

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
15 February 2007 (15.02.2007)

PCT

(10) International Publication Number
WO 2007/018317 A1

(51) International Patent Classification:
CIID 3/37 (2006.01) *CIID 1/72* (2006.01)
CIID 1/22 (2006.01)

(74) Agent: **HOSODA, Yoshinori**; c/o Hosoda International Patent Office, P.O. Box 26, OMM Building 5th Floor, 7-31, Otemae 1-chome, Chuo-ku, Osaka-shi, Osaka 540-6591 (JP).

(21) International Application Number:
PCT/JP2006/316120

(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HN, HR, HU, ID, IL, IN, IS, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(22) International Filing Date: 10 August 2006 (10.08.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2005-233702 11 August 2005 (11.08.2005) JP

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(71) Applicant (*for all designated States except US*): **KAO CORPORATION** [JP/JP]; 14-10, Nihonbashi Kayabacho 1-chome, Chuo-ku, Tokyo 103-8210 (JP).

(72) Inventors; and

(75) Inventors/Applicants (*for US only*): **YANAGISAWA, Yuki** [JP/JP]; c/o Kao Corporation, Research Laboratories, 1334 Minato, Wakayama-shi, Wakayama 640-8580 (JP). **MIZUSAWA, Kimihiro** [JP/JP]; c/o Kao Corporation, Research Laboratories, 1334 Minato, Wakayama-shi, Wakayama 640-8580 (JP). **KASAI, Katsuhiko** [JP/JP]; c/o Kao Corporation, Research Laboratories, 1334 Minato, Wakayama-shi, Wakayama 640-8580 (JP).

Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: DETERGENT COMPOSITION FOR HAND-WASHING

(57) Abstract: The present invention provides a detergent composition for hand-washing, containing a polymer 90% by mass or more of which monomer unit is composed of ethylene oxide, the polymer having a viscosity-average molecular weight of 1,500,000 or more and 4,500,000 or less being contained in an amount exceeding 0.03% by mass and 5% by mass or less of the detergent composition. The detergent composition for hand-washing and the laundry detergent composition can be suitably utilized as a hand-washing detergent.

WO 2007/018317 A1

DESCRIPTION

DETERGENT COMPOSITION FOR HAND-WASHING

FIELD OF THE INVENTION

5 The present invention relates to a detergent composition for hand-washing.

BACKGROUND OF THE INVENTION

 Washing methods can be roughly classified into two kinds: hand-washing
and washing machine-washing. In recent years, with the widespread use of
10 washing machines, washing machine-washing tends to be used increasingly.
However, hand-washing has still been carried out from the viewpoint of easy
removal of stains and economic advantages.

 While hand-washing enables flexible washing depending upon the
washing situations such as the extent of removal of stains and the kinds of items
15 to be washed, physical and mental fatigue are caused for an individual who hand-
washes, as compared to washing machine-washing. Especially, in "rub-
washing" wherein the items to be washed are rubbed against each other,
mechanical forces can be directly applied to sites to be washed, thus being one of
the most natural processes for hand-washing. However, a long-period of work
20 would be burdensome to an individual who hand-washes.

 In addition, since the surface of the items to be washed, such as clothes, is
not smooth microscopically, friction is generated when these clothes are actually
rubbed together. This friction is felt by the individual who hand-washes as
unpleasant factors, such as "rough texture" and "squeakiness," and increases the
25 burden applied physically to the individual from the viewpoint of exhaustion of

physical strength by the rub-washing movement. In addition, the local friction generated during rub-washing cause scratches or cuts on the hands of the individual, which in turn appear as wear on fibers, a so-called "cloth-damage" to the items to be washed. The damage on fibers not only shortens the duration
5 period of clothes but also serves as an accelerating factor with respect to adhesion of stains, thereby further increasing the physical burden required for washing.

On the other hand, conventionally, technological developments have been made by remarking mainly on the aspect of "how to remove adhered dirt stains
10 from an item to be washed," such as improvement of detergency of a detergent or prevention of the redeposition of a detergent on the washed laundry, or the aspect of "how to finish the washed laundry," such as imparting a softening property to the washed laundry, or preventing wrinkles of the clothes from being generated (see, for instance, JP-A-Hei 5-508889, JP-A-Hei 1-98697, and JP-A-
15 Hei 7-216389). Taking into consideration the unpleasant factors and physical burden generated during the hand-washing as mentioned above, i.e. "mental and physical burden for an individual who washes," the technological developments focusing on the improvements thereon to reduce the burdens have not been so far made. JP-A-Hei 1-98697 discloses a detergent composition in which a
20 polyethylene oxide having a high molecular weight is formulated as a clay mineral aggregation agent, in order to impart softness to the laundered clothes. However, in the conventional techniques such as JP-A-Hei 1-98697, there are no intentions in reducing frictions by giving smoothness to clothes upon washing, in imparting smooth feel to clothes in a washing liquid, thereby making hand-
25 washing a pleasant experience. Therefore, these techniques did not disclose the

ranges of molecular weight and formulation amount as defined in the present invention, concerning the ethylene oxide-containing polymer formulated in the detergent composition, which would have been the essential requirement for realizing such effects. In addition, for the same reasons as above, there are no technological suggestions for a detergent composition, a detergent component, and a composition for realizing the effects of the present invention, i.e. a description that a detergent component that inhibits the effect of exhibiting the effects by the ethylene oxide-containing polymer is simultaneously given, or the like.

