

## DESCRIPTION

Title of the Invention: DETERGENT COMPOSITION FOR TEXTILE PRODUCTS

### Technical Field

[0001]

The present invention relates to a detergent composition for textile products.

### Background Art

[0002]

As a detergent composition for washing textile products such as clothes, for example, PTL 1 discloses that when a salt of an organic phosphate ester anion and an organic amine derivative cation and a nonionic surfactant are blended, the detergency on mud stains improves. However, with the detergent described in PTL 1, it is difficult to remove blood stains adhering to a textile product.

[0003]

In addition, generally, blood stains can be removed by using a high-pH detergent. However, high-pH detergents cause damage to textile products.

### Citation List

#### Patent Literature

[0004]

PTL 1: JP-A-2000-008078

Summary of Invention

Technical Problem

[0005]

An object of an embodiment of the invention is to provide a detergent composition for textile products, which is capable of improving the detergency on blood stains while suppressing damage to textile products.

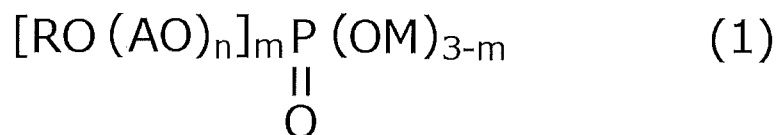
Solution to Problem

[0006]

A detergent composition for textile products according to an embodiment of the invention is a detergent composition including a phosphate ester (A) represented by the following general formula (1) and an alkali metal carbonate (B), and having a pH of 9.5 to 11.5 as measured in the form of an aqueous solution having a concentration of 1 mass%.

[0007]

[Chemical Formula 1]



In formula (1), R represents an aliphatic hydrocarbon group having 8 to 18 carbon atoms or a styrenated phenyl group, AO represents an oxyalkylene group having 2 to 4 carbon atoms, n represents an average addition mole number

and is a number of 0 to 10, M represents a hydrogen atom, an alkali metal, ammonium, or an organic ammonium, and m represents 1 or 2, the phosphate ester (A) being a monoester where m = 1, a diester where m = 2, or a mixture of the monoester and the diester.

#### Advantageous Effects of Invention

[0008]

According to the embodiment of the invention, it is possible to improve the detergency on blood stains while suppressing damage to textile products such as clothes.

#### Description of Embodiments

[0009]

Hereinafter, an embodiment of the invention will be described in detail.

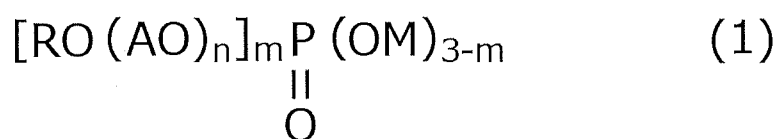
[0010]

[Phosphate Ester (A)]

The phosphate ester (A) used in this embodiment (hereinafter also referred to as "component (A)") is an anionic surfactant and represented by the following general formula (1).

[0011]

[Chemical Formula 2]



In formula (1), R represents an aliphatic hydrocarbon group having 8 to 18 carbon atoms or a styrenated phenyl group. When a plurality of Rs are contained in one molecule, they may be the same or different from each other. In addition, also as the whole component (A), all Rs may be the same, or the component may also be a mixture of compounds having different Rs.

[0012]

