

DESCRIPTION

Title of the Invention: DETERGENT ARTICLE FOR TEXTILE PRODUCTS

Field of the Invention

[0001]

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

Background of the Invention

[0002]

As the number of dual-income families that cannot make time for housework increases, the washing-machine laundering environment is changing. Specifically, people are increasingly washing a large amount of textile products at one time in batch washing or using short-time washing courses on washing machines to further reduce washing time.

Further, in washing of textile products, detergent articles containing detergent compositions wrapped in water-soluble films are widely and generally used for saving the trouble of measuring detergent compositions.

[0003]

JP-A H2-155999 discloses an article consisting of (1) an aqueous liquid laundry detergent containing from about 10% to about 24% by weight of water and a

substantially organic neutralization system and (2) a package for said aqueous liquid laundry detergent prepared from a water-soluble film-forming material which maintains structural integrity on substantially direct contact with the aqueous liquid laundry detergent.

JP-A 2002-3897 discloses a laundry article containing a laundry composition such as a detergent containing a surfactant, a bleaching agent, a fabric softener, starch, or the like wrapped in a water-soluble film, the water-soluble film containing a copolymer obtained by saponifying after polymerizing (a) a fatty acid ester of vinyl alcohol and (b) a specific unsaturated compound.

JP-A H5-320699 discloses a bathtub heater cleaner containing a composition in a pouch of a water-soluble polymer film, the composition containing a percarbonate in an amount of 50 to 95 weight%, an organic acid in an amount of 2 to 30 weight%, and an anionic surfactant in an amount of 0.1 to 10 weight%.

Summary of the Invention

[0004]

For example, detergent articles containing wrapped detergent compositions preferably have a breaking strength equal to or greater than a certain value to prevent them from easily breaking during handling. When detergent articles containing wrapped detergent

compositions and having a certain breaking strength or more are used for short-time (6 to 9 minutes) washing of textile products, the actual washing time is even shorter because it takes about 1 to 2 minutes for the contained detergent compositions to be dissolved in washing water, which is unsatisfactory to consumers who expect textile products to be washed cleanly and is harmful to the interests of consumers.

In addition, detergent articles are bulky and thus look messy and prevent effective use of space when they clutter up laundry rooms. Therefore, it is desirable to store detergent articles as compactly as possible.

[0005]

The present invention provides a detergent article for textile products containing a detergent composition wrapped in a water-soluble film and a method for washing a textile product that can suppress reduction in washing power even if the detergent article is used for short-time (6 to 9 minutes) washing of textile products.

[0006]

The present invention relates to a detergent article for textile products containing a detergent composition wrapped in a water-soluble film, the composition containing (a) a surfactant (hereinafter referred to as component (a)) in an amount of 5 mass% or more and 80 mass% or less, wherein a major-axis diameter of a maximum projection area of the detergent article is

30 mm or more and 200 mm or less, an aspect ratio of the major-axis diameter to a minor-axis diameter orthogonal to the major-axis diameter (major-axis diameter/minor-axis diameter) is 5 or more, and a breaking strength of the detergent article is 300 N or more.

[0007]

Further, the present invention relates to a method for washing a textile product including bringing the detergent article for textile products of the present invention into contact with the textile product and water.

[0008]

The present invention provides a detergent article for textile products containing a detergent composition wrapped in a water-soluble film and a method for washing a textile product that can suppress reduction in washing power even if the detergent article is used for short-time (6 to 9 minutes) washing of textile products.

Embodiments of the Invention

[0009]

The mechanism of action by which the detergent article for textile products and the method for washing a textile product of the present invention can suppress reduction in washing power even if they are used for short-time (6 to 9 minutes) washing of textile products is not wholly certain, but is inferred to be as follows.

A detergent article having an aspect ratio (major-axis diameter/minor-axis diameter) of less than 5 is unlikely to become entangled in textile products when the detergent article is brought into contact with the textile products and water to perform washing. Therefore, it takes long time for the detergent article to collapse due to the dissolution of the water-soluble film in the water and the external force from the textile products to allow the contained detergent composition to be dissolved in the washing water, which might cause reduction in washing power in short-time washing.

On the other hand, the present invention uses a long, thin detergent article having an aspect ratio (major-axis diameter/minor-axis diameter) of 5 or more, and the detergent article is more likely to become entangled in textile products when the detergent article is brought into contact with the textile products and water to perform washing. Therefore, the detergent article is more likely to collapse due to the dissolution of the water-soluble film in the water and the external force from the textile products, and it takes short time for the contained detergent composition to be dissolved in the washing water. It is inferred that the present invention can thus suppress reduction in washing power even in short-time washing.

Note that the mechanism of action of the present invention is not limited to the above.

[0010]

[Detergent article]

The present invention relates to a detergent article for textile products containing a detergent composition wrapped in a water-soluble film, wherein a major-axis diameter of a maximum projection area of the detergent article is 30 mm or more and 200 mm or less, an aspect ratio of the major-axis diameter to a minor-axis diameter orthogonal to the major-axis diameter (major-axis diameter/minor-axis diameter) is 5 or more, and a breaking strength of the detergent article is 300 N or more.

The detergent article for textile products of the present invention may be a detergent article for textile products composed of a detergent composition and a water-soluble film, wherein the detergent composition is wrapped in the water-soluble film, a major-axis diameter of a maximum projection area of the detergent article is 30 mm or more and 200 mm or less, an aspect ratio of the major-axis diameter to a minor-axis diameter orthogonal to the major-axis diameter (major-axis diameter/minor-axis diameter) is 5 or more, and a breaking strength of the detergent article is 300 N or more.

Note that the detergent article for textile products of the present invention is sometimes referred to as "detergent article" herein.

[0011]

The aspect ratio of the major-axis diameter of the maximum projection area of the detergent article to the minor-axis diameter orthogonal to the major-axis diameter (major-axis diameter/minor-axis diameter) is 5 or more, preferably 6 or more, more preferably 7 or more, and further preferably 8 or more from the viewpoint of being able to suppress reduction in washing power even in short-time washing, and preferably 20 or less, more preferably 16 or less, further preferably 13 or less, and furthermore preferably 10 or less from the viewpoints of ease of use and storage.

The major-axis diameter of the maximum projection area of the detergent article is 30 mm or more, preferably 50 mm or more, and more preferably 80 mm or more, and 200 mm or less, preferably 160 mm or less, and more preferably 120 mm or less from the viewpoint of ease of use.

The minor-axis diameter of the maximum projection area of the detergent article is preferably 5 mm or more, more preferably 10 mm or more, further preferably 12 mm or more, and furthermore preferably 14 mm or more, and preferably 25 mm or less, more preferably 23 mm or less, and further preferably 20 mm or less from the viewpoint of ease of use.

[0012]

In the present invention, the maximum projection area is the area of the projection view having the

maximum horizontal projection area among the projection views of the detergent article projected horizontally from all planes. The term "projection" is synonymous with "projection" used in mathematics, in other words, shedding a parallel beam of light horizontally on an object, thereby projecting its shadow onto a plane.

Further, in the present invention, if the shape of the maximum projection area of the detergent article is an oval, a method for measuring the major-axis diameter and the minor-axis diameter of the maximum projection area of the detergent article is performed by measuring the major-axis diameter and the minor-axis diameter of the oval as they are. Further, if the shape of the maximum projection area of the detergent article is rectangular (the length of the vertical axis > the length of the horizontal axis), the length of the vertical axis is measured as the major-axis diameter and the length of the horizontal axis is measured as the minor-axis diameter. Further, if the maximum projection area of the detergent article has an irregular shape, the longest portion thereof is measured as the major-axis diameter, and the longest portion of the line (axis) orthogonal to the major-axis diameter is measured as the minor-axis diameter.