A conventional detergent component such as a surfactant or a low-molecular weight polymer formulated as a dispersant for dirt stains and carbon stains, such as sodium polyacrylate or polyethylene glycol, might show a lubricating effect under special conditions, for instance, a very highly concentrated system (for instance, a liquid mixture having a concentration of 100 g/L as a concentration of the polymer). However, in a concentration of a washing liquid which is usually employed (for instance, a liquid mixture having a concentration of 0.05 to 5.0 g /L as a concentration of the polymer), there are no such lubricating effects, or even if there is a slight effect, the effect is insufficient for eliminating the above-mentioned disadvantages when hand-washing is carried out. For instance, there has been known that some compounds have an effect of reducing friction between fibers, such as the silicone compound polymers described in JP-A-Hei 5-508889 mentioned above. However, a user still is not led to feel especially significant changes in feel when rub-washing with a washing liquid at a concentration usually employed for the hand-washing. Therefore, hand-washing does not become a pleasant experience

for the user by the effects of these polymers alone. In addition, the silicone compound polymers are a kind of a surface-coating oil agent having spreadability for reducing friction on the fiber surface during drying, and these polymers do not provide sufficient effects from the viewpoint of preventing fiber damage generated during rub-washing when the polymers are used in the form of an aqueous solution, i.e. a washing liquid.

In order that hand-washing is carried out as a pleasant experience in households, it is necessary that smoothness of an item to be washed can be realized in a washing liquid at a usual concentration.

SUMMARY OF THE INVENTION

The present invention relates to a detergent composition for hand-washing, containing a polymer 90% by mass or more of which monomer unit is composed of ethylene oxide, the polymer having a viscosity-average molecular weight of 1,500,000 or more and 4,500,000 or less being contained in an amount exceeding 0.03% by mass and 5% by mass or less of the detergent composition.

DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to a detergent composition which is capable of giving an item to be washed proper smoothness during hand-washing in households, and imparting the clothes in a washing liquid a smooth feel, thereby reducing unpleasant factors such as "rough texture" and "squeaking" and physical fatigue, and providing hand-care and washing item-care properties.

As a result of intensive studies for the needs for carrying out hand-washing as a more pleasant experience, the present inventors have found that

specific smoothness can be obtained when especially rubbing items to be washed with each other by using a detergent composition containing a specified amount of a polymer containing ethylene oxide having a specified molecular weight and carrying out hand-washing, and thereby feel during hand-washing is improved, and at the same time the physical burden is lessened, whereby further accomplishing laundry-care and hand-care.

By using the laundry detergent composition of the present invention, there is exhibited an effect that conventional washing, especially hand-washing, can be carried out in households as a more pleasant experience. Specifically, according to the present invention, there are exhibited some effects that the feel during hand-washing is improved, that at the same time physical burdens are lessened, and that further laundry-care and hand-care can be accomplished. In addition, according to the laundry detergent composition of the present invention, smoothness that is considered to be optimal in a washing liquid, and change in feel that is considered to be optimal can be more stably provided, so that the user can carry out washing with a pleasant experience without having to suffer from change in feel that can be expressed as "excessively slimy."

These and other advantages of the present invention will be apparent from the following description.

One of the features of the detergent composition of the present invention resides in that the detergent composition contains an ethylene oxide-containing polymer having a high molecular weight. The detergent composition of the present invention may contain a surfactant, or a detergent builder such as an alkalizing agent or a metal ion capturing agent, that is ordinarily contained in a

detergent composition, and other usual detergent component. The components other than the ethylene oxide-containing polymer contained in the detergent composition, and the form of the detergent composition, and a process for preparing the detergent composition and the like are not particularly limited.

5 The composition and the detergent composition include a detergent composition obtained according to a composition and a process described in Tokkyocho Koho: Shuchi Kanyo Gijutsu Shu (Clothes Powder Detergent: Japanese Patent Office), 10(1998)-25(7159), and the like. The detergent composition may be prepared by the process mentioned above, or alternatively by preparing detergent
10 components other than the ethylene oxide-containing polymer according to the above method, and thereafter mixing the ethylene oxide-containing polymer therewith.

More specifically, the present invention relates to a detergent composition for hand-washing, containing a polymer 90% by mass or more of which
15 monomer unit is composed of ethylene oxide, the polymer having a viscosity-average molecular weight of 1,500,000 or more and 4,500,000 or less being contained in an amount exceeding 0.03% by mass and 5% by mass or less of the detergent composition.

The ethylene oxide-containing polymer is a polymer containing ethylene
20 oxide in an amount, as a monomer unit, of 90% by mass (hereinafter also simply referred to as "ethylene oxide-containing polymer"). Among them, polyethylene oxide is preferable, from the viewpoint of obtaining an aqueous polymer having a high degree of polymerization. The polyethylene oxide is a polymer obtained by polymerization of ethylene oxide, and for example, the
25 trade name of PEO manufactured by Sumitomo Seika Co., Ltd. is commercially

available.

In the detergent composition of the present invention, an ethylene oxide-containing polymer having a viscosity-average molecular weight of from 1,500,000 or more and 4,500,000 or less is used, in order to design an appropriate smoothness imparting ability.

The phrase "improving smoothness" as used herein refers to reduction in friction generated between clothes or between fibers or the like in a washing liquid or in a state where the clothes or fibers contain the washing liquid during washing. Especially during hand-washing, the smoothness can be exhibited as a degree of friction felt by hands of an individual who hand-washes during rubbing of the items to be washed. Therefore, with the improvement in smoothness, this friction felt by hand is reduced, so that the items to be washed can be rubbed against each other very smoothly. In addition, when a detergent composition containing an ethylene oxide-containing polymer is used, the above-mentioned smoothness is exhibited and at the same time an individual who hand-washes can obtain a feel that can be expressed as "smooth and soft," upon touching an item to be washed in a washing liquid. This change in feel can be generally felt as "pleasant." The ethylene oxide-containing polymer is an excellent base agent from the viewpoint of improving smoothness and imparting change in feel.