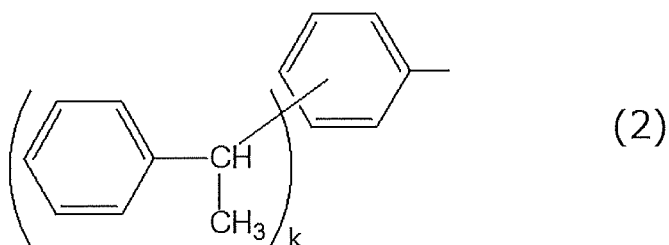
The aliphatic hydrocarbon group of R may be linear or branched. It is preferable that the aliphatic hydrocarbon group has 8 to 15 carbon atoms. The aliphatic hydrocarbon group may be saturated or unsaturated, and is preferably an alkyl group or an alkenyl group, and more preferably an alkyl group. As specific examples of the aliphatic hydrocarbon group, linear alkyl groups such as an n-octyl group, an n-nonyl group, an n-decyl group, an n-undecyl group, an n-dodecyl group, an n-tridecyl group, an n-tetradecyl group, an n-pentadecyl group, an n-hexadecyl group, an n-heptadecyl group, and an n-octadecyl group, branched alkyl groups such as a 2-ethylhexyl group, an isodecyl group, a 2-hexyldecyl group, and an isostearyl group, alkenyl groups such as an oleyl group, and the like can be mentioned.

[0013]

The styrenated phenyl group of R is represented by the

following general formula (2). In the formula, k represents the number of substituents (i.e., the number of styrene residues) and is 1 to 3 as the average (value rounded to the nearest whole number). The component (A) may also be a mixture of compounds having different k values. It is preferable that the substituent is in the ortho position and/or the para position.

[Chemical Formula 3]



[0014]

R is preferably a linear or branched alkyl group having 8 to 18 carbon atoms or a styrenated phenyl group, and more preferably a linear or branched alkyl group having 8 to 15 carbon atoms or a styrenated phenyl group.

[0015]

AO in formula (1) represents an oxyalkylene group having 2 to 4 carbon atoms. That is, A represents an alkylene group having 2 to 4 carbon atoms (i.e., alkanediyl group), and may be linear or branched. As the oxyalkylene group represented by AO, an oxyethylene group, an oxypropylene group, an oxybutylene group, and the like can be mentioned. The (AO)<sub>n</sub> moiety in formula (1) is an addition

polymer using one or more kinds of alkylene oxides having 2 to 4 carbon atoms, such as ethylene oxide, propylene oxide, butylene oxide, and tetrahydrofuran (1,4-butylene oxide). The addition form of the oxyalkylene group is not particularly limited, and may be a single adduct using one kind of alkylene oxide, a random adduct or block adduct using two or more kinds of alkylene oxides, or a combination of such random addition and block addition.

[0016]

As the oxyalkylene group, an oxyethylene group is particularly preferable. In the case where two or more kinds of oxyalkylene groups are selected, it is preferable that one of them is an oxyethylene group. The  $(AO)_n$  chain moiety is preferably a (poly)oxyalkylene chain containing 50 to 100 mol% of, more preferably 70 to 100 mol% of, an oxyethylene group, and is still more preferably composed only of an oxyethylene group, that is,  $(CH_2CH_2O)_n$ .

[0017]

$n$  represents the average addition mole number (value rounded to the nearest whole number) of oxyalkylene groups, and is a number of 0 to 10, preferably a number of 1 to 9, and more preferably a number of 2 to 8.

[0018]

$M$  in formula (1) represents a hydrogen atom, an alkali metal, ammonium, or an organic ammonium. When a plurality

of Ms are contained in one molecule, they may be the same or different from each other. In addition, also as the whole component (A), all Ms may be the same, or the component may also be a mixture of compounds having different Ms. As the alkali metal, for example, sodium, potassium, and the like can be mentioned. As the organic ammonium, for example, alkylammoniums such as monomethylammonium and dipropylammonium, alkanolammoniums such as monoethanolammonium, diethanolammonium, and triethanolammonium, and the like can be mentioned. M is preferably a hydrogen atom or an alkali metal, and more preferably a hydrogen atom, sodium, or potassium.