The maximum projection area of the detergent article includes the water-soluble film in which the detergent composition is wrapped, and also includes a

portion where the sheets of water-soluble film overlap each other, such as a sealing portion.

For example, when the detergent composition is wrapped in the water-soluble film by laminating two sheets of water-soluble film, it is more preferable that the water-soluble film have a larger contact area with the detergent composition. When the detergent composition is wrapped in the water-soluble film by laminating two sheets of water-soluble film, the proportion of the contact area of one sheet of water-soluble film with the detergent composition relative to the total area of the surface facing the other sheet of water-soluble film of the sheet of water-soluble film is preferably 60% or more, more preferably 70% or more, further preferably 80% or more, and furthermore preferably 90% or more, and less than 100%. The contact area of the water-soluble film with the detergent composition herein may be the area of the water-soluble film surface that forms the space for containing the detergent composition.

Further, one detergent article may be connected to another in such a manner that one end of the water-soluble film in which the detergent composition is wrapped is separable from one end of the other water-soluble film in which the detergent composition is wrapped. In such a case, the maximum projection area of each detergent article is calculated for each water-

soluble film in which the detergent composition is wrapped, and on the basis of the calculated maximum projection area, the aspect ratio of the major-axis diameter of the maximum projection area of the detergent article to the minor-axis diameter orthogonal to the major-axis diameter (major-axis diameter/minor-axis diameter) is measured. In other words, in the case of the detergent articles connected in such a manner that the ends of the water-soluble films in which the detergent composition is wrapped are separable from each other, the aforementioned aspect ratio is measured by separating them at a connection portion between the water-soluble films in which the detergent composition is wrapped. Note that when this connection portion is unknown, a line dividing the connected articles into equal parts in which the detergent composition is wrapped can be considered as the connection portion.

[0013]

The detergent article for textile products of the present invention contains the detergent composition of the present invention wrapped in the water-soluble film.

The detergent article for textile products of the present invention may be a detergent article for textile products composed of the detergent composition of the present invention and the water-soluble film, wherein the detergent composition is wrapped in the water-soluble film.

In the present invention, the water-soluble film refers to a film that does not appear to form any insoluble matter after 500 g of ion-exchanged water at 30°C and a Teflon® stirrer with a diameter of 8 cm are placed in a 1-L glass beaker, and 1 g of the film to be evaluated is added thereto and stirred at 100 rpm for 30 minutes.

[0014]

A thickness of the water-soluble film is preferably 70 µm or more and more preferably 100 µm or more from the viewpoint of strength of the detergent article, and preferably 200 µm or less and more preferably 140 µm or less from the viewpoint of being able to suppress reduction in washing power even in short-time washing.

[0015]

The water-soluble film is preferably composed by containing a polymer. The water-soluble film can be obtained by a method known in the present technical field, for example, polymer cast molding, blow molding, extrusion molding, injection molding, or the like. Non-limiting examples of the polymer for producing the water-soluble film include polyvinyl alcohol (PVA), vinyl alcohol copolymers, polyvinyl pyrrolidone, polyalkylene oxides, (modified) cellulose, (modified) cellulose-ethers, -esters, or -amides, polycarboxylic acids and salts thereof such as polyacrylates and others,

copolymers of maleic acid/acrylic acid, polyamino acids, i.e., peptides, polyamides such as polyacrylamide and others, polysaccharides such as starch and gelatin and others, and natural rubbers such as xanthan and carragum and others. The vinyl alcohol copolymers are copolymers of vinyl alcohol and other monomers, for example, ethylene or acrylic acid. The water-soluble film preferably contains a polymer selected from the group composed of the following: polyacrylates and water-soluble acrylates, methyl cellulose, sodium carboxymethyl cellulose, dextrin, ethyl cellulose, hydroxyethyl cellulose, maltodextrin, polymethacrylates, polyvinyl alcohol, vinyl alcohol copolymers, hydroxypropyl methylcellulose (HPMC), and combinations of these. The water-soluble film more preferably contains a polymer selected from polyvinyl alcohol, vinyl alcohol copolymers, and hydroxypropyl methylcellulose. The water-soluble film further preferably contains polyvinyl alcohol, for example, Solublon available from AICELLO CORPORATION. Polymers suitable for the production of water-soluble film pouches are described, for example, in US-B 6995126.

[0016]

In the detergent article for textile products of the present invention, a total contact area of the water-soluble film with the detergent composition of the present invention is preferably 2 cm² or more, more

preferably 5 cm² or more, further preferably 7 cm² or more, furthermore preferably 15 cm² or more, and furthermore preferably 30 cm² or more from the viewpoint of further increasing product stability, and preferably 100 cm² or less, more preferably 70 cm² or less, further preferably 60 cm² or less, and furthermore preferably 50 cm² or less from the same viewpoint.

[0017]

The detergent article of the present invention can be prepared by any suitable process known in the present technical field, for example, a known process for preparing a detergent pouch. Examples of processes for preparing pouches are described in US-B 6,995,126, US-B 7,127,874, US-B 8,156,713, US-B 7,386,971, US-B 7,439,215, US-A 2009/199877, JP-B 6915017, and JP-B 4514858.

[0018]

In the detergent article for textile products of the present invention, an amount of the contained material per detergent article (in other words, an amount of the detergent composition wrapped in the water-soluble film) is preferably 8 g or more, more preferably 10 g or more, and further preferably 12 g or more from the viewpoint of washing performance, and preferably 30 g or less, more preferably 26 g or less, further preferably 22 g or less from the viewpoints of downsizing and storage of the detergent article.

[0019]

The breaking strength of the detergent article of the present invention is 300 N or more, preferably 350 N or more, and more preferably 400 N or more from the viewpoint of preventing the detergent article from easily breaking during handling.

In a measurement environment under a condition of room temperature (20°C)/relative humidity of about 50%, using a compression tester (for example, AUTOGRAPH AG-X, manufactured by Shimadzu Science Corporation), the detergent article is placed such that the surface attaining the maximum projection area comes in contact with a fixed compression plate of the compression tester (which is not a spherically seated compression plate and has an area larger than the maximum projection area of the detergent article) and compression force is added thereto at a rate of 200 mm/min, and the compression force when the detergent article breaks is considered as the breaking strength of the detergent article.

[0020]

The detergent composition contained in the detergent article for textile products of the present invention (hereinafter referred to as the detergent composition of the present invention) is a solid detergent composition or a liquid detergent composition, and preferably a solid detergent composition.

[0021]

The detergent composition of the present invention contains a surfactant as component (a).

Examples of the surfactant of component (a) include one or more selected from (a1) a nonionic surfactant (hereinafter referred to as component (a1)), (a2) an anionic surfactant (hereinafter referred to as component (a2)), (a3) a cationic surfactant (hereinafter referred to as component (a3)), and (a4) an amphoteric surfactant (hereinafter referred to as component (a4)), and one or more selected from components (a1) and (a2) are preferable from the viewpoints of washing performance and foaming performance.

[0022]

The nonionic surfactant of component (a1) is preferably (a11) a nonionic surfactant containing an alkyleneoxy group, wherein an average number of added moles of the alkyleneoxy group is 1 or more and 30 or less (hereinafter referred to as component (a11)).

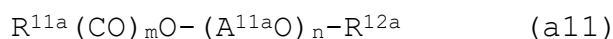
The alkyleneoxy group of component (a11) is preferably one or more groups selected from an alkyleneoxy group with 2 or more and 4 or less carbons. The alkyleneoxy group with 2 or more and 4 or less carbons is preferably one or more groups selected from an ethyleneoxy group and a propyleneoxy group.