The larger the molecular weight of the ethylene oxide-containing polymer, the higher the smoothness imparting ability. The ethylene oxide-containing polymer having a high smoothness imparting ability can realize impartment of smoothness and change in feel even in a smaller amount of formulation in the detergent composition, thereby making it economically advantageous. Here, in

an ordinary concentration of a washing liquid (for example, concentration of detergent composition: 0.3 to 10 g/L, concentration of the ethylene oxide-containing polymer formulated being 1 to 500 mg/L), the molecular weight dependencies of smoothness imparting ability and feel imparting ability dramatically change from a viscosity-average molecular weight of 1,000,000 or more. When the viscosity-average molecular weight is 1,500,000 or more, the ethylene oxide-containing polymer can impart sufficient smoothness even in a low base agent concentration as in the above-mentioned washing liquid. The ethylene oxide-containing polymer has a viscosity-average molecular weight of more preferably 1,800,000 or more, and even more preferably 2,000,000 or more, from the viewpoint of realizing sufficient "smoothness" even at a lower diluted concentration.

On the other hand, when the ethylene oxide-containing polymer has a viscosity-average molecular weight of higher than a given value, the change in feel upon touching an item to be washed in a washing liquid is too much. Therefore, there exists an appropriate molecular weight range, from the viewpoint of obtaining a detergent composition so as to impart a comfortable feel. The ethylene oxide-containing polymer has a viscosity-average molecular weight of 4,500,000 or less, preferably 4,000,000 or less, and even more preferably 3,500,000 or less, in order to obtain a pleasant feel even more stably. A detergent composition in which this ethylene oxide-containing polymer is used can impart an more comfortable change in feel, as compared to a detergent composition in which an ethylene oxide-containing polymer having a viscosity-average molecular weight far greater than that of above is used.

In addition, the larger the viscosity-average molecular weight of the

ethylene oxide-containing polymer, the lower the dissolubility to an aqueous solution, so that the tendency that the ethylene oxide-containing polymer is unevenly distributed in the washing liquid becomes stronger. This unevenly distributed ethylene oxide-containing polymer forms a complex with a water-insoluble component in the detergent in some cases, whereby having a disadvantage in dissolubility of the detergent, i.e. a detergent quality. Even from this viewpoint, the ethylene oxide-containing polymer has a viscosity-average molecular weight of 4,500,000 or less, and preferably 3,500,000 or less.

The ethylene oxide-containing polymer is contained in the detergent composition in an amount exceeding 0.03% by mass, from the viewpoint of improving hand-washing property. As mentioned above, the larger the molecular weight, the more excellent smoothness is exhibited even in a lower concentration. As to an ethylene oxide-containing polymer having a viscosity-average molecular weight of 1,500,000 or more and less than 3,500,000, the ethylene oxide-containing polymer is contained in the detergent composition in an amount of preferably exceeding 0.1% by mass, more preferably 0.15% by mass or more, even more preferably 0.2% by mass or more, even more preferably 0.25% by mass or more, even more preferably 0.3% by mass or more, and even more preferably 0.5% by mass or more. In addition, the ethylene oxide-containing polymer is contained in the detergent in a formulation amount of preferably 5% by mass or less, more preferably 3% by mass or less, and even more preferably 1% by mass or less, in order to obtain rinsability and a pleasant feel during washing.

As to an ethylene oxide-containing polymer having a viscosity-average molecular weight of 3,500,000 or more and 4,500,000 or less, the ethylene

oxide-containing polymer is contained in the detergent composition in an amount of preferably exceeding 0.03% by mass, more preferably 0.05% by mass or more, even more preferably 0.1% by mass or more, and even more preferably 0.2% by mass or more. In addition, the ethylene oxide-containing polymer is contained in the detergent composition in a formulation amount of preferably 3% by mass or less, and more preferably 1% by mass or less, in order to obtain rinsability and a pleasant feel during washing.

In the present invention, as the average molecular weight, a viscosity-average molecular weight is employed. This is because it would be difficult to obtain an accurate distribution in a high-molecular weight portion in a large molecule having a viscosity-average molecular weight exceeding 3,000,000 due to the influence of exclusion limitation or the like in the case of analysis with G.P.C. The viscosity-average molecular weight is described in *Journal of Applied Polymer Science* 1(1) 56-62 (1959) "Some Properties of Poly(ethylene oxide) in Aqueous Solution," F. E. Bailey, Jr., and R. W. Callard). For example, a product commercially available from Sumitomo Seika Co., Ltd. under the trade name of "PEO-8Z" is a polyethylene oxide that can impart smoothness defined in the present invention, of which viscosity-average molecular weight is about 2,000,000. A product commercially available from the same under the trade name of "PEO-3Z" is a polyethylene oxide that does not impart smoothness defined in the present invention, of which viscosity-average molecular weight is about 1,000,000 when determined in accordance with the following method.

The detergent composition of the present invention can be used in general method of use and concentration as a detergent used in ordinary hand-washing or machine-washing. As the concentration of the detergent composition in the

washing liquid, in the case of hand-washing, the concentration is preferably 0.05 g/L or more, more preferably 0.1 g/L or more, even more preferably 0.5 g/L or more, even more preferably 1 g/L or more, even more preferably 2 g/L or more, and even more preferably 3 g/L or more, from the viewpoint of improving smoothness of the washing liquid. On the other hand, the concentration is preferably 20 g/L or less, more preferably 15 g/L or less, and even more preferably 10g/L or less, from the viewpoint of handling ability of the washing liquid. It is even more preferable to use the detergent composition in a concentration of from 0.5 to 10 g/L. In addition, a preferred method of use includes a method of rub-washing while sprinkling or the like a proper amount of the detergent composition of the present invention to a part of clothes to be washed that is to be rub-washed; and contacting the detergent-contained clothes with water to make a washing liquid. In a preferred embodiment, the detergent composition of the present invention may be used combinedly with a detergent composition other than the detergent composition of the present invention, or with a clothes-care composition such as a perfume composition that does not contain a detergent component.