[0019]

m in formula (1) represents 1 or 2. The case where m = 1 is a monoester, while the case where m = 2 is a diester. The component (A) may be a monoester:  $\text{RO}(\text{AO})_n\text{P}(=\text{O})(\text{OM})_2$ , a diester:  $[\text{RO}(\text{AO})_n]_2\text{P}(=\text{O})(\text{OM})$ , or a mixture of the monoester and the diester. The component is usually obtained as a mixture of a monoester and a diester, and the molar ratio between the two is not particularly limited. For example, a molar ratio of the monoester/diester may be 20/80 to 90/10, or may also be 50/50 to 80/20.

[0020]

In one embodiment, in formula (1), R represents a linear or branched alkyl group having 8 to 18 carbon atoms

or a styrenated phenyl group,  $(AO)_n$  represents  $(CH_2CH_2O)_n$ , the average addition mole number  $n$  is a number of 0 to 10,  $M$  represents a hydrogen atom, sodium, or potassium, and  $m$  represents 1 or 2, the component (A) being a monoester, a diester, or a mixture of the two.

[0021]

[Alkali Metal Carbonate (B)]

As the alkali metal carbonate (B) used in this embodiment (hereinafter also referred to as "component (B)"), for example, sodium carbonate and potassium carbonate can be mentioned. They may be used alone or in combination.

[0022]

[Polyoxyalkylene Alkyl Ether Sulfate Ester and Salt Thereof (C)]

At least one of a polyoxyalkylene alkyl ether sulfate ester or a salt thereof (C) used in this embodiment (hereinafter also referred to as "component (C)") is a sulfate ester type anionic surfactant.

[0023]

With respect to the component (C), the number of carbon atoms in the alkyl group as a hydrophobic group is not particularly limited, but is preferably 8 to 18, more preferably 8 to 15, and may also be 10 to 14. The component may also be a mixture of two or more kinds of alkyl groups having different numbers of carbon atoms.

[0024]

With respect to the polyoxyalkylene chain of the component (C), the oxyalkylene group may be a group having 2 to 4 carbon atoms, that is, an oxyethylene group, an oxypropylene group, an oxybutylene group, or the like, and is preferably an oxyethylene group. The addition form of the oxyalkylene group is not particularly limited, and may be a single adduct, or may also be a random adduct or block adduct of two or more kinds. The average addition mole number (value rounded to the nearest whole number) of oxyalkylene groups may be 1 to 30, 1 to 20, or 2 to 10. In addition, the polyoxyalkylene chain preferably contains 50 to 100 mol% of, more preferably 70 to 100 mol% of, an oxyethylene group, and is still more preferably composed only of an oxyethylene group.

[0025]

The salt as an anionic hydrophilic group in the component (C) may be an alkali metal salt, an ammonium salt, an alkanolamine salt (e.g., ethanolamine salt), or the like, and is preferably an alkali metal salt, such as a sodium salt or a potassium salt, or an ammonium salt.

[0026]

[Detergent Composition for Textile Products]

The detergent composition for textile products according to this embodiment contains the phosphate ester

(A) and alkali metal carbonate (B) described above, and has a pH within a range of 9.5 to 11.5 in the form of an aqueous solution having a concentration of 1 mass%. As a result, it is possible to improve the detergency on blood stains while suppressing damage to textile products such as clothes. Specifically, in a composition containing the component (A) and the component (B), when, further, the above pH is 9.5 or more, the detergency on blood stains can be improved, while when the pH is 11.5 or less, damage to textile products can be suppressed.

[0027]

As the pH in the form of an aqueous solution having a concentration of 1 mass%, the detergent composition for textile products is dissolved in water or diluted with water to prepare an aqueous solution having a solids concentration (nonvolatile concentration) of 1 mass%, and the pH of such an aqueous solution is measured at 25°C (measured by Glass Electrode Method in accordance with JIS Z 8802). The pH in the form of an aqueous solution having a concentration of 1 mass% is preferably 9.8 to 11.2, and more preferably 10.0 to 11.0.