The average number of added moles of the alkyleneoxy group of component (a11) is 1 or more, preferably 6 or more, and more preferably 10 or more, and

30 or less, preferably 25 or less, and more preferably 20 or less from the viewpoint of washing performance.

[0023]

Component (a11) is preferably a nonionic surfactant represented by the following general formula (a11):



wherein R^{11a} is an aliphatic hydrocarbon group with 8 or more and 18 or less carbons, R^{12a} is a hydrogen atom or a methyl group, CO is a carbonyl group, m is a number of 0 or 1, $A^{11a}O$ group is an alkyleneoxy group with 2 or more and 4 or less carbons containing an ethyleneoxy group; and n is an average number of added moles and a number of 1 or more and 30 or less.

[0024]

In the general formula (a11), R^{11a} has 8 or more, preferably 10 or more, and more preferably 12 or more, and 18 or less, preferably 16 or less, and more preferably 14 or less carbons from the viewpoint of washing power.

R^{11a} is an aliphatic hydrocarbon group, and preferably a group selected from an alkyl group and an alkenyl group.

[0025]

In the general formula (a11), $A^{11a}O$ group is an alkyleneoxy group with 2 or more and 4 or less carbons containing an ethyleneoxy group, preferably an

alkyleneoxy group with 2 or more and 3 or less carbons containing an ethyleneoxy group, and more preferably an ethyleneoxy group. A^{11a}O group may be an alkyleneoxy group containing an ethyleneoxy group and another alkyleneoxy group, for example, a propyleneoxy group. The other alkyleneoxy group is preferably a propyleneoxy group. If A^{11a}O group contains an ethyleneoxy group and a propyleneoxy group, ethyleneoxy groups and propyleneoxy groups may be bonded in blocks or bonded at random.

[0026]

In the general formula (a11), n is an average number of added moles of A^{11a}O group and a number of 1 or more and 30 or less. In the general formula (a11), n is 1 or more, preferably 6 or more, and more preferably 10 or more, and 30 or less, preferably 25 or less, and more preferably 20 or less from the viewpoint of washing power.

[0027]

Specific examples of a nonionic surfactant other than component (a11) not having an alkyleneoxy group include one or more selected from a sucrose fatty acid ester, a glycerin fatty acid ester, a sorbitan fatty acid ester, an alkyl glycoside, and a glyceryl monoether.

[0028]

Examples of the anionic surfactant of component (a2) include an alkylbenzene sulfonate, an alkyl or alkenyl ether sulfate, an alkyl or alkenyl sulfate, an

olefin sulfonate, an alkane sulfonate, a saturated or unsaturated fatty acid salt, an alkyl or alkenyl ether carboxylate, an α -sulfo fatty acid salt, an N-acyl amino acid, a phosphate mono or diester, a sulfosuccinate ester, and others. Examples of the alkyl ether sulfate include a polyoxyethylene alkyl ether sulfate.

The anionic surfactant has an alkyl group or an alkenyl group with, for example, 8 or more and 22 or less carbons. The anionic surfactant has an average number of added moles of oxyethylene group of, for example, 0 or more and 10 or less.

Examples of counterions of the anionic groups of the above anionic surfactants include an alkali metal ion such as a sodium ion, a potassium ion, or the like, an alkaline earth metal ion such as a calcium ion, a magnesium ion, or the like, an ammonium ion, or an alkanol amine having 1 to 3 alkanol groups with 2 or 3 carbons (for example, monoethanolamine, diethanolamine, triethanolamine, triisopropanolamine, or the like).

One or a combination of two or more of these surfactants can be used.

[0029]

Component (a2) is preferably one or more selected from an alkylbenzene sulfonic acid, an alkyl sulfate, a polyoxyethylene alkyl ether sulfate, an α -sulfo fatty acid ester, and a salt of these, and more preferably an

alkylbenzene sulfonic acid or a salt thereof from the viewpoint of washing power.

The alkylbenzene sulfonic acid has an alkyl group with preferably 8 or more and more preferably 12 or more, and preferably 18 or less and more preferably 14 or less carbons.

[0030]

Examples of the cationic surfactant of component (a3) include an alkyl trimethyl ammonium salt having an alkyl group with 8 or more and 22 or less carbons, a dialkyl dimethyl ammonium salt having an alkyl group with 8 or more and 22 or less carbons, an alkyl dimethyl benzyl ammonium salt having an alkyl group with 8 or more and 22 or less carbons, a benzethonium salt, and others. Examples of the salts include a halide salt and an alkyl sulfate with 1 or more and 3 or less carbons.

One or a combination of two or more of these surfactants can be used.

[0031]

Examples of the amphoteric surfactant of component (a4) can include an N-alkanoylaminopropyl-N,N-dimethylamine oxide, an N-alkyl-N,N-dimethylamine oxide, an N-alkanoylaminopropyl-N,N-dimethyl-N-carboxymethyl ammonium betaine, an N-alkyl-N,N-dimethyl-N-carboxymethyl ammonium betaine, an N-alkyl-N,N-dimethyl-N-sulfopropyl ammonium sulfobetaine, an N-alkyl-N,N-dimethyl-N-(2-hydroxysulfopropyl) ammonium sulfobetaine, an N-

alkanoylaminoethyl-N,N-dimethyl-N-sulfoethyl ammonium sulfobetaine, and an N-alkanoylaminoethyl-N,N-dimethyl-N-(2-hydroxyethylsulfopropyl) ammonium sulfobetaine. The alkanoyl groups in these are, for example, lauroyl or myristoyl. Further, the alkyl groups in these are, for example, lauryl groups or myristyl groups.

[0032]

The detergent composition of the present invention contains component (a) in the detergent composition in an amount of preferably 5 mass% or more, more preferably 10 mass% or more, and further preferably 20 mass% or more, and preferably 80 mass% or less, more preferably 50 mass% or less, and further preferably 30 mass% or less from the viewpoints of washing performance and stability.

If the detergent composition of the present invention is a solid detergent composition, the detergent composition contains component (a) in an amount of preferably 5 mass% or more, more preferably 10 mass% or more, and further preferably 20 mass% or more, and preferably 40 mass% or less and more preferably 30 mass% or less from the viewpoints of washing performance and stability.

If the detergent composition of the present invention is a liquid detergent composition, the detergent composition contains component (a) in an amount of preferably 20 mass% or more, more preferably 30 mass% or more, and further preferably 40 mass% or more, and

preferably 80 mass% or less, more preferably 70 mass% or less, and further preferably 60 mass% or less from the viewpoints of washing performance and stability.

Note that if the detergent composition of the present invention contains component (a2) as component (a), the mass of component (a2) is specified in terms of the value of a sodium salt.

Further, if the detergent composition of the present invention contains component (a3) as component (a), the mass of component (a3) is specified in terms of the value of a chloride.

[0033]

If the detergent composition of the present invention contains component (a1), the detergent composition contains component (a1) in an amount of preferably 2.5 mass% or more, more preferably 5 mass% or more, and further preferably 10 mass% or more, and preferably 40 mass% or less, more preferably 25 mass% or less, and further preferably 15 mass% or less from the viewpoints of washing performance and stability.

[0034]

If the detergent composition of the present invention contains component (a2), the detergent composition contains component (a2) in an amount of preferably 2.5 mass% or more, more preferably 5 mass% or more, and further preferably 10 mass% or more, and preferably 40 mass% or less, more preferably 25 mass% or

less, and further preferably 15 mass% or less from the viewpoints of washing performance and stability.

