

Description

Title of the invention

POWDERED DETERGENT COMPOSITION FOR CLOTHING

Field of the invention

[0001]

The present invention relates to a powdered detergent composition for clothing and a method for laundering clothing.

Background of the invention

[0002]

There are many cases where anionic surfactants such as alkylbenzene sulfonic acid (salt) of a washing component are used in detergents for clothing as a main base. It has also been known that the detergency of anionic surfactants is affected by the hardness components in water used for washing. Hence, it is general that builders such as a zeolite or a tripolyphosphate are normally concurrently used in order to remove the hardness components from water.

[0003]

A high density laundry detergent composition containing an anionic surfactant such as sodium alkylbenzenesulfonate or sodium alkylsulfate and anhydrous

magnesium sulfate is disclosed in Table 11 on page 85 and Table 28 on page 102 of JP-A 2005-160476. In these specific examples, a great amount of phosphoric acid-based builder such as a tripolyphosphate is blended.

[0004]

It is disclosed in JP-A 2009-504871 that magnesium sulfate and the like can be used as a dehydrating agent in a solid laundry detergent composition which contains an anionic deterative surfactant, a calcium augmenting technology and a zeolite builder or a phosphate builder at a low content of less than 5% by mass and is in a particulate form.

[0005]

A solid laundry detergent is disclosed in JP-A 2009-504836 which contains an alkylbenzenesulfonate, a hydratable material and a zeolite builder or a phosphate builder at a low content of less than 5% by mass. As the hydratable material, sodium carbonate and/or magnesium sulfate are mentioned in claim 4 of JP-A 2009-504836. It is described in paragraph [0016] of JP-A 2009-504836 that the purpose to use the hydratable material is to suppress the deterioration in physical stability of the solid laundry detergent, especially the cake strength caused when the content of the zeolite builder or the phosphate builder is decreased. The hydratable material of JP-A 2009-504836 is

suggested to be in an anhydrous form from the description in paragraph [0024] and the like as it is preferable that a hydratable material have a predetermined hydration index.
[0006]

A detergent composition for hand-washing is disclosed in JP-A 2012-236978 which contains menthol, camphor and a perfume component having 2 or more and 7 or less of log Pow and one or more detergent components selected from a surfactant, an alkali agent and a sequestering agent and can provide a feel of coolness at the time of hand-washing.
[0007]

An ultra-concentrated liquid laundry detergent composition is disclosed in JP-A 2012-500306, which contains a non-ionic surfactant, an anionic surfactant and a dispersing auxiliary agent in cold water and exhibits excellent dispersibility in water at a low temperature. As the dispersing auxiliary agent in cold water, magnesium sulfate heptahydrate is described in claims 11 and 12.
[0008]

A detergent bar containing an alkylbenzenesulfonate, an alkylsulfate and a 25% by weight aqueous solution of magnesium sulfate at 2.9% by weight is described in US 5,013,486. It is described that magnesium sulfate hardens the detergent bar.

Summary of the invention

[0009]

The invention relates to a powdered detergent composition for clothing containing:

the following component (A) at 10% by mass or more and 30% by mass or less;

the following component (B) at 1.5% by mass or more and 10% by mass or less as a value converted into anhydrous magnesium sulfate; and

the following component (C) at 8% by mass or less, in which

a mass ratio of the component (a1) to the component (a2), that is, $\text{component (a1)}/\text{component (a2)}$ is 0.5 or more and 5 or less, and

the component (a1) and the component (a2) are contained in the component (A) at 60% by mass or more and 100% by mass or less in total.

Component (A): a surfactant containing the following component (a1) and component (a2)

Component (a1): an alkylbenzenesulfonate

Component (a2): an alkylsulfate

Component (B): one or more kinds of compounds selected from anhydrous magnesium sulfate and a magnesium sulfate hydrate

Component (C): one or more kinds of compounds selected from a zeolite and a tripolyphosphate

[0010]

In addition, the invention relates to a method for laundering clothing including:

hand-washing clothing with a washing liquid prepared by mixing 1 g or more and 10 g or less of the above powdered detergent composition for clothing of the invention with 1 liter of water having the German hardness of 5° DH or more and 30° DH or less.

Detailed description of the invention

[0011]

Clothing such as fashionable clothes is hand-washed in Japan as well. Furthermore, it is known that there is a custom to hand-wash even clothing for everyday use in Southeast Asia.

