyl betaine	*2							1	
		Sodium lauroamphoacetate	*3								1
	(B)	Aminopolyether-modified silicone 1 (Si/AO = 0.80)	*4	0.01	0.1	0.1	0.01	1	5	0.1	0.1
Others		Purified water									
Mass ration (A)/(B)			100	10	50	1000	100	10	2.0	-	-
Evaluation	Lathering		3	3	4	5	5	4	3	2	2
	Combing load (gf)		72469	44025	71100	84066	35414	10847	5097	108325	169086
	Easiness of brushing after towel drying (the number of strokes required until the maximum load per stroke became not more than 400 gf)		-	-	-	-	1	0	-	4	-
	Quick drying properties (drying time/sec)		-	121	-	-	-	101	-	161	-

*1: Manufactured by Kao Corporation, AMPHITOL 20HD (active ingredient: 30%)
 *2: Manufactured by Kao Corporation, AMPHITOL 20AB (active ingredient: 30%)
 *3: Manufactured by Kao Corporation, AMPHITOL 20YB (active ingredient: 40%)
 *4: Manufactured by Dow Corning Toray Co., Ltd., SILSTYLE 201

[0080]

Table 2

				Example		
				8	9	10
Blending (% by mass)	(A)	Lauryl hydroxysultaine	*1	10.0	8.0	9.0
		Alkyl glucoside (decyl glucoside)	*2	5.0		5.0
		Laureth-3	*3	1.0		1.0
		Laureth-16	*4		3.0	
		PPG-3 caprylyl ether	*5		1.0	
		Isodecyl glyceryl ether	*6	1.0		1.0
	(A)'	Lauramidopropyl betaine	*7		1.0	
		Sodium lauroamphoacetate	*8			1.0
	(B)	Aminopolyether-modified silicone 1 (Si/AO = 0.80)	*9	0.3	0.3	0.3
	(B1)'	Aminopolyether-modified silicone 2 (Si/AO = 2.46)	*10		0.3	
		Aminopolyether-modified silicone 3 (Si/AO = 2.39)	*11	0.3	0.1	0.3
	(C)	Dimethicone	*12		1.0	0.1
		Amodimethicone	*13		0.2	
	(D)	Stearoxypropyldimethylamine	*14	1.1		
		Cetrimonium chloride	*15		1.0	
	Others	Anionic surfactant (ammonium laureth sulfate)	*16	1.0	1.0	
		pH modifier		Amount at which the pH of the 5% aqueous dispersion becomes 5		
		Antiseptic		Moderate		
Purified water		Balance				
Mass ratio (A)/(B)				56.7	40.0	53.3
Mass ratio (A)/(A)'				-	12.0	16.0
Mass ratio (A)/(C)				-	10.0	160.0
Mass ratio (A)/(D)				15.5	12.0	-
Evaluation		Lathering		5	5	5
		Combing load (gf)		6728	24600	37073
		Easiness of brushing after towel drying (the number of strokes required until the maximum load per stroke became not more than 400 gf)		0	1	1
		Quick drying properties (drying time/sec)		94	109	119

*1: Manufactured by Kao Corporation, AMPHITOL 20HD (active ingredient: 30%)

*2: Manufactured by Kao Corporation, MYDOL 10 (active ingredient: 40%)

*3: Manufactured by Kao Corporation, EMULGEN 103

*4: Manufactured by Kao Corporation, EMULGEN 116

*5: Manufactured by Kao Corporation, KAO SOFCARE GP-1

*6: Manufactured by Kao Corporation, PENETOL GE-ID

*7: Manufactured by Kao Corporation, AMPHITOL 20AB (active ingredient: 30%)

*8: Manufactured by Kao Corporation, AMPHITOL 20YB (active ingredient: 40%)

*9: Manufactured by Dow Corning Toray Co., Ltd., SILSTYLE 201

*10: Manufactured by Dow Corning Toray Co., Ltd., SILSTYLE 104

*11: Manufactured by Dow Corning Toray Co., Ltd., SS-3588

*12: Manufactured by Dow Corning Toray Co., Ltd., BY22-029 (active ingredient: 50%)

*13: Manufactured by Momentive Performance Materials Inc., KT-0032 (active ingredient: 40%)

*14: Manufactured by Kao Corporation, FARMIN DM E-80

*15: Manufactured by Kao Corporation, QUARTAMIN 60W

*16: Manufactured by Kao Corporation, EMAL 170S-A (active ingredient: 70%)

[0081]