[0028]

It is preferable that the detergent composition for textile products according to this embodiment is a liquid detergent composition containing water together with the

component (A) and the component (B). In the liquid detergent composition, the component (A) is at least partially neutralized by the component (B). Therefore, even when the component (A) is an acid type, that is, Ms in formula (1) are all hydrogen atoms, they are at least partially neutralized into alkali metals. The solids concentration of the liquid detergent composition is not particularly limited, and may be, for example, 10 to 50 mass%, or may also be 20 to 40 mass%.

[0029]

The proportions of the component (A) and the component (B) are preferably such that the blending ratio (A)/(B) is 0.3 to 2.0. That is, it is preferable that the detergent composition for textile products has the phosphate ester (A) and the alkali metal carbonate (B) blended, that is, mixed, in a mass ratio (A)/(B) of 0.3 to 2.0. As a result of blending a large amount of component (B) in this manner, the detergency on blood stains can be improved. The blending ratio (A)/(B) is preferably 0.5 to 1.5, and more preferably 0.6 to 1.2.

[0030]

The amount of component (A) blended in the detergent composition for textile products is not particularly limited, and may be, for example, based on 100 mass% of the solids content (nonvolatile content), 5 to 65 mass%, 10 to 50 mass%,

or 15 to 40 mass%.

[0031]

It is preferable that the detergent composition for textile products according to this embodiment contains, together with the component (A) and the component (B), at least one of a polyoxyethylene alkyl ether sulfate ester or a salt thereof (C). As a result of blending the component (C) together with the component (A) and the component (B), the detergency on sebum stains can be improved.

[0032]

The amount of component (C) blended is not particularly limited, but is preferably such that when the component (C) is blended together with the component (A) and the component (B), the blending ratio (C)/(B) of the component (C) to the component (B) is 0.5 to 4.0. That is, it is preferable that the component (C) and the component (B) are blended in a mass ratio (C)/(B) of 0.5 to 4.0. The blending ratio (C)/(B) is more preferably 1.5 to 3.5.

[0033]

In the detergent composition for textile products according to this embodiment, without impairing its effects, other components can be blended in addition to the component (A), the component (B), the component (C), and water. As other components, for example, anionic surfactants other than the above component (A) and component (C), nonionic

surfactants, cationic surfactants, amphoteric surfactants, chelating agents, pH regulators (sodium hydroxide, potassium hydroxide, sulfuric acid, hydrochloric acid, etc.), bleaches, softeners, fluorescent agents, enzymes, preservatives, fragrances, colorants, defoamers, and hydrophilic solvents (monohydric alcohol, dihydric alcohol, etc.) can be mentioned.

[0034]

As specific examples of nonionic surfactants, polyoxyalkylene alkyl ethers, polyoxyalkylene alkyl phenyl ethers, polyoxyalkylene fatty acid esters, polyoxyalkylene sorbitan fatty acid esters, sucrose fatty acid esters, fatty acid alkanolamides, and the like can be mentioned. Here, polyoxyethylene is preferable as a polyoxyalkylene.

[0035]

The detergent composition for textile products according to this embodiment can be used as a detergent for washing textile products such as clothes. The washing method is not particularly limited. For example, it is possible that using a washing machine such as a drum type washing machine or a pulsator type washing machine, the detergent composition for textile products described above is introduced into water such as tap water, and textile products are stirred therewith and thus washed. In addition, it is also possible that textile products are soak-washed

or rub-washed in a washing solution formed of the detergent composition for textile products dissolved in or diluted with water, and thus washed. In addition, it is also possible that the detergent composition for textile products is directly applied to soiled parts of textile products, followed by washing in water.

[0036]

The amount of detergent composition for textile products used is not particularly limited and may be, as the solids concentration in a washing solution obtained by mixing the detergent composition for textile products with water, 0.01 to 2 mass%, or may also be 0.1 to 1 mass%. The bath ratio (volume (L) of the washing solution used to wash 1 kg of an object to be washed) is not particularly limited either, and may be, for example, 1:3 to 1:40, or may also be 1:5 to 1:30.