[0012]

In Southeast Asia district, it is a hot and humid environment, the work of hand-washing takes time and effort, and also a great amount of oily stains such as sebum stains adheres to the clothing. In addition, there are regions where water exhibits a high hardness of more than 5° DH (especially 8° DH). It has been found that there is a problem that stain removal from clothing decreases, the sebum stains makes it hard to foam at the time of washing, and the foam hardly endures when there are a great

amount of sebum stains in the washing liquid. It has been revealed that the detergent used is required not only (1) to remove the stains from clothing, but is also newly required (2) to provide firm and enduring foam at the time of hand-washing, and (3) to provide a favorable feel without warming the hand too much (hot) at the time of hand-washing. In addition, mud stains are one of stubborn stains and thus higher detergency is required. It has been revealed that stain removal of mud stains is also required in "(1) stain removal from clothing" above.

[0013]

A zeolite or a tripolyphosphate is used as the component to decrease the hardness of water in order to decrease the hardness components in water and thus to suppress a decrease in detergency of the anionic surfactant.

However, it has been revealed that there is a problem that it is not only economically undesirable but also it is hardly foamed and the foam hardly endures at the time of hand-washing when these components are blended in a great amount.

[0014]

In other words, the detergent compositions used in hand-washing is desired to exert high detergency for oily stains and detergency for particle stains such as mud in

water having a high hardness even when the content of a zeolite or a tripolyphosphate is decreased as well as to provide firm and enduring foam at the time of hand-washing and a washing liquid with a favorable feel.

[0015]

The invention provides a powdered detergent composition for clothing which can maintain high detergency for oily stains, foaming at the time of hand-washing and foam durability after hand-washing even when washing with water having a high hardness and a washing liquid containing a great amount of sebum stains, and provides a favorable feel without warming the hand too much (hot) at the time of hand-washing. Furthermore, the invention provides a powdered detergent composition for clothing which is excellent in detergency for mud stains adhered to clothing even when using water having a high hardness.

[0016]

The invention provides a powdered detergent composition for clothing which can maintain high detergency for oily stains, foaming at the time of hand-washing and foam durability after hand-washing even when washing with water having a high hardness and a washing liquid containing a great amount of sebum stains, provides a favorable feel without warming the hand too much (hot) at the time of hand-washing, and is suitable for hand-washing

is provided. Furthermore, a powdered detergent composition for clothing which is excellent in detergency for mud stains adhered to clothing even when using water having a high hardness.

[0017]

An aspect of the invention includes a powdered detergent composition for clothing containing:

the following component (A) at 10% by mass or more and 30% by mass or less;

the following component (B) at 1.5% by mass or more and 10% by mass or less as magnesium sulfate; and

the following component (C) at 8% by mass or less, in which

a mass ratio of the component (a1) to the component (a2), that is, component (a1)/component (a2) is 0.5 or more and 5 or less, and

the component (a1) and the component (a2) are contained in the component (A) at 60% by mass or more and 100% by mass or less in total.

Component (A): a surfactant containing the following component (a1) and component (a2)

Component (a1): an alkylbenzenesulfonate

Component (a2): an alkylsulfate

Component (B): magnesium sulfate heptahydrate

Component (C): one or more kinds of compounds selected from

a zeolite and a tripolyphosphate

In addition, an aspect of the invention relates to a method for laundering clothing including:

hand-washing clothing with a washing liquid prepared by mixing 1 g or more and 10 g or less of the powdered detergent composition for clothing of the above-described aspect of the invention with 1 liter of water having the German hardness of 5° DH or more and 30° DH or less.

[0018]

<Component (A)>

The component (A) is a surfactant containing the following component (a1) and component (a2) under a predetermined condition.

Component (a1): an alkylbenzenesulfonate

Component (a2): an alkylsulfate

[0019]

[Component (a1)]

The alkylbenzenesulfonate of the component (a1) is not particularly limited, and examples thereof include an alkylbenzenesulfonate having an alkyl group and preferably a linear alkyl group having, for example, 8 or more, preferably 10 or more and more preferably 12 or more, and 20 or less and preferably 16 or less carbon atoms.