Table 3

			Example									Comparative Example	
			11	12	13	14	15	16	17	3	4		
Blending (% by mass)	(A)	Alkyl glucoside (decyl glucoside)	*1	1	5	10	10	10	10		1		
	(B)	Aminopolyether-modified silicone 1 (Si/AO = 0.80)	*2	0.1	0.1	0.01	0.1	1	5	0.1			
	Others	Purified water											
Mass ration (A)/(B)			100	10	50	1000	100	10	2.0	0	-		
Evaluation	Lathering		3	3	4	5	5	5	4	1	3		
	Combing load (gf)		62958	29788	40228	47481	38712	8956	10347	109474	192697		
	Easiness of brushing after towel drying (the number of strokes required until the maximum load per stroke became not more than 400 gf)		-	-	-	-	1	0	-	4	9		
	Quick drying properties (drying time/sec)		-	104	-	-	-	115	-	138	-		

*1: Manufactured by Kao Corporation, MYDOL 10 (active ingredient: 30%)
*2: Manufactured by Dow Corning Toray Co., Ltd., SILSTYLE 201

[0082]

Table 4

				Example		
				18	19	20
Blending (% by mass)	(A)	Lauryl hydroxysultaine	*1	4.0	3.0	2.0
		Alkyl glucoside (decyl glucoside)	*2	9.0		6.0
		Laureth-3	*3	1.0		1.0
		Laureth-16	*4		9.0	6.0
		PPG-3 caprylyl ether	*5		1.0	
		Isodecyl glyceryl ether	*6	1.0		1.0
	(A)'	Lauramidopropyl betaine	*7		1.0	
		Sodium lauroamphoacetate	*8			1.0
	(B)	Aminopolyether-modified silicone 1 (Si/AO = 0.80)	*9	0.3	0.3	0.3
	(B1)'	Aminopolyether-modified silicone 2 (Si/AO = 2.46)	*10		0.3	
		Aminopolyether-modified silicone 3 (Si/AO = 2.39)	*11	0.3	0.1	0.3
	(C)	Dimethicone	*12		1.0	0.1
		Amodimethicone	*13		0.2	
	(D)	Stearoxypropyldimethylamine	*14	1.1		
		Cetrimonium chloride	*15		1.0	
	Others	Anionic surfactant (ammonium laureth sulfate)	*16	1.0	1.0	
		pH modifier		Amount at which the pH of the 5% aqueous dispersion becomes 5		
		Antiseptic		Moderate		
Purified water		Balance				
Mass ratio (A)/(B)				50.0	43.3	53.3
Mass ratio (A)/(A)'				-	13.0	16.0
Mass ratio (A)/(C)				-	10.8	160.0
Mass ratio (A)/(D)				13.6	13.0	-
Evaluation		Lathering		5	5	5
		Combing load (gf)		6680	15225	12285
		Easiness of brushing after towel drying (the number of strokes required until the maximum load per stroke became not more than 400 gf)		1	0	0
		Quick drying properties (drying time/sec)		107	98	109

*1: Manufactured by Kao Corporation, AMPHITOL 20HD (active ingredient: 30%)

*2: Manufactured by Kao Corporation, MYDOL 10 (active ingredient: 40%)

*3: Manufactured by Kao Corporation, EMULGEN 103

*4: Manufactured by Kao Corporation, EMULGEN 116

*5: Manufactured by Kao Corporation, KAO SOFCARE GP-1

*6: Manufactured by Kao Corporation, PENETOL GE-ID

*7: Manufactured by Kao Corporation, AMPHITOL 20AB (active ingredient: 30%)

*8: Manufactured by Kao Corporation, AMPHITOL 20YB (active ingredient: 40%)

*9: Manufactured by Dow Corning Toray Co., Ltd., SILSTYLE 201

*10: Manufactured by Dow Corning Toray Co., Ltd., SILSTYLE 104

*11: Manufactured by Dow Corning Toray Co., Ltd., SS-3588

*12: Manufactured by Dow Corning Toray Co., Ltd., BY22-029 (active ingredient: 50%)

*13: Manufactured by Momentive Performance Materials Inc., KT-0032 (active ingredient: 40%)

*14: Manufactured by Kao Corporation, FARMIN DM E-80

*15: Manufactured by Kao Corporation, QUARTAMIN 60W

*16: Manufactured by Kao Corporation, EMAL 170S-A (active ingredient: 70%)

Industrial Applicability

[0083]

In accordance with the detergent of the present invention, lathering during washing is favorable, and the generation of entanglement of a washing object, such as hair and fibers, even during washing and after washing can be substantially inhibited and solved without performing an operation of putting fingers through hair or the like. For example, in the case where the detergent of the present invention is a hair detergent, the entanglement in hair after washing and towel drying is hardly generated, and therefore, the hair can be dried for a short time, and finish after drying becomes favorable.