[0037]

As textile products, for example, cloths such as woven fabrics, knitted fabrics, and non-woven fabrics using organic fibers such as synthetic fibers such as polyester fibers, polyamide fibers, and acrylic fibers, natural fibers such as cotton, linen, and silk, cellulose fibers such as rayon, and acetate, and the like, as well as clothes and other fabric products obtained using them (e.g., towels, sheets), can be mentioned.

## Examples

[0038]

Hereinafter, the invention will be described in further detail with reference to examples, but is not limited thereto.

[0039]

Using the following components (A), components (B), components (B'), components (C), nonionic surfactant, chelating agent, and water, the components were mixed according to the formulation (part by mass) shown in Table 1 to prepare detergent compositions.

[0040]

Component (A):

· A-1: Polyoxyethylene octyl ether phosphate ester

A 55:45 (molar ratio) mixture of, in formula (1), a monoester ( $m = 1$ ) and a diester ( $m = 2$ ), where R = 2-ethylhexyl group, AO = oxyethylene group,  $n = 3$ , and M = hydrogen atom, obtained by a reaction of 0.17 mol of tetraphosphorus decaoxide fed to polyoxyethylene octyl ether obtained by adding 3 mol of ethylene oxide to 1 mol of C8 alcohol (trade name: octanol, manufactured by KH Neochem Co., Ltd.).

[0041]

· A-2: Polyoxyethylene lauryl ether phosphate ester

A 58:42 (molar ratio) mixture of, in formula (1), a

monoester ( $m = 1$ ) and a diester ( $m = 2$ ), where R = n-dodecyl group, AO = oxyethylene group,  $n = 4$ , and M = hydrogen atom, obtained by the same operation as in A-1 except that 4 mol of ethylene oxide was added to 1 mol of C12 alcohol (trade name: KALCOL 2098, manufactured by Kao Corporation).

[0042]

· A-3: Polyoxyethylene tridecyl ether phosphate ester

A 60:40 (molar ratio) mixture of, in formula (1), a monoester ( $m = 1$ ) and a diester ( $m = 2$ ), where R = tridecyl group, AO = oxyethylene group,  $n = 6$ , and M = hydrogen atom, obtained by the same operation as in A-1 except that 6 mol of ethylene oxide was added to 1 mol of C13 alcohol (trade name: Tridecanol, manufactured by KH Neochem Co., Ltd.).

[0043]

· A-4: Polyoxyethylene styrenated phenyl ether phosphate ester

A 75:25 (molar ratio) mixture of, in formula (1), a monoester ( $m = 1$ ) and a diester ( $m = 2$ ), where R = styrenated phenyl group ( $k = 2$ ) represented by formula (2), AO = oxyethylene group,  $n = 8$ , and M = hydrogen atom, obtained by the same operation as in A-1 except that 8 mol of ethylene oxide was added to 1 mol of styrenated phenol (trade name: Distyrenated phenol, manufactured by Yokkaichi Chemical Co., Ltd.).

[0044]

Component (B):

- B-1: Sodium carbonate
- B-2: Potassium carbonate

[0045]

Component (B'):

- B'-1: Sodium hydroxide
- B'-2: Sodium silicate

[0046]

Component (C):

- C-1: Sodium polyoxyethylene lauryl ether sulfate

Obtained by allowing 1 mol of chlorosulfonic acid to react with polyoxyethylene lauryl ether obtained by adding 2 mol of ethylene oxide to 1 mol of C12 alcohol (trade name: KALCOL 2098, manufactured by Kao Corporation), followed by neutralization with an aqueous sodium hydroxide solution. Average addition mole number of oxyethylene groups = 2.

[0047]

- C-2: Ammonium polyoxyethylene lauryl ether sulfate

Obtained by allowing 1 mol of sulfamic acid to react with polyoxyethylene lauryl ether obtained by adding 6 mol of ethylene oxide to 1 mol of C12 alcohol (trade name: KALCOL 2098, manufactured by Kao Corporation). Average addition mole number of oxyethylene groups = 6.