[0020]

Examples of the alkylbenzenesulfonate include a salt

of an alkali metal such as sodium and potassium and an alkanolamine salt from the viewpoint of detergency or the storage stability of the composition. In the case of preparing the composition of the invention, an alkylbenzenesulfonic acid (acid form) may be added into the composition and then converted into an alkylbenzenesulfonate by the neutralization reaction with an alkali in the mixed system of the powdered component, or an alkylbenzenesulfonate may be added into the composition after being neutralized in advance. It is possible to use a base such as sodium hydroxide, potassium hydroxide, lithium hydroxide and ammonium hydroxide for the neutralization of alkylbenzenesulfonic acid. The salt constituting the component (a1) is preferably a salt of an alkali metal such as sodium and potassium and more preferably a sodium salt.

[0021]

[Component (a2)]

The component (a2) of the invention is an alkylsulfate, and the alkyl group preferably has 10 or more and 16 or less carbon atoms. In other words, the component (a) is preferably an alkylsulfate having an alkyl group and preferably a linear alkyl group having 10 or more and 16 or less carbon atoms. The component (a2) is preferably an alkylsulfate in which the proportion of a linear alkyl

group having 12 or more and 16 or less carbon atoms in the entire alkyl groups is 50% by mass or more. It is preferably an alkylsulfate in which the proportion of a linear alkyl group having 12 carbon atoms in the entire alkyl groups is preferably 40% by mass or more, more preferably 50% by mass or more and more preferably 60% by mass or more from the viewpoint of foaming and foam durability at the time of washing. The component (a2) is more preferably an alkylsulfate in which the proportion of a linear alkyl group having 12 or more and 16 or less carbon atoms in the entire alkyl groups is 50% by mass or more and the proportion of a linear alkyl group having 12 carbon atoms in the entire alkyl groups is preferably 40% by mass or more, more preferably 50% by mass or more and more preferably 60% by mass or more. In addition, in the component (a2), the proportion of a linear alkyl group in the entire alkyl groups is preferably 50% by mass or more, more preferably 70% by mass or more, more preferably 90% by mass or more, more preferably 99% by mass or more and more preferably 100% by mass, that is, the component (a2) is more preferably a linear alkylsulfate from the viewpoint of reducing the environmental burden by the use of a reproducible raw material.

[0022]

Examples of the salt constituting the component (a2)

include a salt of an alkali metal such as sodium and potassium, an alkanolamine salt and a salt of an alkaline earth metal such as magnesium and calcium, but an alkali metal salt is preferable and a sodium salt is more preferable from the viewpoint of washing performance, foaming properties and solubility.

[0023]

In the invention, the mass ratio of the component (a1) to the component (a2), that is, component (a1)/component (a2) is 0.5 or more and 5 or less.

The mass ratio of component (a1)/component (a2) is 5 or less, preferably 4.8 or less, and more preferably 4.6 or less, more preferably 4.3 or less, more preferably 4.0 or less, more preferably 3.5 or less, more preferably 2.5 or less, more preferably 2.4 or less, more preferably 2.2 or less and more preferably 2.0 or less from the viewpoint that detergency for mud stains can be maintained even when the powdered detergent composition for clothing of the invention contains a great amount of the component (B).

The mass ratio of component (a1)/component (a2) is 5 or less, preferably 4.8 or less, more preferably 4.6 or less, more preferably 4.3 or less, more preferably 2.5 or less, more preferably 2.4 or less, more preferably 2.2 or less, more preferably 2.0 or less and more preferably 1.8 or less from the viewpoint that detergency for oily stains

can be maintained even when the powdered detergent composition for clothing of the invention contains a great amount of magnesium sulfate heptahydrate.

The mass ratio of component (a1)/component (a2) is 5.0 or less, preferably 4.8 or less, more preferably 4.6 or less, more preferably 4.3 or less, more preferably 2.5 or less, more preferably 2.4 or less, more preferably 2.2 or less, more preferably 2.0 or less and more preferably 1.8 or less from the viewpoint that detergency for oily stains can be maintained even when the powdered detergent composition for clothing of the invention contains a great amount of a magnesium sulfate hydrate or anhydrous magnesium sulfate other than magnesium sulfate heptahydrate.

The mass ratio of component (a1)/component (a2) is 0.5 or more, preferably 0.6 or more, more preferably 0.7 or more and more preferably 0.9 or more from the viewpoint of foam durability at the time of washing under a condition to have a high hardness.

The mass ratio of component (a1)/component (a2) is preferably 0.9 or more and 1.8 or less from the viewpoint that detergency for oily stains can be compatible with foam durability at the time of washing.