The detergent composition of the present invention may take any form such as powder, granule, liquid or paste, and the detergent composition may be molded by a secondary working into an aggregate, a tablet or a doughy shape. It is preferable that the detergent composition contains an alkalizing agent and a metal ion capturing agent together with a surfactant, from the viewpoint of detergency. In addition, it is preferable that the base agent is quickly dispersed upon dissolution, from the viewpoint of dissolubility of the detergent composition. Also, when the ethylene oxide-containing polymer having a high

molecular weight as defined in the present invention is dissolved in an aqueous solution, and formed into a liquid preparation, the aqueous solution has a very strong tendency of spinnability, i.e. stringy property. Even from this viewpoint, it is preferable that the detergent composition is in the form of powder or granule.

5 In addition, since the ethylene oxide-containing polymer in the present invention is mostly in the form of powder or granule, the resulting detergent composition that is in the form of powder or granule facilitates the formation of preparation, so that the degree of freedom in the formulation of the polymer is even more increased.

10 In order that the ethylene oxide-containing polymer in the detergent composition sufficiently stably exhibits its smoothness imparting effect, in the preparation steps of the detergent composition, an addition method including the step of dispersing the ethylene oxide-containing polymer in the present invention in the detergent composition homogeneously at a practical level. In the
15 preparation process of an ordinary powder detergent, the ethylene oxide-containing polymer of the present invention may be added in the after-blending step (the step of adding other component, including, for example, a fluorescer, an enzyme, a perfume, a defoaming agent, a bleaching agent, a bleaching activator or the like to the prepared detergent particles), or the ethylene oxide-containing
20 polymer of the present invention may be added in a surface-modifying step or a granulation step. If it can be so arranged, adding the ethylene oxide-containing polymer of the present invention in the step of formulating a slurry is also convenient.

25 The physical properties of the ethylene oxide-containing polymer are not particularly limited. The ethylene oxide-containing polymer has an average

particle size of preferably 3 mm or less, more preferably 1 mm or less, and even more preferably 500 μm or less, from the viewpoint of dissolubility of the particles. In addition, the ethylene oxide-containing polymer has an average particle size of preferably 10 μm or more, more preferably 50 μm or more, and even more preferably 100 μm or more, from the viewpoint of dispersibility upon supplying a detergent composition to water, and preventing the formation of doughy mass (a state in which interparticle adhesion takes place due to partial hydration of an aggregate of the particles or the like, thereby causing not be dispersed even when a mechanical power is applied).

In addition, the ethylene oxide-containing polymer can be used as a mixture with other base agent by means of granulation or the like in order to suppress the generation of doughy mass. The other base agent as used herein refers to a base agent capable of sufficiently dispersing or dissolving the ethylene oxide-containing polymer of the present invention, and the base agent includes, for example, sodium sulfate, sodium carbonate, zeolite, polyethylene glycol, an alkyl sulfate, and the like.

As other detergent composition, a surfactant can be used. As the surfactant used in the present invention, a conventionally known substance can be used. In the surfactant, it is preferable to use an anionic surfactant as a main surfactant.

Even more preferably, as the anionic surfactant, a salt of a linear alkylbenzenesulfonic acid of which alkyl moiety has 10 to 18 carbon atoms, a salt of a an alkyl sulfuric acid ester, a salt of a polyoxyalkylene alkyl ether sulfuric acid, a salt of a methyl ester of alpha-sulfofatty acid, an N-acyl amino acid-type surfactant, an alkyl or alkenyl ether carboxylate, an amino acid-type

surfactant, an alkali metal salt such as an alkyl or alkenyl phosphate ester, or a salt thereof are preferable, and a salt of a fatty acid derived from beef tallow or coconut oil may be formulated therewith. Among them, the alkylbenzenesulfonate, the salt of the alkyl sulfuric acid ester, and the salt of the polyoxyalkylene alkyl ether sulfuric acid are preferable, and sodium alkylbenzenesulfonate is even more preferable. The anionic surfactant, even more preferably sodium alkylbenzenesulfonate, has an effect of further enhancing "spinnability" of the polyethylene oxide defined in the present invention. From this viewpoint, the content of the anionic surfactant is preferably 10% by mass or more, more preferably 12% by mass or more, even more preferably 15% by mass or more, even more preferably 18% by mass or more, and even more preferably 20% by mass or more, of the detergent composition. In addition, the content of the anionic surfactant is preferably 40% by mass or less, more preferably 35% by mass or less, even more preferably 30% by mass or less, and even more preferably 25% by mass or less, of the detergent composition, from the viewpoint of powder properties.

In addition, as the nonionic surfactant, an alkanolamide of a higher fatty acid or an alkylene oxide adduct thereof, a sucrose fatty acid ester, an alkyl glycoside, or a fatty acid glycerol monoester can be used. The nonionic surfactant is outstandingly excellent in detergency against oily stains such as sebum dirt stains because of its excellent hard water resistance. The nonionic surfactant is used in an amount of 15% by mass or less, from the viewpoint of lathering ability and rinsability.