[0048]

- C-3: Sodium polyoxyethylene tridecyl ether sulfate

Obtained by allowing 1 mol of chlorosulfonic acid to react with polyoxyethylene tridecyl ether obtained by adding 3 mol of ethylene oxide to 1 mol of C13 alcohol (trade name: Tridecanol, manufactured by KH Neochem Co., Ltd.), followed by neutralization with an aqueous sodium hydroxide solution. Average addition mole number of oxyethylene groups = 3.

[0049]

· Nonionic surfactant: Polyoxyalkylene decyl ether, "NOIGEN XL-80" manufactured by DKS Co., Ltd.

· Chelating agent: Tetrasodium ethylenediamine tetraacetate

[0050]

Each of the obtained detergent compositions was diluted with water to prepare an aqueous solution having a solids concentration of 1 mass%, and the pH of the aqueous solution at 25°C was measured using a pH meter ("pH METER F-71" manufactured by HORIBA, Ltd.). In addition, with respect to each detergent composition, the blood stain detergency, fabric damage after washing, sebum stain detergency, and red wine stain detergency were evaluated by the following evaluation methods.

[0051]

· Blood stain detergency:

A standard artificially soiled fabric (EMPA111, manufactured by Swisstatest) was cut into 6 cm × 6 cm to give an object to be washed, and subjected to a washing test.

The soiled fabric was immersed in 1 L of a washing solution obtained by diluting each detergent composition with water to 2 mass% (50-fold dilution), and stirred for 10 minutes. Subsequently, the soiled fabric was taken out, rinsed with 1 L of tap water for 10 seconds, rinsed again with 1 L of tap water for 10 seconds, and dried at room temperature. After drying, the reflection Y-value was measured with a colorimeter and evaluated according to the following criteria.

#### Evaluation criteria

A: Y-value is 70 or more

B: Y-value is 65 or more and less than 70

F: Y-value is less than 65

[0052]

· Fabric damage after washing:

Each fabric surface after washing in the evaluation of blood stain detergency was visually checked to see whether the surface was roughened, and evaluated according to the following criteria.

#### Evaluation criteria

A: No noticeable roughening is observed

F: Roughening can be seen on the fabric surface

[0053]

· Sebum stain detergency:

The Y-value was measured in the same manner as for

blood stain detergency except that the standard artificially soiled fabric was changed to WFK10D (manufactured by WFK), and evaluated according to the following criteria.

Evaluation criteria

A: Y-value is 55 or more

B: Y-value is 50 or more and less than 55

F: Y-value is less than 50

[0054]

· Red wine stain detergency:

The Y-value was measured in the same manner as for blood stain detergency except that the standard artificially soiled fabric was changed to WFK10LI (manufactured by WFK), and evaluated according to the following criteria.

Evaluation criteria

A: Y-value is 65 or more

B: Y-value is 60 or more and less than 65

F: Y-value is less than 60

[0055]

[Table 1]