The mass ratio of component (a1)/component (a2) is preferably 0.9 or more, more preferably 1.1 or more, more

preferably 1.2 or more, more preferably 1.4 or more and more preferably 1.5 or more and preferably 6.0 or less, more preferably 5.0 or less, more preferably 4.8 or less, more preferably 4.6 or less, more preferably 4.3 or less, more preferably 2.5 or less, more preferably 2.4 or less, more preferably 2.2 or less and more preferably 2.0 or less from the viewpoint that detergency for oily stains and mud stains can be compatible with foam durability at the time of washing.

[0024]

In addition, in the invention, the component (a1) and the component (a2) are contained in the component (A) at 60% by mass or more and 100% by mass or less in total. The component (a1) and the component (a2) are contained in the component (A) at preferably 70% by mass or more, more preferably 80% by mass or more, more preferably 90% by mass or more and more preferably 100% by mass in total from the viewpoint of foaming and foam durability at the time of hand-washing.

[0025]

It is possible to contain a surfactant other than the component (a1) and the component (a2) as the component (A). Examples of the surfactant other than the component (a1) and the component (a2) include an anionic surfactant selected from a polyoxyalkylene alkyl ether sulfate [the

polyoxyalkylene group has a polymerization degree of the oxyalkylene group of 1 or more and 10 or less, and the alkyl group has 12 or more and 16 or less carbon atoms], an α -sulfofatty acid alkyl ester, an α -olefinsulfonate [α -olefin has 12 or more and 18 or less carbon atoms] and a fatty acid salt having 12 or more and 18 or less carbon atoms.

[0026]

In addition, examples of the component (A) include a nonionic surfactant selected from a polyoxyalkylene sorbitan fatty acid ester, a polyoxyalkylene fatty acid ester, a polyoxyalkylene alkyl ether, a polyoxyalkylene alkylphenyl ether, a sucrose fatty acid ester, a sorbitan fatty acid ester, a fatty acid alkanolamide and an alkyl glycoside, a cationic surfactant selected from a mono- or dialkylamine and a polyoxyethylene adduct thereof and a mono- or di-long chain alkyl quaternary ammonium salt and an amphoteric surfactant selected from a carboxybetaine, a sulfobetaine and a hydroxy sulfobetaine. The alkyl group of the nonionic surfactant, the cationic surfactant and the amphoteric surfactant above is preferably a primary or secondary alkyl group having 12 or more and 16 or less carbon atoms. The fatty acid preferably has 12 or more and 16 or less carbon atoms. The oxyalkylene group is preferably an oxyalkylene group having 2 or more and 4 or

less carbon atoms, and it is more preferable to contain an oxyethylene group as the oxyalkylene group. The polyoxyalkylene group is preferably a group having 2 or more and 40 or less repeating units of the oxyalkylene group. In other words, the average added mole number is preferably 2 or more and 40 or less in the case of being expressed by the average added mole number of alkylene oxide. The alkanol group is preferably an ethanol group (hydroxyethyl group).

[0027]

The content of the surfactant other than the component (a1) and the component (a2) in the component (A) is less than 40% by mass, preferably less than 30% by mass, more preferably less than 20% by mass, more preferably less than 10% by mass and more preferably 0% by mass, that is, it is more preferable that the surfactant other than the component (a1) and the component (a2) be not contained in the component (A) from the viewpoint of detergency for oily stains and foam durability at the time of washing.

[0028]

The component (A) can be blended as a mixture containing the component (a1), the component (a2) and the other surfactant upon preparing the powdered detergent composition for clothing of the invention. In addition, it is also possible to blend the component (a1), the component

(a2) and the other surfactant separately upon preparing the powdered detergent composition for clothing of the invention.

[0029]

[Component (B)]

The component (B) is one or more kinds of compounds selected from anhydrous magnesium sulfate and a magnesium sulfate hydrate. Combined use of the component (B) with the component (a1) and component (a2) can maintain detergency for sebum stains, foaming at the time of hand-washing and foam durability after hand-washing even when using water having a high hardness as washing water.

In addition, the powdered detergent composition for clothing of the invention contains a specific amount of component (B) and thus exhibits excellent detergency of mud stains in the case of being used in washing with water having a high hardness, for example, water having a hardness of 8° DH or more. Magnesium contained in the component (B) of the invention is a hardness component which is said to form a scum with the anionic surfactant of the washing component in the washing liquid and thus to lower the washing effect. It has been demonstrated that detergency of mud stains is surprisingly improved when magnesium from the component (B) is supplied to water having a high hardness, for example, water having a

hardness of 8° DH or more.