In the present invention, a polyoxyethylene alkyl ether-type nonionic surfactant has a risk of inhibiting smoothness imparting ability of the ethylene

oxide-containing polymer. The polyoxyethylene alkyl ether-type nonionic surfactant is formulated in an amount of preferably 5% by mass or less, more preferably less than 2% by mass, even more preferably less than 1.5% by mass, even more preferably less than 1.0% by mass, even more preferably less than 0.5% by mass, even more preferably consisting essentially of no polyoxyethylene alkyl ether-type nonionic surfactant, of the detergent composition, for the purpose of more effectively exhibiting the smoothness imparting agent of the ethylene oxide-containing polymer.

The mass ratio of the polyoxyethylene alkyl ether-type nonionic surfactant to the ethylene oxide-containing polymer contained in the detergent composition, i.e. the polyoxyethylene alkyl ether-type nonionic surfactant / the ethylene oxide-containing polymer, is preferably 20 or less, more preferably 15 or less, even more preferably 10 or less, even more preferably 5 or less, and even more preferably 3 or less.

The detergent composition of the present invention can further be, if necessary, formulated with a surfactant such as a betaine-type amphoteric surfactant, a phosphate ester-based surfactant, or a cationic surfactant.

As the alkalizing agent usable in the present invention, it is preferable to formulate a conventionally known alkalizing agent. Examples of the alkalizing agent include alkali metal salts including alkali metal carbonates such as sodium carbonate collectively referred to as dense ash and light ash; amorphous alkali metal silicates, such as JIS No. 1, 2 or 3 Sodium Silicate; crystalline alkali metal silicates; and the like. The alkali metal salt has an effect of further enhancing "smoothness" by the ethylene oxide-containing polymer defined in the present invention. From this viewpoint, the content of the alkali metal salt is preferably

1% by mass or more, more preferably 5% by mass or more, more preferably 7% by mass or more, even more preferably 10% by mass or more, even more preferably 12% by mass or more, even more preferably 15% by mass or more, and even more preferably 20% by mass or more, of the detergent composition.

5 In addition, the content of the alkalizing agent is preferably 40% by mass or less, and more preferably 30% by mass or less, of the detergent composition, from the viewpoint of compositional balance.

It is very effective to formulate a metal ion capturing agent as a builder in the detergent composition to capture water hardness-increasing components in a washing water, from the viewpoint of detergency. Especially, it is more effective to formulate a metal ion capturing agent having a calcium ion capturing ability of 100 mg CaCO_3/g or more. The metal ion capturing agent includes a crystalline aluminosilicate, a crystalline sodium silicate, an acrylic acid polymer, an acrylic acid-maleic acid copolymer, sodium tripolyphosphate, ethylenediaminetetraacetic acid, and methylglycinediacetic acid. Here, in the present invention, sodium carbonate and amorphous sodium silicate are not included in the metal ion capturing agent. The content of the metal ion capturing agent is preferably 1% by mass or more, more preferably 5% by mass or more, even more preferably 10% by mass or more, and even more preferably 20% by mass or more, of the detergent composition, from the viewpoint of detergency. In addition, the content of the metal ion capturing agent is preferably 50% by mass or less, more preferably 40% by mass or less, and even more preferably 35% by mass or less, of the detergent composition, from the viewpoint of compositional balance. It is preferable that the detergent composition of the present invention further contains an alkylbenzenesulfonate in an amount of from

10 to 40% by mass, and an alkalizing agent in an amount of from 7 to 40% by mass, from the viewpoint of smoothness and detergency.

In addition, the detergent composition of the present invention or the washing liquid containing the detergent composition can contain an organic
5 polymer having a weight-average molecular weight of less than 500,000, and preferably a weight-average molecular weight of from 1,000 to 100,000, for the conventionally known purpose of increasing dispersibility of solid particle stains, including, for example, a carboxylate polymer, polyethylene glycol, carboxymethyl cellulose or the like.

10 The carboxylate polymer has a function of dispersing the solid particle stains into a washing liquid besides the function of capturing metal ions. The carboxylate polymer is preferably a homopolymer or copolymer of acrylic acid, methacrylic acid, itaconic acid or the like. As the copolymer, those prepared by copolymerizing the above monomer with maleic acid are suitable, and those
15 having a weight-average molecular weight of from 3,000 to 20,000 are preferable.

The polyethylene glycol has a function of dispersing the solid particle stains into a washing liquid. A polyethylene glycol having a weight-average molecular weight of from 1,000 to 20,000 is preferable.

20 The carboxymethyl cellulose has a function of dispersing the solid particle stains into a washing liquid. It is preferable that a carboxymethyl cellulose has a weight-average molecular weight of from several thousands to several hundred thousands, and a degree of etherification thereof of from 0.2 to 1.0 from the viewpoint of dispersibility.

25 The detergent composition of the present invention can contain an

appropriate amount of an enzyme, a perfume, a fluorescer, a hydrogen peroxide-releasing inorganic salt, a dye or the like.

EXAMPLES

5 The following examples further describe and demonstrate embodiments of the present invention. The examples are given solely for the purposes of illustration and are not to be construed as limitations of the present invention.

Ethylene Oxide-Containing Polymer

10 Physical properties of each of the organic polymers used in the present Examples are shown hereinbelow.

[Sample 1] Polyethylene oxide: Commercially available from Sumitomo Seika Co., Ltd. under the trade name of "PEO3Z," viscosity of a 0.5% aqueous solution of the polymer having a viscosity-average molecular weight of about
15 1,000,000: about 15 mPa•s.

[Sample 2] Polyethylene oxide: Commercially available from Sumitomo Seika Co., Ltd. under the trade name of "PEO8Z," viscosity of a 0.5% aqueous solution of the polymer having a viscosity-average molecular weight of about
2,000,000: about 35 mPa•s.