|                             | Examples |      |      |      |      |      |      |      |      |      |      |      |      |      |      | Comparative Examples |      |      |      |      |      |      |
|-----------------------------|----------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|----------------------|------|------|------|------|------|------|
|                             | 1        | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10   | 11   | 12   | 13   | 14   | 15   | 1                    | 2    | 3    | 4    | 5    | 6    | 7    |
| Formulation (part by mass)  |          |      |      |      |      |      |      |      |      |      |      |      |      |      |      |                      |      |      |      |      |      |      |
| A-1                         | 5        | -    | -    | -    | 5    | 5    | 5    | 5    | -    | 7.5  | 17   | 5    | 10   | -    | 20   | 5                    | 5    | 5    | 5    | 5    | 20   | 5    |
| A-2                         | -        | 5    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | 5    | -    | -                    | -    | -    | -    | -    | -    | -    |
| A-3                         | -        | -    | 5    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -                    | -    | -    | -    | -    | -    | -    |
| A-4                         | -        | -    | -    | 5    | -    | -    | -    | -    | 5    | -    | -    | -    | -    | -    | -    | -                    | -    | -    | -    | -    | -    | -    |
| C-1                         | 15       | 15   | 15   | 15   | -    | -    | -    | -    | -    | -    | -    | -    | -    | 15   | -    | 15                   | 15   | 15   | 15   | 15   | -    | 15   |
| C-2                         | -        | -    | -    | -    | 15   | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -                    | -    | -    | -    | -    | -    | -    |
| C-3                         | -        | -    | -    | -    | -    | 15   | 15   | 15   | 15   | 15   | 15   | 10   | 10   | -    | -    | -                    | -    | -    | -    | -    | -    | -    |
| Nonionic surfactant         | -        | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | 5    | -    | -    | -    | -                    | -    | -    | -    | -    | -    | -    |
| B-1                         | 5        | -    | 5    | 5    | 5    | 5    | 10   | 15   | 15   | 5    | 17   | 5    | 10   | 5    | 20   | -                    | -    | -    | -    | 2    | -    | 5    |
| B-2                         | -        | 5    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -                    | -    | -    | -    | -    | -    | -    |
| B'-1                        | -        | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | 5                    | -    | 0.7  | -    | -    | 20   | 1.2  |
| B'-2                        | -        | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -    | -                    | 5    | -    | 2    | -    | -    | -    |
| Chelating agent             | -        | -    | 0.5  | 0.5  | 0.5  | 0.5  | 0.5  | 0.5  | 0.5  | 0.5  | 0.5  | 0.5  | 0.5  | 0.5  | 0.5  | 0.5                  | 0.5  | 0.5  | 0.5  | 0.5  | 0.5  | 0.5  |
| Water                       | 75       | 75   | 74.5 | 74.5 | 74.5 | 74.5 | 69.5 | 64.5 | 64.5 | 72   | 50.5 | 74.5 | 69.5 | 74.5 | 59.5 | 74.5                 | 74.5 | 78.8 | 77.5 | 77.5 | 59.5 | 73.3 |
| Total                       | 100      | 100  | 100  | 100  | 100  | 100  | 100  | 100  | 100  | 100  | 100  | 100  | 100  | 100  | 100  | 100                  | 100  | 100  | 100  | 100  | 100  | 100  |
| Blending ratio (A)/(B)      | 1        | 1    | 1    | 1    | 1    | 1    | 0.5  | 0.3  | 0.3  | 1.5  | 1    | 1    | 1    | 1    | 1    | 1                    | 1    | 7.1  | 2.5  | 2.5  | 1    | 1    |
| Blending ratio (C)/(B)      | 3        | 3    | 3    | 3    | 3    | 3    | 1.5  | 1    | 1    | 3    | 0.9  | 2    | 1    | 3    | 0    | 3                    | 3    | 21.4 | 7.5  | 7.5  | 0    | 3    |
| pH (1% aqueous solution)    | 10.4     | 10.5 | 10.5 | 10.6 | 10.4 | 10.4 | 10.7 | 11.0 | 11.4 | 10.1 | 10.2 | 10.4 | 10.5 | 10.5 | 10.2 | 12.5                 | 11.7 | 10.3 | 10.4 | 9.2  | 12.8 | 11.7 |
| Evaluation                  |          |      |      |      |      |      |      |      |      |      |      |      |      |      |      |                      |      |      |      |      |      |      |
| Blood stain detergency      | A        | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A                    | A    | F    | F    | F    | A    | A    |
| Fabric damage after washing | A        | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | F                    | F    | A    | A    | A    | F    | F    |
| Sebum stain detergency      | A        | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | B    | A                    | B    | A    | F    | F    | A    | A    |
| Red wine stain detergency   | A        | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | A    | F                    | F    | F    | F    | A    | F    | A    |