[0035]

If the detergent composition of the present invention contains components (a1) and (a2), a mass ratio of a content of component (a1) to a content of component (a2), $(a1)/(a2)$, is preferably 0.1 or more, more preferably 0.4 or more, further preferably 0.6 or more, and furthermore preferably 1 or more, and preferably 10 or less, more preferably 8 or less, further preferably 6 or less, furthermore preferably 4 or less, and furthermore preferably 2 or less from the viewpoint of being able to further suppress reduction in washing power in the detergent article of the present invention having a specific aspect ratio.

[0036]

If the detergent composition of the present invention is a solid detergent composition, the composition can contain one or more compounds selected from an inorganic sulfate and an inorganic halogen compound as component (b). Examples of component (b) include a compound selected from sodium sulfate, magnesium sulfate, sodium chloride, and magnesium chloride. Component (b) may be a hydrate or an anhydride.

[0037]

If the detergent composition of the present invention contains component (b), the detergent composition contains component (b) in an amount of preferably 2 mass% or more, more preferably 5 mass% or more, further preferably 10 mass% or more, and furthermore preferably 15 mass% or more, and preferably 40 mass% or less, more preferably 30 mass% or less, and further preferably 25 mass% or less from the viewpoint of stability.

[0038]

If the detergent composition of the present invention is a solid detergent composition, the composition can contain one or more alkali agents selected from an alkali metal carbonate, an alkali metal bicarbonate, an alkali metal silicate, and a tripolyphosphate as component (c).

Examples of the alkali metal carbonate include sodium carbonate and potassium carbonate, and sodium carbonate is preferable.

Examples of the alkali metal bicarbonate include sodium bicarbonate and potassium bicarbonate.

Examples of the alkali metal silicate include sodium silicate and potassium silicate.

Examples of the tripolyphosphate include an alkali metal salt of tripolyphosphoric acid.

[0039]

If the detergent composition of the present invention contains component (c), the detergent composition contains component (c) in an amount of preferably 2 mass% or more, more preferably 5 mass% or more, further preferably 10 mass% or more, furthermore preferably 20 mass% or more, and furthermore preferably 25 mass% or more, and preferably 80 mass% or less, more preferably 60 mass% or less, further preferably 50 mass% or less, furthermore preferably 40 mass% or less, and furthermore preferably 35 mass% or less from the viewpoints of washing performance and stability.

[0040]

If the detergent composition of the present invention is a solid detergent composition, the composition can contain one or more compounds selected from zeolite and bentonite as component (d).

[0041]

Zeolite is also called crystalline aluminosilicate. A crystalline aluminosilicate such as zeolite A, X, or P, or the like can be contained as a specific zeolite. An average primary particle size thereof is preferably 0.1 μm or more and more preferably 1 μm or more, and preferably 10 μm or less and more preferably 5 μm or less. Suitable as the crystalline aluminosilicate is preferably zeolite A (for example, the trade name "TOYOBUILDER" manufactured by Tosoh Corporation, oil absorption capacity according to the

method in JIS K 5101-13-2: 40 mL/100 g or more). Other suitable examples include type P (for example, the trade names "Doucil A24" and "ZSEO64" which are both manufactured by Crosfield, or the like, oil absorption capacity: 60 to 150 mL/100 g), type X (for example, the trade name "WessalithXD" manufactured by Degussa, oil absorption capacity: 80 to 100 mL/100 g), and a hybrid zeolite described in WO-A 98/42622.

[0042]

A bentonite having an ion exchange capability of 50 to 100 meq/100 g is preferable. Examples of the bentonite include one or more selected from (d1) a clay mineral of the montmorillonite group (smectitic clay) selected from the group composed of an alkali metal or alkaline earth metal montmorillonite, saponite, or hectorite, (d2) illite, (d3) attapulgite, and (d4) kaolinite. The bentonite can be used in granule form. For example, reference can be made to granulated products of clay minerals in JP-A 2008-189719.

[0043]

If the detergent composition of the present invention contains component (d), the detergent composition contains component (d) in an amount of preferably 2 mass% or more, more preferably 5 mass% or more, further preferably 10 mass% or more, and furthermore preferably 15 mass% or more, and preferably 50 mass% or less, more preferably 30 mass% or less, and

further preferably 25 mass% or less from the viewpoints of softness of textile products and stability.

[0044]

If the detergent composition of the present invention is a solid detergent composition, the composition can contain a polymer having a carboxylic acid group or a salt thereof and a weight average molecular weight of 3,000 or more as component (e).

Examples of component (e) include a polymer selected from polyacrylic acid or a salt thereof and a copolymer of acrylic acid and maleic acid or a salt thereof (hereinafter referred to as component (e)).

Examples of the polyacrylic acid or salt thereof include polyacrylic acid, sodium polyacrylate, potassium polyacrylate, and others, and preferably include sodium polyacrylate and potassium polyacrylate.

Examples of the copolymer of acrylic acid and maleic acid or salt thereof include a copolymer of acrylic acid and maleic acid, a sodium salt of the copolymer of acrylic acid and maleic acid, a potassium salt of the copolymer of acrylic acid and maleic acid, and others, and preferably include a sodium salt of the copolymer of acrylic acid and maleic acid and a potassium salt of the copolymer of acrylic acid and maleic acid. A molar ratio of acrylic acid to maleic acid in the copolymer, molar number of acrylic acid/molar number of maleic acid, is preferably 1/99 or more and more

preferably 10/90 or more, and preferably 99/1 or less and more preferably 90/10 or less.

[0045]

Component (e1) may be a copolymer that contains a monomer other than acrylic acid and maleic acid and copolymerizable with acrylic acid and/or maleic acid to a degree that the development of the effect of the present invention is not hindered. Examples of the monomer other than acrylic acid and maleic acid and copolymerizable with acrylic acid and/or maleic acid include a vinyl-based monomer, an acrylic-based monomer, a styrene-based monomer, or the like, and more specifically include methacrylic acid, methyl acrylate, ethyl acrylate, methyl methacrylate, styrene, or the like. A molar ratio of the monomer other than acrylic acid and maleic acid and copolymerizable with acrylic acid and/or maleic acid in component (e1) is preferably 0 mol% or more, and preferably 5 mol% or less and more preferably 3 mol% or less, and further preferably 0 mol% in component (e1). Therefore, the polyacrylic acid or salt thereof and the copolymer of acrylic acid and maleic acid or salt thereof of the present invention may be a polymer or a copolymer that contains the monomer other than acrylic acid and maleic acid and copolymerizable with acrylic acid and/or maleic acid in a range of 0 mol% or more and 5 mol% or less in all constituent monomers.

[0046]

A weight average molecular weight of component (e) is 3,000 or more, preferably 3,500 or more, more preferably 4,000 or more, further preferably 5,000 or more, furthermore preferably 6,000 or more, furthermore preferably 7,000 or more, furthermore preferably 8,000 or more, furthermore preferably 9,000 or more, and furthermore preferably 10,000 or more, and preferably 100,000 or less, more preferably 50,000 or less, and further preferably 10,000 or less.

This weight average molecular weight can be measured in accordance with the following method for measuring weight average molecular weight.

<Method for measuring weight average molecular weight>

The weight average molecular weight of component (e) can be a weight average molecular weight (M_w) measured and determined by GPC (gel permeation chromatography) on the basis of a reference standard product.

The GPC measurement conditions are shown below.