20 [Sample 3] Polyethylene oxide: Commercially available from Sumitomo Seika Co., Ltd. under the trade name of "PEO15Z," viscosity of a 0.5% aqueous solution of the polymer having a viscosity-average molecular weight of about
4,200,000: about 170 mPa•s.

[Sample 4] Polyethylene oxide: Commercially available from Sumitomo
25 Seika Co., Ltd. under the trade name of "PEO PF-2 (red)," viscosity of a 0.5%

aqueous solution of the polymer having a viscosity-average molecular weight of about 5,500,000: about 450 mPa•s, all the viscosities are values determined using ion-exchanging water at 25°C with a B-type viscometer at 12 r/min.

Incidentally, the method for evaluating hand-washing carried out in the Examples will be described hereinbelow.

< 1. Method for Evaluating Hand-Washing >

[Conditions for Hand-Washing]

An 8.2 L polypropylene washtub (commercially available from YAZAKI) having a diameter of 30 cm and a depth of 13 cm was charged with 2 L of hard water (Ca/Mg molar ratio: 7/3) corresponding to 89 mg CaCO₃/liter, temperature-controlled to 25°C, and 8 g of a detergent composition was supplied into the water, and the water was continued to be stirred by hand with a vigorousness to an extent that the water was not spilled from the washtub. After 30 seconds from the beginning of stirring, two pieces of 100% cotton T-shirts (white, commercially available from Gunze, L size) were soaked in the washing liquid in the washtub so that the entire T-shirts were sufficiently soaked. Five minutes thereafter, the breast portions of the T-shirts were held with both hands, and the breast portions of the T-shirts were rubbed against each other. The portions were rubbed together upon taking the shirt out of the washing liquid. After rubbing together for every 3 to 5 times, the rubbed portions were temporarily soaked in the washing liquid. The ease in rubbing when the portions were rubbed together was judged in Ranks 1 to 5 as to smoothness. When this evaluation was carried out only with the water prepared above, the wrinkles of the T-shirt hindered the smoothness, the portions to be rubbed together were

hardly rubbed because there were no bubbles in the portions rubbed together, so that the smoothness worsened. In such a case, the smoothness was defined to have a rank of 1. The state of each rank is as shown below.

Rank 1: very low smoothness and some feel of squeakiness, thereby making it very difficult to perform hand-washing.

Rank 2: low smoothness and some feel of squeakiness, thereby not being easy to perform hand-washing.

Rank 3: smoothness being medium level, and being capable of performing hand-washing without squeakiness.

Rank 4: smoothness being high, being capable of performing hand-washing more easily without squeakiness.

Rank 5: smoothness being very high, being capable of performing hand-washing very easily without squeakiness.

Incidentally, in the above test, an average value of the results of evaluation made by 6 expert panelists were obtained to provide the rank. Also, the evaluation of the smoothness-improving effect by a pair comparison with the detergent composition obtained in Preparation Example 1 was carried out.

< Preparation of Detergent Compositions >

Preparation Example 1

The amount of 325 kg of water, 200 kg of a 50% by weight aqueous sodium dodecylbenzenesulfonate solution, 75 kg of a 40% by weight aqueous JIS No. 2 sodium silicate solution, 50 kg of sodium carbonate, 212.5 kg of sodium sulfate, 5 kg of polyethylene glycol, 2.5 kg of a CBS fluorescer, and 100 kg of zeolite were mixed together, to provide a homogeneous slurry.

Thereafter, the obtained slurry was spray-dried, to provide a detergent composition.

The smoothness of the detergent composition obtained in Preparation Example 1 is shown in Table 1.

Comparative Example 1

The amount of 4.0 kg of the detergent composition obtained in Preparation Example 1 was supplied into a concrete mixer (commercially available from KYC Machine Industry CO., LTD., capacity: 40 L), and thereafter 280 g of Sample 1 (polyethylene oxide commercially available from Sumitomo Seika Co., Ltd. under the trade name of "PEO3Z"), 100 g of carboxymethyl cellulose ("F10MC" commercially available from NIPPON PAPER CHEMICALS CO., LTD.), and 12 g of perfume were added thereto. The components were mixed at a slanted angle of 30° at a rotational speed of 20 r/min for 3 minutes, to provide a detergent composition containing a high-molecular weight organic polymer. In the washing water dissolving this detergent composition, a lubricating layer containing the polymer could not be felt on the surface of the T-shirts used. The smoothness of the detergent composition obtained is shown in Table 1.

Example 1

The amount of 4.0 kg of the detergent composition obtained in Preparation Example 1 was supplied into a concrete mixer (commercially available from KYC Machine Industry CO., LTD., capacity: 40 L), and thereafter 32 g of Sample 2 (polyethylene oxide commercially available from

Sumitomo Seika Co., Ltd. under the trade name of "PEO8Z"), 150 g of carboxymethyl cellulose ("F10MC" commercially available from NIPPON PAPER CHEMICALS CO., LTD.), and 10 g of perfume were added thereto. The components were mixed at a slanted angle of 30° at a rotational speed of 20 r/min for 3 minutes, to provide a detergent composition. In the washing water dissolving this detergent composition, a lubricating layer containing the polymer could be felt on the surface of the T-shirts used. The smoothness of the detergent composition obtained is shown in Table 1. In comparison with that of Preparation Example 1, all members of the six panelists judged that the smoothness was clearly improved.

Example 2

The amount of 4.0 kg of the detergent composition obtained in Preparation Example 1 was supplied into a concrete mixer (commercially available from KYC Machine Industry CO., LTD., capacity: 40 L), and thereafter 5 g of Sample 3 (polyethylene oxide commercially available from Sumitomo Seika Co., Ltd. under the trade name of "PEO15Z"), 100 g of carboxymethyl cellulose ("F10MC" commercially available from NIPPON PAPER CHEMICALS CO., LTD.), and 12 g of perfume were added thereto.