CLAIMS

1. A detergent comprising:

(A) at least one selected from the group consisting of an alkyl sultaine, an alkyl hydroxysultaine, and a nonionic surfactant, and

(B) an aminopolyether-modified silicone containing a polyoxyalkylene structure and satisfying the following formula (I):

$$0.01 \leq \text{Si}/\text{AO} \leq 1.6 \quad (\text{I})$$

wherein Si represents a molar number of a silicon atom in the component (B), and AO represents an oxyalkylene average addition molar number in the component (B),

wherein a mass ratio [(A)/(B)] of the component (A) to the component (B) is 0.1 or more and 1,000 or less.

2. A detergent, which is prepared by blending:

(A) at least one selected from the group consisting of an alkyl sultaine, an alkyl hydroxysultaine, and a nonionic surfactant, and

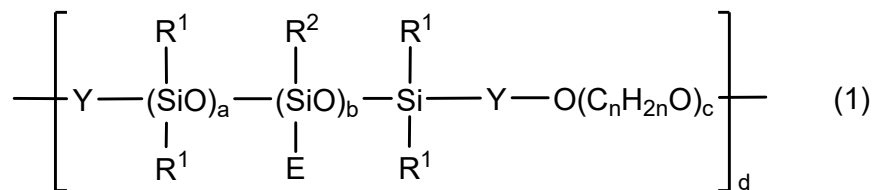
(B) an aminopolyether-modified silicone containing a polyoxyalkylene structure and satisfying the following formula (I):

$$0.01 \leq \text{Si}/\text{AO} \leq 1.6 \quad (\text{I})$$

wherein Si represents a molar number of a silicon atom in the component (B), and AO represents an oxyalkylene average addition molar number in the component (B),

wherein a mass ratio [(A)/(B)] of the component (A) to the component (B) is 0.1 or more and 1,000 or less.

3. The detergent according to claim 1 or 2, wherein the component (B) has a repeating unit represented by the following general formula (1):



wherein R¹ represents a hydrogen atom or a monovalent hydrocarbon group having 1 or more and 6 or less carbon atoms; R² represents either R¹ or E; E represents a monovalent group represented by -R³-Z, wherein R³ represents a

single bond or a divalent hydrocarbon group having 1 or more and 20 or less carbon atoms, and Z represents a primary to tertiary amino group-containing group; Y represents an alkylene group having 1 or more and 6 or less carbon atoms; a represents a number of 2 or more; b represents a number of 1 or more; c represents a number of 4 or more and 100 or less; and d represents a number of 1 or more; n represents a number of 2 or more and 10 or less; the bonding order among the structural units within the bracket does not matter, and the bonding form may be a block form or a random form; the $(C_nH_{2n}O)$'s in the number of c may be the same as or different from each other; and plural R¹'s, R²'s, and E's may be the same as or different from each other, respectively.

4. The detergent according to any one of claims 1 to 3, wherein the nonionic surfactant in the component (A) is at least one selected from the group consisting of a polyoxyalkylene alkyl ether, a polyoxyalkylene alkenyl ether, a polyoxyalkylene sorbitan fatty acid ester, a polyoxyalkylene fatty acid ester, an alkyl glucoside, and an alkyl glyceryl ether.

5. The detergent according to any one of claims 1 to 4, which further comprises or is prepared by further blending, as a component (A)', an ampholytic surfactant other than the alkyl sultaine and the alkyl hydroxysultaine.

6. The detergent according to any one of claims 1 to 5, which further comprises or is prepared by further blending, as a component (B)', an aminopolyether-modified silicone other than the component (B).

7. The detergent according to any one of claims 1 to 6, which further comprises or is prepared by further blending, as a component (C), a silicone other than the component (B) and the component (B)'.

8. The detergent according to any one of claims 1 to 7, which further comprises or is prepared by further blending, as a component (D), a cationic surfactant.

9. The detergent according to any one of claims 1 to 8, wherein the

content or blending amount of the component (A) is 1% by mass or more and 30% by mass or less.

10. The detergent according to any one of claims 1 to 9, wherein the content or blending amount of the anionic surfactant is 5% by mass or less.

11. The detergent according to any one of claims 1 to 10, which is a hair detergent.