· Column:

trade name TSK-GEL guard PWXL manufactured by
Tosoh Corporation

trade name TSK-GEL G4000 PWXL manufactured by
Tosoh Corporation

trade name TSK-GEL G2500 PWXL manufactured by
Tosoh Corporation

- Mobile phase: aqueous solution of 0.1 mol/L of potassium dihydrogen phosphate and 0.1 mol/L of sodium dihydrogen phosphate/acetonitrile = 90/10 (volume ratio)

- Detector: differential refractometer

- Column temperature: 40°C

- Flow rate: 1.0 mL/min

- Reference standard product: polyacrylic acid
[manufactured by American Standard Corporation]

- Sample: From a preparation liquid in a total liquid amount of 200 mL prepared by adding ion-exchanged water to an aqueous polymer solution with a solid content of 0.8 g, 10 µL is separated and purified and poured into the column.

[0047]

If the detergent composition of the present invention contains component (e), the detergent composition contains component (e) in an amount of preferably 0.1 mass% or more, more preferably 0.5 mass% or more, and further preferably 2 mass% or more, and preferably 20 mass% or less, more preferably 10 mass% or less, and further preferably 7 mass% or less from the viewpoints of washing performance and stability.

[0048]

The detergent composition of the present invention can contain a polyalkylene glycol with a weight average molecular weight of 100 or more and 100,000 or less as component (f).

Examples of component (f) include one or more selected from polyethylene glycol and polypropylene glycol.

The weight average molecular weight of component (f) is 100 or more, preferably 1,000 or more, more preferably 5,000 or more, and further preferably 10,000 or more, and 100,000 or less, preferably 50,000 or less, and more preferably 20,000 or less.

Here, the weight average molecular weight of component (f) is a value determined by gel permeation chromatography using polystyrene as the standard product.
[0049]

If the detergent composition of the present invention contains component (f), the detergent composition contains component (f) in an amount of preferably 0.001 mass% or more, more preferably 0.01 mass% or more, further preferably 0.1 mass% or more, and furthermore preferably 1 mass% or more, and preferably 15 mass% or less, more preferably 10 mass% or less, and further preferably 5 mass% or less from the viewpoint of stability.
[0050]

If the detergent composition of the present invention is a solid detergent composition, the solid detergent composition may be in powder form, particle form, or granule form. From the viewpoint of washing power for sebum stains, the detergent composition of the

present invention is preferably one or more solid detergent compositions selected from those in powder form, particle form, and granule form.

The solid detergent composition can be produced by a publicly-known method. For example, a spray drying method, a dry neutralization method, a dry granulation method, a dry blending method, a fluidized bed drying method, a thin film drying method, an extrusion granulation method, a tumbling granulation method, an agitation granulation method, a compaction granulation method, a surfactant supporting method, or a combination of methods selected from these can be applied to the production.

If the detergent composition of the present invention is a powder detergent composition, a bulk density of the detergent composition of the present invention varies depending on the production method, but is preferably 0.2 g/cm^3 or more, more preferably 0.3 g/cm^3 or more, and more preferably 0.35 g/cm^3 or more, and preferably 1 g/cm^3 or less, more preferably 0.95 g/cm^3 or less, and more preferably 0.9 g/cm^3 or less from the viewpoint of making the detergent article of the present invention having a specific aspect ratio become entangled in fibers to be more likely to collapse due to the external force from the textile product, thereby being able to further suppress reduction in short-time washing power.

If the detergent composition of the present invention is a powder detergent composition, an average particle size of the detergent composition of the present invention is preferably 100 μm or more, more preferably 150 μm or more, and further preferably 200 μm or more, and preferably 800 μm or less, more preferably 750 μm or less, and further preferably 700 μm or less.

[0051]

If the detergent composition of the present invention is a liquid detergent composition, the detergent composition of the present invention can contain an alkanol amine as component (g).

Examples of the alkanol amine include one or more compounds selected from monoethanolamine, diethanolamine, triethanolamine, N-methyl monoethanolamine, N-methyl diethanolamine, and N,N-dimethylmonoethanolamine.

[0052]

If the detergent composition of the present invention contains component (g), the detergent composition contains component (g) in an amount of preferably 0.01 mass% or more, more preferably 0.1 mass% or more, and further preferably 1 mass% or more, and preferably 20 mass% or less, more preferably 15 mass% or less, and further preferably 10 mass% or less from the viewpoint of stability.

[0053]

If the detergent composition of the present invention is a liquid detergent composition, the detergent composition of the present invention can contain a polyhydric alcohol as component (h).

More specific examples of component (h) include a polyhydric alcohol having 2 or more, and 12 or less, preferably 10 or less, and more preferably 8 or less carbons, and having a valence of 2 or more, and 12 or less, preferably 10 or less, and more preferably 8 or less. Specific examples of such a compound include, for example, ethylene glycol, propylene glycol, butylene glycol, hexylene glycol, diethylene glycol, triethylene glycol, tetraethylene glycol, dipropylene glycol, tripropylene glycol, and glycerin.

[0054]

If the detergent composition of the present invention contains component (h), the detergent composition contains component (h) in an amount of preferably 0.001 mass% or more, more preferably 0.01 mass% or more, further preferably 0.1 mass% or more, furthermore preferably 1 mass% or more, and furthermore preferably 5 mass% or more, and preferably 30 mass% or less, more preferably 20 mass% or less, and further preferably 15 mass% or less from the viewpoint of stability.

[0055]

The detergent composition of the present invention can contain water. As the water, deionized water (sometimes also referred to as ion-exchanged water) or water obtained by adding sodium hypochlorite in an amount of 1 mg/kg or more and 5 mg/kg or less to ion-exchanged water can be used. Further, tap water can also be used.

[0056]

If the detergent composition of the present invention is a solid detergent composition, the detergent composition contains water in an amount of preferably 0.01 mass% or more, more preferably 0.1 mass% or more, and further preferably 1 mass% or more, and preferably 10 mass% or less and more preferably 5 mass% or less from the viewpoint of stability.

If the detergent composition of the present invention is a liquid detergent composition, the detergent composition contains water in an amount of preferably 10 mass% or less and more preferably 5 mass% or less.

[0057]

The detergent composition of the present invention can contain, as other components, other components publicly known in the field of clothes detergents, for example, bleaching agents (perborates, bleach activators, and others), recontamination inhibitors, reducing agents (sulfites and others), fluorescent whitening agents, foam suppressants (silicone and others), fragrances, enzymes

(cellulase, proteases, peptinase, lipase, dextranase, amylases, and others), coloring agents, antibacterial agents, and others.

[0058]

A detergent liquid obtained by diluting the detergent article for textile products with water to achieve a concentration of the contained detergent composition of 0.2 g/L has a pH at 25°C of preferably 8.0 or more, more preferably 9.0 or more, and further preferably 10.0 or more, and preferably 13.0 or less, more preferably 12.0 or less, and further preferably 11.0 or less from the viewpoint of making the detergent article of the present invention having a specific aspect ratio become entangled in fibers to be more likely to collapse due to the external force from the textile product, thereby being able to further suppress reduction in short-time washing power.

The pH is measured in accordance with the pH measurement method described below.

<pH measurement method>

A composite electrode for pH measurement (glass slide-in sleeve type, manufactured by HORIBA, Ltd.) is connected to a pH meter (pH/ion meter F-23, manufactured by HORIBA, Ltd.), and the power is turned on. As the internal solution of the pH electrode, a saturated potassium chloride aqueous solution (3.33 mol/L) is used. Next, a pH 4.01 standard solution (phthalate standard

solution), a pH 6.86 standard solution (neutral phosphate standard solution), and a pH 9.18 standard solution (borate standard solution) are each filled into a 100-mL beaker, and immersed in a constant temperature bath at 25°C for 30 minutes. A calibration operation is performed in the order of pH 6.86 -> pH 9.18 -> pH 4.01 by immersing the electrode for pH measurement in each standard solution adjusted to the constant temperature for 3 minutes. A sample to be measured is adjusted to 25°C, the electrode of the pH meter is immersed in the sample, and the pH one minute later is measured.