The components were mixed at a slanted angle of 30° at a rotational speed of 20 r/min for 3 minutes, to provide a detergent composition. In the washing water dissolving this detergent composition, a lubricating layer containing the polymer could be felt on the surface of the T-shirts used. The smoothness of the detergent composition obtained is shown in Table 1. In comparison with that of

Preparation Example 1, all members of the six panelists judged that the smoothness was clearly improved.

Example 3

5 The amount of 4.0 kg of the detergent composition obtained in Preparation Example 1 was supplied into a concrete mixer (commercially available from KYC Machine Industry CO., LTD., capacity: 40 L), and thereafter 3 g of Sample 3 (polyethylene oxide commercially available from Sumitomo Seika Co., Ltd. under the trade name of "PEO15Z"), 100 g of
10 carboxymethyl cellulose ("F10MC" commercially available from NIPPON PAPER CHEMICALS CO., LTD.), and 12 g of perfume were added thereto. The components were mixed at a slanted angle of 30° at a rotational speed of 20 r/min for 3 minutes, to provide a detergent composition. In the washing water dissolving this detergent composition, a lubricating layer containing the polymer
15 could be felt on the surface of the T-shirts used. The smoothness of the detergent composition obtained is shown in Table 1. In comparison with that of Preparation Example 1, all members of the six panelists judged that the smoothness was clearly improved.

Comparative Example 2

20 The amount of 4.0 kg of the detergent composition obtained in Preparation Example 1 was supplied into a concrete mixer (commercially available from KYC Machine Industry CO., LTD., capacity: 40 L), and thereafter 4 g of Sample 4 (polyethylene oxide commercially available from
25 Sumitomo Seika Co., Ltd. under the trade name of "PEO PF-2 (red)"), 100 g of

carboxymethyl cellulose ("F10MC" commercially available from NIPPON PAPER CHEMICALS CO., LTD.), and 15 g of perfume were added thereto.

The components were mixed at a slanted angle of 30° at a rotational speed of 20 r/min for 3 minutes, to provide a detergent composition. In the washing water dissolving this detergent composition, a lubricating layer containing the polymer could be felt on the surface of the T-shirts used. The smoothness of the detergent composition obtained is shown in Table 1.

Table 1

	Prep. Ex. 1	Ex. 1	Ex. 2	Ex. 3	Comp. Ex. 1	Comp. Ex. 2
Detergent Composition Prepared in Preparation Example 1	100.0	100.0	100.0	100.0	100.0	100.0
Carboxymethyl Cellulose (CMC)		3.75	2.5	2.5	2.5	2.5
Perfume		0.25	0.3	0.3	0.3	0.375
PEO (MW 1,200,000)					7.0	
PEO (MW 2,000,000)		0.8				
PEO (MW 4,200,000)			0.125	0.075		
PEO (MW 5,500,000)						0.1
Ranks for Smoothness	2	5	4	4	2	5

(Note) Numerical values for each of the components in the table are expressed in parts by weight; and MW stands for a viscosity-average molecular weight.

10 < 2. Method for Evaluating Feel upon Hand-Washing >

Hand-washing was carried out on T-shirts with the detergent compositions obtained in Examples 1 and 2 and Comparative Example 2 on the basis of the hand-washing conditions of the above-mentioned 1., and feel upon hand-washing T-shirts was compared. The evaluation on feel was carried out

using 10 panelists. The evaluation results for feel were expressed as indices in accordance with the following scores, and feel was evaluated in its total score.

Score +2: Example being highly preferable, as compared to that of Comparative Example 2;

5 Score +1: Example being preferable, as compared to that of Comparative Example 2;

Score 0: Example being preferable the same level as Comparative Example 2;

10 Score -1: Comparative Example 2 being preferable, as compared to that of Example; and

Score -2: Comparative Example 2 being highly preferable, as compared to that of Example;

1) Example 1 was evaluated in comparison with Comparative Example 2.

15 Example 1 gave a score of evaluation results of +15, thereby obtaining the results that the detergent composition obtained in Example 1 is preferable as compared to that of Comparative Example 2. The ten panelists commented that "in both the cases of Example 1 and Comparative Example 2, the T-shirts during washing had a soft feel." Six of them commented that "Comparative Example 2 had a
20 strong imparted feel, so that Comparative Example 2 gives a slimy feel, as compared to that of Example 1; therefore, the feel of Example 1 is proper and excellent as compared to that of Comparative Example 2."

2) Example 2 was evaluated in comparison with Comparative Example 2.

25 Example 2 gave a score of evaluation results of +12, thereby obtaining the results that the detergent composition obtained in Example 2 is preferable as compared

to that of Comparative Example 2. The ten panelists commented that “in both the cases of Example 2 and Comparative Example 2, the T-shirts during washing had a soft feel.” Eight of them commented that “Comparative Example 2 had a strong imparted feel, so that Comparative Example 2 gives a slimy feel, as compared to that of Example 2; therefore, the feel of Example 2 is proper and excellent as compared to that of Comparative Example 2.”

Combining the results for 1. Method for Evaluating Hand-Washing and 2. Method for Evaluating Feel upon Hand-Washing described above, it can be seen that all of the powder detergent compositions obtained in Examples 1 to 3 are more excellent than those obtained in Comparative Examples 1 and 2, from the viewpoint of improving smoothness upon hand-washing and obtaining the most appropriate feel.

INDUSTRIAL APPLICABILITY

The detergent composition for hand-washing and the laundry detergent composition of the present invention can be suitably utilized as a hand-washing detergent.