[0056]

The results are as shown in Table 1. In Comparative Examples 1, 2, and 6, although a phosphate ester (A) is used, no alkali metal carbonate (B) is blended, and sodium hydroxide or sodium silicate (B') is blended as an alkaline agent. In Comparative Examples 1, 2, and 6, because of the high pH, the detergency on blood stains was excellent; however, fabric damage was observed after washing. In Comparative Examples 3 and 4, as compared with Comparative Examples 1, 2, and 6, the amount of alkaline agent was reduced to lower the pH, and thus fabric damage after washing was ameliorated; however, the detergency on blood stains was inferior. In addition, in all of Comparative Examples 1 to 4 and 6, the detergency on red wine stains was inferior. In addition, in Comparative Examples 2 and 4 where sodium silicate was used as an alkaline agent, the detergency on sebum stains was also inferior.

[0057]

In Comparative Example 5, although a phosphate ester (A) and an alkali metal carbonate (B) were used together, because the amount of alkali metal carbonate (B) blended was small, and the pH was low, the detergency on blood stains and sebum stains was inferior. In Comparative Example 7, although a phosphate ester (A) and an alkali metal carbonate (B) were used together, because sodium hydroxide

(B') was blended, and the pH was high, fabric damage was observed after washing.

[0058]

In contrast, in Examples 1 to 15 where a phosphate ester (A) and an alkali metal carbonate (B) were used together, and the pH was within a range of 9.5 to 11.5, it was possible to remove blood stains while suppressing fabric damage after washing, and the blood stain detergency was excellent. In addition, in Examples 1 to 15, the detergency on red wine stains was also excellent. Further, in Examples 1 to 14 where a polyoxyalkylene alkyl ether sulfate ester salt (C) was blended in addition to a phosphate ester (A) and an alkali metal carbonate (B), the detergency on sebum stains was also excellent.

[0059]

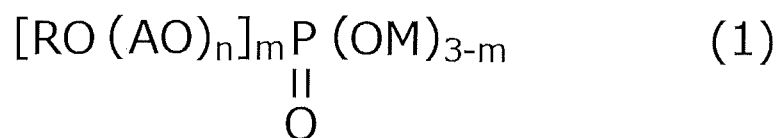
Some embodiments of the invention have been described above. These embodiments are presented as examples and not intended to limit the scope of the invention. These embodiments can be implemented in other various modes, and, without departing from the gist of the invention, various omissions, substitutions, and changes can be made thereto. These embodiments, as well as omissions, substitutions, and changes thereto, etc., fall within the scope and gist of the invention, and also fall within the scope of the claimed invention and its equivalents.

## CLAIMS

[Claim 1]

A detergent composition for textile products, comprising a phosphate ester (A) represented by the following general formula (1) and an alkali metal carbonate (B), and having a pH of 9.5 to 11.5 as measured in the form of an aqueous solution having a concentration of 1 mass%:

[Chemical Formula 1]



wherein R represents an aliphatic hydrocarbon group having 8 to 18 carbon atoms or a styrenated phenyl group, AO represents an oxyalkylene group having 2 to 4 carbon atoms, n represents an average addition mole number and is a number of 0 to 10, M represents a hydrogen atom, an alkali metal, ammonium, or an organic ammonium, and m represents 1 or 2, the phosphate ester (A) being a monoester where m = 1, a diester where m = 2, or a mixture of the monoester and the diester.

[Claim 2]

The detergent composition for textile products according to claim 1, wherein the phosphate ester (A) and the alkali metal carbonate (B) are blended in a mass ratio

(A)/(B) of 0.3 to 2.0.

[Claim 3]

The detergent composition for textile products according to claim 1 or 2, further comprising at least one of a polyoxyalkylene alkyl ether sulfate ester or a salt thereof (C).

[Claim 4]

The detergent composition for textile products according to any one of claims 1 to 3, being a liquid detergent composition containing water.