[0059]

The detergent article of the present invention can suitably be used for textile products, especially for washing textile products with a washing machine.

[0060]

Fibers washed with the detergent article of the present invention may be either hydrophobic fibers or hydrophilic fibers. Examples of the hydrophobic fibers include, for example, protein fibers (milk protein casein fiber, promix, and others), polyamide fibers (nylon and others), polyester fibers (polyester and others), polyacrylonitrile fibers (acrylic and others), polyvinyl alcohol fibers (vinylon and others), polyvinyl chloride fibers (polyvinyl chloride and others), polyvinylidene chloride fibers (vinylidene and others), polyolefin fibers (polyethylene, polypropylene, and others),

polyurethane fibers (polyurethane and others), polyvinyl chloride/polyvinyl alcohol copolymer fibers (polychlal and others), polyalkylene paraoxybenzoate fibers (benzoate and others), polyfluoroethylene fibers (polytetrafluoroethylene and others), glass fibers, carbon fibers, alumina fibers, silicon carbide fibers, rock wool (rock fibers), slag wool (slag fibers), metallic fibers (gold yarn, silver yarn, and steel fiber), and others. Examples of the hydrophilic fibers include, for example, seed hair fibers (cotton, kapok, and others), bast fibers (hemp, flax, ramie, cannabis, jute, and others), vein fibers (manila hemp, sisal hemp, and others), palm fibers, juncus, straw, animal hair fibers (wool, mohair, cashmere, camel hair, alpaca, vicuna, angora, and others), silk fibers (domestic silk and wild silk), feather, cellulose fibers (rayon, polynosic, cupro, acetate, and others), or the like.

The fibers are preferably fibers containing cotton fiber from the viewpoint of finishes. A content of cotton fiber in the fibers is preferably 5 mass% or more, more preferably 10 mass% or more, further preferably 15 mass% or more, furthermore preferably 20 mass% or more, furthermore preferably 40 mass% or more, furthermore preferably 60 mass% or more, and furthermore preferably 80 mass% or more, and preferably 100 mass% or less, and may be 100 mass% from the viewpoint of finishes of the fibers.

[0061]

In the present invention, the term "textile product" means textiles such as woven materials, knitted materials, nonwoven fabric, and others using the above hydrophobic fibers or hydrophilic fibers, and products obtained by using them, such as undershirts, T-shirts, dress shirts, blouses, slacks, caps, handkerchiefs, towels, knitwear, socks, underwear, tights, and others.

[0062]

[Method for washing textile product]

The present invention provides a method for washing a textile product including bringing the detergent article for textile products of the present invention into contact with the textile product and water.

The aspects described in the detergent article for textile products of the present invention can be appropriately applied to the method for washing a textile product of the present invention.

The method for washing a textile product of the present invention may be a method including putting in advance into a washer tub the detergent article for textile products of the present invention and water and mixing them to prepare a detergent liquid (hereinafter also referred to as the detergent liquid of the present invention), and then putting an object to be washed, i.e., a textile product and washing the textile product.

However, from the viewpoint of having the effect of the present invention, the method is preferably a method including putting the detergent article for textile products of the present invention, water, and a textile product into a washer tub, and making the detergent article for textile products of the present invention become entangled in the textile product to apply external force to the textile product and the detergent article, thereby dissolving the detergent article in the water, thus preparing the detergent liquid of the present invention and washing the textile product concurrently.

[0063]

When the detergent article for textile products of the present invention and the water are mixed in the method for washing a textile product of the present invention, an amount of the water is adjusted such that a total amount of the detergent composition of the present invention contained in the detergent article for textile products of the present invention is a concentration of preferably 0.1 g or more, more preferably 0.2 g or more, and further preferably 0.3 g or more, and preferably 10 g or less, more preferably 5 g or less, and further preferably 1.0 g or less relative to 1 L of the water from the viewpoints of washing performance and rinsing performance.

[0064]

In the washing method of the present invention, a temperature of the water is preferably 10°C or more, more preferably 20°C or more, and further preferably 30°C or more, and preferably 100°C or less, more preferably 80°C or less, and further preferably 60°C or less from the viewpoint of washing performance.

Further, a temperature of the detergent liquid of the present invention may fall within the above range. Further, a temperature of water used in the washing method, for example, water such as water used for rinsing or the like may also fall within the above range.

[0065]

A pH at 25°C of the detergent liquid of the present invention is preferably 8.0 or more, more preferably 9.0 or more, and further preferably 10.0 or more, and preferably 13.0 or less, more preferably 12.0 or less, and further preferably 11.0 or less from the viewpoint of washing performance.

The pH is measured in accordance with the above pH measurement method described in the detergent article.

[0066]

In the method for washing a textile product of the present invention, a value of bath ratio expressed as a ratio of a water amount (L) of the detergent liquid containing the detergent composition of the present invention and the water to a mass (kg) of the textile product, in other words, a value of a water amount (L) of

the detergent liquid of the present invention to a mass (kg) of the textile product, is preferably 8 or more, more preferably 10 or more, further preferably 12 or more, and furthermore preferably 15 or more, and preferably 45 or less, more preferably 40 or less, further preferably 30 or less, and furthermore preferably 20 or less from the viewpoints of washing performance and economy.

[0067]

In the method for washing a textile product of the present invention, a washing time during which the detergent article for textile products of the present invention, the textile product, and the water are brought into contact (in other words, a washing time during which the detergent liquid of the present invention and the textile product are brought into contact) is preferably 1 minute or more, more preferably 3 minutes or more, and further preferably 5 minutes or more from the viewpoint of washing performance, and preferably 1 hour or less, more preferably 45 minutes or less, and further preferably 30 minutes or less from the viewpoint of damage to clothes.

[0068]

The method for washing a textile product of the present invention is suitable as a method in which fibers are immersed in a scouring liquid while being fed by rollers or the like, or a rotating washing method. The

rotating washing method means a washing method in which textile products not fixed in a rotating device rotate around a rotation axis together with a detergent liquid. The rotating washing method can be performed by a rotating washing machine. Therefore, in the washing method of the present invention, the washing of the textile product is preferably performed with a washing machine, especially a rotating washing machine, in terms of a better finish of the textile product. Specific examples of the rotating washing machine include a front loader washing machine, a pulsator washing machine, or an agitator washing machine. As each of these rotating washing machines, a commercially available product for household use can be used.

[0069]

The method can include rinsing and dewatering after the washing of the textile product. The rinsing and dewatering can be performed with a washing machine. The rinsing and dewatering can be alternately performed multiple times.

The method can include drying after the rinsing and dewatering. The drying may be either natural drying or heat drying. Each drying can be performed multiple times.

[0070]

The aspects of the present invention are illustrated below. The matters stated in the detergent

article for textile products and the method for washing a textile product of the present invention can be appropriately applied to these aspects.

[0071]

<1>

A detergent article for textile products containing a detergent composition wrapped in a water-soluble film, the composition containing (a) a surfactant (hereinafter referred to as component (a)) in an amount of 5 mass% or more and 80 mass% or less, wherein a major-axis diameter of a maximum projection area of the detergent article is 30 mm or more and 200 mm or less, an aspect ratio of the major-axis diameter to a minor-axis diameter orthogonal to the major-axis diameter (major-axis diameter/minor-axis diameter) is 5 or more, and a breaking strength of the detergent article is 300 N or more.