The present invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

CLAIMS

1. A detergent composition for hand-washing, comprising a polymer 90% by mass or more of which monomer unit is composed of ethylene oxide, the polymer having a viscosity-average molecular weight of 1,500,000 or more and 4,500,000 or less being contained in an amount exceeding 0.03% by mass and 5% by mass or less of the detergent composition.

2. The detergent composition according to claim 1, wherein the detergent composition comprises a polymer 90% by mass or more of which monomer unit is composed of ethylene oxide, the polymer having a viscosity-average molecular weight of 3,500,000 or more and 4,500,000 or less being contained in an amount exceeding 0.03% by mass and 3% by mass or less of the detergent composition.

3. The detergent composition according to claim 1, wherein the detergent composition comprises a polymer 90% by mass or more of which monomer unit is composed of ethylene oxide, the polymer having a viscosity-average molecular weight of 1,500,000 or more and less than 3,500,000 being contained in an amount exceeding 0.1% by mass and 5% by mass or less of the detergent composition.

4. The detergent composition according to claim 1, wherein said polymer is a polyethylene oxide.

5. The detergent composition according to claim 2, wherein said polymer is a polyethylene oxide.

5 6. The detergent composition according to claim 3, wherein said polymer is a polyethylene oxide.

7. The detergent composition according to any one of claims 1 to 6, further comprising 10 to 40% by mass of an alkylbenzenesulfonate and 7 to 40% by
10 mass of an alkalizing agent.

8. The detergent composition according to any one of claims 1 to 6, wherein the detergent composition comprises a polyoxyethylene alkyl ether-type nonionic surfactant in an amount of 5% by mass or less.

15 9. The detergent composition according to claim 8, wherein the mass ratio of the polyoxyethylene alkyl ether-type nonionic surfactant to the polyethylene oxide, i.e. the polyoxyethylene alkyl ether-type nonionic surfactant / the polyethylene oxide, is 20 or less.

20 10. The detergent composition according to any one of claims 1 to 6, wherein the detergent composition is in the form of powder or granules.

INTERNATIONAL SEARCH REPORT

International application No

PCT/JP2006/316120

A. CLASSIFICATION OF SUBJECT MATTER

INV. C11D3/37 C11D1/22 C11D1/72

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

C11D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	BE 784 980 A1 (COLGATE PALMOLIVE CO) 16 October 1972 (1972-10-16) page 1, paragraph 1; claims 1-8; example 1 page 1, paragraph 4 - page 2, paragraph 2	1-7, 10
X	GB 998 507 A (PROCTER & GAMBLE LTD) 14 July 1965 (1965-07-14) page 3, line 108 - page 4, line 21; claim 1 page 1, lines 74-78	1, 2, 4, 5, 8, 9
X	GB 1 340 518 A (BURTON PARSONS CHEMICALS INC) 12 December 1973 (1973-12-12) page 1, line 68 - page 2, line 14; example 1	1-6, 8, 9
	----- -/-	

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

20 October 2006

Date of mailing of the international search report

31/10/2006

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Klier, Erich

INTERNATIONAL SEARCH REPORT

International application No

PCT/JP2006/316120

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 014 980 A1 (HENKEL KGAA [DE]) 3 September 1980 (1980-09-03) page 3, line 26 - page 4, line 10; claims 1-4 -----	1,2,4,5, 8-10
X	EP 0 009 194 A1 (HENKEL KGAA [DE]) 2 April 1980 (1980-04-02) page 4, line 3 - page 5, line 15; claims 1-3 -----	1-6,8
X	WO 95/27037 A (PROCTER & GAMBLE [US]) 12 October 1995 (1995-10-12) page 9, line 12 - page 10, line 8; claims 1,16 -----	1,3,4,6, 7
X	DE 18 07 779 A1 (HENKEL & CIE GMBH) 4 June 1970 (1970-06-04) page 4, paragraph 2; claims 1-8; examples 10b,11,12 -----	1-10
X	WO 91/02509 A (JOHNSON & SON INC S C [US]) 7 March 1991 (1991-03-07) claims 1-7; examples 1,8-11; table III -----	1-9

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/JP2006/316120

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
BE 784980	A1	16-10-1972	AR 193407 A1	23-04-1973
			AT 344845 B	10-08-1978
			AT 508572 A	15-10-1975
			DK 146223 B	01-08-1983
			ES 403890 A1	16-05-1975
			IE 36647 B1	19-01-1977
			IT 958374 B	20-10-1973
			JP 56045959 B	29-10-1981
			PH 9969 A	16-06-1976
			SE 411556 B	14-01-1980
			ZA 7203722 A	30-01-1974
GB 998507	A	14-07-1965	BE 607795 A	
			NL 268317 A	
GB 1340518	A	12-12-1973	CA 970687 A1	08-07-1975
			CH 543278 A	31-10-1973
			DE 2051369 A1	09-06-1971
			FR 2073437 A5	01-10-1971
			GB 1340517 A	12-12-1973
			GB 1340515 A	12-12-1973
			GB 1340516 A	12-12-1973
			JP 54021405 B	30-07-1979
			NL 7015332 A	03-06-1971
EP 0014980	A1	03-09-1980	AT 376449 B	26-11-1984
			AT 96780 A	15-04-1984
			DE 2906891 A1	04-09-1980
EP 0009194	A1	02-04-1980	DE 2840464 A1	03-04-1980
			US 4343725 A	10-08-1982
WO 9527037	A	12-10-1995	CN 1145095 A	12-03-1997
			MA 23489 A1	01-10-1995
DE 1807779	A1	04-06-1970	NONE	
WO 9102509	A	07-03-1991	AU 6170490 A	03-04-1991
			US 4992266 A	12-02-1991