[0072]

<2>

The detergent article for textile products according to <1>, wherein the detergent article is composed of the detergent composition and the water-soluble film, the detergent composition is wrapped in the water-soluble film, a major-axis diameter of a maximum projection area of the detergent article is 30 mm or more and 200 mm or less, an aspect ratio of the major-axis diameter to a minor-axis diameter orthogonal to the

major-axis diameter (major-axis diameter/minor-axis diameter) is 5 or more, and a breaking strength of the detergent article is 300 N or more.

[0073]

<3>

The detergent article for textile products according to <1> or <2>, wherein the detergent composition contains component (a) in the detergent composition in an amount of preferably 5 mass% or more, more preferably 10 mass% or more, and further preferably 20 mass% or more, and preferably 80 mass% or less, more preferably 50 mass% or less, and further preferably 30 mass% or less.

[0074]

<4>

The detergent article for textile products according to any of <1> to <3>, wherein the detergent composition is a solid detergent composition.

[0075]

<5>

The detergent article for textile products according to <4>, wherein the detergent composition is a solid detergent composition, and contains component (a) in the detergent composition in an amount of preferably 5 mass% or more, more preferably 10 mass% or more, and further preferably 20 mass% or more, and preferably 40 mass% or less and more preferably 30 mass% or less.

[0076]

<6>

The detergent article for textile products according to any of <1> to <3>, wherein the detergent composition is a liquid detergent composition, and contains component (a) in the detergent composition in an amount of preferably 20 mass% or more, more preferably 30 mass% or more, and further preferably 40 mass% or more, and preferably 80 mass% or less, more preferably 70 mass% or less, and further preferably 60 mass% or less.

[0077]

<7>

The detergent article for textile products according to any of <1> to <6>, wherein component (a) is one or more selected from (a1) a nonionic surfactant (hereinafter referred to as component (a1)) and (a2) an anionic surfactant (hereinafter referred to as component (a2)), and a mass ratio of a content of component (a1) to a content of component (a2) in the detergent composition, $(a1)/(a2)$, is 0.1 or more and 10 or less.

[0078]

<8>

The detergent article for textile products according to <7>, wherein component (a) contains components (a1) and (a2), and the mass ratio $(a1)/(a2)$ is preferably 0.1 or more, more preferably 0.4 or more, further preferably 0.6 or more, and furthermore

preferably 1 or more, and preferably 10 or less, more preferably 8 or less, further preferably 6 or less, furthermore preferably 4 or less, and furthermore preferably 2 or less.

[0079]

<9>

The detergent article for textile products according to any of <1> to <8>, wherein a thickness of the water-soluble film is preferably 70 μm or more and more preferably 100 μm or more, and preferably 200 μm or less and more preferably 140 μm or less.

[0080]

<10>

The detergent article for textile products according to any of <1> to <9>, wherein the aspect ratio (major-axis diameter/minor-axis diameter) is 5 or more, preferably 6 or more, more preferably 7 or more, and further preferably 8 or more, and preferably 20 or less, more preferably 16 or less, further preferably 13 or less, and furthermore preferably 10 or less.

[0081]

<11>

The detergent article for textile products according to any of <1> to <10>, wherein the major-axis diameter of the maximum projection area of the detergent article for textile products is 30 mm or more, preferably 50 mm or more, and more preferably 80 mm or more, and 200

mm or less, preferably 160 mm or less, and more preferably 120 mm or less.

[0082]

<12>

The detergent article for textile products according to any of <1> to <11>, wherein the minor-axis diameter of the maximum projection area of the detergent article for textile products is preferably 5 mm or more, more preferably 10 mm or more, further preferably 12 mm or more, and furthermore preferably 14 mm or more, and preferably 25 mm or less, more preferably 23 mm or less, and further preferably 20 mm or less.

[0083]

<13>

The detergent article for textile products according to any of <1> to <12>, wherein the breaking strength of the detergent article for textile products is 300 N or more, preferably 350 N or more, and more preferably 400 N or more.

[0084]

<14>

The detergent article for textile products according to any of <1> to <13>, wherein a detergent liquid obtained by diluting the detergent article for textile products with water to achieve a concentration of the contained detergent composition of 0.2 g/L has a pH at 25°C of preferably 8.0 or more, more preferably 9.0 or

more, and further preferably 10.0 or more, and preferably 13.0 or less, more preferably 12.0 or less, and further preferably 11.0 or less.

[0085]

<15>

The detergent article for textile products according to any of <1> to <14>, wherein the article is used for washing textile products with a washing machine.

[0086]

<16>

A method for washing a textile product including bringing the detergent article for textile products according to any of <1> to <15> into contact with the textile product and water.

[0087]

<17>

The method for washing a textile product according to <16>, wherein the textile product is washed with a washing machine by putting the detergent article, the textile product, and the water into a washer tub.

Examples

[0088]

The following components were used in the detergent composition of examples and comparative examples. The formulation composition of each component in a table is a net amount of each component.

<Component (a)>

· C12EO10: polyoxyethylene lauryl ether (the average number of added moles of oxyethylene group is 10 mol), EMULGEN 110, manufactured by Kao Corporation, component (a1)

· LAS: sodium lauryl benzene sulfonate, NEOPELEX FS, manufactured by Kao Corporation, component (a2)

<Component (b)>

· Sodium sulfate, manufactured by FUJIFILM Wako Pure Chemical Corporation

· Sodium chloride, manufactured by FUJIFILM Wako Pure Chemical Corporation

<Component (c)>

· Sodium carbonate, manufactured by FUJIFILM Wako Pure Chemical Corporation

<Component (d)>

· Zeolite: synthetic zeolite, A-4, powder, passing through 75 μm (200 mesh), manufactured by FUJIFILM Wako Pure Chemical Corporation

<Component (e)>

· Sodium polyacrylate: mass average molecular weight 10,000, POIZ 536, manufactured by Kao Corporation

<Component (f)>

· Polyethylene glycol: mass average molecular weight 13,000, PEG-13000, manufactured by Mitsui Chemicals, Inc.
[0089]

<Preparation of detergent composition>

Components (b), (c), (e), and (f) were mixed to prepare a slurry, and the slurry was spray-dried to obtain spray-dried particles. After C12EO10 of component (a) was added and mixed into the spray-dried particles, dry neutralization was performed with LAS of component (a). Finally, the reaction product was put to a high-speed mixer (manufactured by Fukae Kogyo Ltd.), and component (d), which was the remaining component blended later, was dry-mixed to obtain a powdery solid detergent composition with a bulk density of 0.70 to 0.90 g/cm³. The makeup of the solid detergent composition is shown in Table 1.

[0090]

[Table 1]

				Formulation 1
Detergent composition	Formulation composition (mass%)	(a)	C12EO10	10
			LAS	10
		(b)	Sodium sulfate	15
			Sodium chloride	5
		(c)	Sodium carbonate	30
		(d)	Zeolite	20
		(e)	Sodium polyacrylate	5
		(f)	Polyethylene glycol	2
		Water		
	Total			100

[0091]

<Preparation of detergent articles>

Two sheets of 76 μ m water-soluble film (M8685, manufactured by KURARAY CO., LTD.) cut to the preset rectangular size for each of the examples and comparative examples were stacked, and using a heat sealer (manufactured by FUJIIMPULSE CO., LTD.) and setting the sealing condition of the heat sealer to 8, three sides of the sheets of water-soluble film were fused with the heat sealer by a width of 2 mm from the edge of each side to prepare a pouch with only one side left open. In both the examples and comparative examples, 15 g of the detergent composition in Table 1 was placed in this pouch. Thereafter, the one side of the pouch left open was fused and closed by the heat sealer to obtain each columnar detergent article containing the detergent composition wrapped in the water-soluble film. The maximum projection area of each obtained detergent article was rectangular, and the major-axis diameter of the maximum projection area and the aspect ratio of the major-axis diameter to the minor-axis diameter orthogonal to the major-axis diameter (major-axis diameter/minor-axis diameter) were as shown in Table 2. Further, the total area of the water-soluble film was 48 cm². Note that the area of the sealing portion of the water-soluble film was included in the maximum projection area in the measurement of the maximum projection area.

Further, the total contact area of the water-soluble film with the detergent composition was

determined by doubling the product of the length of the major-axis diameter of the detergent article excluding the sealing portion (4 mm) and the length of the minor-axis diameter of the detergent article excluding the sealing portion (4 mm), and those in examples 1 to 5 were 30.4 cm², 34.2 cm², 35.6 cm², 37.1 cm², and 38.6 cm², respectively.

[0092]

<Measurement of breaking strength>

The breaking strength of each prepared detergent article in Table 2 was measured. In a measurement environment under a condition of room temperature (20°C)/relative humidity of about 50%, using a compression tester (AUTOGRAPH AG-X, manufactured by Shimadzu Science Corporation), each detergent article was placed such that the surface attaining the maximum projection area came in contact with a fixed compression plate of the compression tester (which was not a spherically seated compression plate and had an area larger than the maximum projection area of each detergent article), and a compression force of 300 N was added thereto at a rate of 200 mm/min to make an evaluation. As a result, the detergent articles of both the examples and comparative examples did not break at the compression force of 300 N, demonstrating that the breaking strength was 300 N or more.

[0093]

<Washing performance evaluation>

Preparation of model sebum stain

A model sebum stain having the following composition was prepared, and used for the preparation of artificially contaminated cloth containing the model sebum stain.

· Composition of model sebum stain:

lauric acid 0.44 mass%, myristic acid 3.15 mass%,
pentadecanoic acid 2.35 mass%, palmitic acid 6.31 mass%,
heptadecanoic acid 0.44 mass%, stearic acid 1.6 mass%,
oleic acid 7.91 mass%, triolein 13.33 mass%, n-hexadecyl
palmitate 2.22 mass%, squalene 6.66 mass%, and water of
the balance (100 mass% in total)

[0094]

Preparation of artificially contaminated cloth

The model sebum stain of the above composition was applied to pieces of cotton/polyester blend broadcloth (cotton/polyester ratio = 35/65, purchased from Tanigashira Shoten) with a size of 6 cm × 6 cm by gravure-coating in an amount of 100 mg per piece to prepare the artificially contaminated cloth used.

[0095]

Washing method

Four pieces of the prepared artificially contaminated cloth were sewn onto the chest portions of cotton T-shirts (manufactured by GUNZE LIMITED). A top loader washing machine (manufactured by Panasonic

Corporation, NA-F70PB1) was used as a washing machine. Each prepared detergent article was placed onto the bottom of the washer tub, and then the cotton T-shirts (manufactured by GUNZE LIMITED) were put thereto to make a total weight of 2 kg.

In both the examples and comparative examples, water was added to achieve a concentration of the detergent composition contained in the detergent article in the washer tub of 0.5 g/L, and washing was performed for a washing time of 9 minutes, one time of rinsing, and for a dewatering time of 7 minutes. Further, the temperature of water used for washing and rinsing was 20°C.

Note that, in both the examples and comparative examples, detergent liquids obtained by diluting the detergent articles with water to achieve a concentration of the contained detergent composition of 0.2 g/L had a pH of 10.2 at 25°C.

Further, in place of each detergent article, the detergent composition in Table 1 not wrapped in the water-soluble film was put to the washer tub, and the same washing method as above was performed. This was used as a reference example.

[0096]

Washing performance evaluation

The four pieces of artificially contaminated cloth sewn onto the cotton T-shirts were removed, and washing

rates were measured by the following method and the average value of the four pieces was determined.

The reflectances at 550 nm of the original cloth before contamination and a pre-washing piece and the post-washing pieces of artificially contaminated cloth were measured by a colorimeter (manufactured by NIPPON DENSHOKU INDUSTRIES CO., LTD., SE-2000) to determine the washing rates (%) by the formula below, and the average value of the four pieces was calculated.

$$\text{Washing rate (\%)} = 100 \times [(\text{reflectance of post-washing piece} - \text{reflectance of pre-washing piece}) / (\text{reflectance of original cloth} - \text{reflectance of pre-washing piece})]$$

For the calculated washing rates of the examples and comparative examples, the relative washing rates (%) with respect to the reference example using the detergent composition not wrapped in the water-soluble film were calculated with the washing rate of the reference example as 100%. The results are shown in Table 2. The higher the relative washing rate, the more the reduction in washing power could be suppressed even if the detergent composition was wrapped in the water-soluble film.

[0097]

[Table 2]

	Example					Comparative example				
	1	2	3	4	5	1	2	3	4	5
Type of detergent composition	Formulation 1	Formulation 1	Formulation 1	Formulation 1	Formulation 1	Formulation 1	Formulation 1	Formulation 1	Formulation 1	Formulation 1
Major-axis diameter of detergent article (mm)	200	175	140	120	110	104	98	88	68	49
Aspect ratio of detergent article (major-axis diameter/minor-axis diameter)	17.0	12.5	8.2	6.0	5.0	4.5	4.0	3.0	2.0	1.0
Relative washing rate (%)	94.8	93.1	92.2	90.9	90.5	87.7	85.9	85.3	76.7	72.3

CLAIMS

[Claim 1]

A detergent article for textile products comprising a detergent composition wrapped in a water-soluble film, the composition containing (a) a surfactant (hereinafter referred to as component (a)) in an amount of 5 mass% or more and 80 mass% or less, wherein a major-axis diameter of a maximum projection area of the detergent article is 30 mm or more and 200 mm or less, an aspect ratio of the major-axis diameter to a minor-axis diameter orthogonal to the major-axis diameter (major-axis diameter/minor-axis diameter) is 5 or more, and a breaking strength of the detergent article is 300 N or more.

[Claim 2]

The detergent article for textile products according to claim 1, wherein a thickness of the water-soluble film is 70 μm or more and 200 μm or less.

[Claim 3]

The detergent article for textile products according to claim 1 or 2, wherein the aspect ratio (major-axis diameter/minor-axis diameter) is 5 or more and 20 or less.

[Claim 4]

The detergent article for textile products according to any one of claims 1 to 3, wherein the detergent composition is a solid detergent composition.

[Claim 5]

The detergent article for textile products according to any one of claims 1 to 4, wherein a detergent liquid obtained by diluting the detergent article for textile products with water to achieve a concentration of the contained detergent composition of 0.2 g/L has a pH of 9.0 or more at 25°C.

[Claim 6]

The detergent article for textile products according to any one of claims 1 to 5, wherein the component (a) is one or more selected from (a1) a nonionic surfactant (hereinafter referred to as component (a1)) and (a2) an anionic surfactant (hereinafter referred to as component (a2)), and a mass ratio of a content of the component (a1) to a content of the component (a2) in the detergent composition, (a1)/(a2), is 0.1 or more and 10 or less.

[Claim 7]

The detergent article for textile products according to any one of claims 1 to 6, wherein the

article is used for washing textile products with a washing machine.

[Claim 8]

A method for washing a textile product comprising bringing the detergent article for textile products according to any one of claims 1 to 7 into contact with the textile product and water.

[Claim 9]

The method for washing a textile product according to claim 8, wherein washing is performed with a washing machine by putting the detergent article, the textile product, and the water into a washer tub.