In addition, the feel at the time of hand-washing is more favorable when the component (B) is a magnesium sulfate hydrate.

[0030]

The component (B) is preferably a magnesium sulfate hydrate, and specific examples thereof include magnesium sulfate monohydrate, magnesium sulfate hexahydrate, magnesium sulfate heptahydrate and magnesium sulfate dodecahydrate. Magnesium sulfate heptahydrate is more preferable. Magnesium sulfate heptahydrate is preferable since it is excellent in detergency for sebum stains and mud stains in the case of using water having a high hardness as washing water, foaming at the time of hand-washing, foam durability after hand-washing and a feel at the time of hand-washing. In addition, magnesium sulfate heptahydrate is also preferable from the viewpoint of the storage stability of the powdered detergent composition for clothing, particularly from the viewpoint that the solidification thereof hardly occurs during storage. Magnesium sulfate heptahydrate having a powdery shape or a granular shape can be used.

[0031]

[Component (C)]

The component (C) is one or more kinds of compounds

selected from a zeolite and a tripolyphosphate.

[0032]

A zeolite is also referred to as a crystalline aluminosilicate. It is possible to contain a crystalline aluminosilicate such as an A-type zeolite, an X-type zeolite and a P-type zeolite as a specific zeolite. The 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. An A-type al (for example, "Toyobuilder", trade name: manufactured by TOSOH CORPORATION, oil-absorbing ability by JIS K 5101 Method: 40 mL/100 g or more) is preferable as a suitable crystalline aluminosilicate. In addition to this, those suitable include a P-type zeolite (for example, "Doucil A24" and "ZSE064", trade names; both of them are manufactured by Crosfield Group; oil-absorbing ability: 60 to 150 mL/100 g), an X-type zeolite (for example, "WessalithXD", trade name; manufactured by Degussa; oil-absorbing ability: 80 to 100 mL/100 g) and a hybrid zeolite described in WO-A 9842622.

[0033]

As the counter ion in a tripolyphosphate, an alkali metal ion is preferable and an ion selected from a sodium ion and a potassium ion is more preferable. The mass ratio of the sodium ion and the potassium ion in the entire

counter ions is preferably 70% by mass or more and more preferably 85% by mass or more. It is possible to concurrently use an orthophosphate and a pyrophosphate with a tripolyphosphate. The amount of a tripolyphosphate, an orthophosphate and a pyrophosphate and the mass ratio thereof to one another are suitably tripolyphosphate/orthophosphate/pyrophosphate = (80 parts by mass or more and 97 parts by mass or less)/(1 part by mass or more and 10 parts by mass or less)/(2 parts by mass or more and 10 parts by mass or less) (the amount is calculated as an anhydride).

[0034]

The powdered detergent composition for clothing of the invention preferably contains a zeolite as the component (C). Furthermore, the powdered detergent composition for clothing of the invention can also contain a tripolyphosphate as the component (C).

[0035]

[Powdered detergent composition for clothing]

The powdered detergent composition for clothing of the invention is suitable for hand-washing. It is suitable as a powdered detergent composition for preparing a washing liquid used in hand-washing as described in detail below. In addition to this, it is suitable as a detergent used in washing clothing in contact with water by scrubbing while

the powdered detergent composition for clothing of the invention is sprinkled on a part of the clothing immersed in the water used for washing. In addition, it is suitable as a detergent used in preparing the washing liquid by taking an appropriate amount of the powdered detergent composition for clothing of the invention in hand and immersing the hand in water used for washing and then mixing with water while stirring and washing clothing by immersing it in this washing liquid and rubbing.

[0036]

The content of the component (A) in the powdered detergent composition for clothing of the invention is 10% by mass or more and 30% by mass or less, and the content of the component (A) is preferably 12% by mass or more, more preferably 14% by mass and more preferably 16% by mass or more from the viewpoint of detergency and foaming and foam durability at the time of hand-washing. The content of the component (A) in the powdered detergent composition for clothing of the invention is preferably 25% by mass or less, more preferably 23% by mass or less, more preferably 21% by mass or less, more preferably 20% by mass or less and more preferably 19% by mass or less from the viewpoint of economic efficiency.

[0037]

In addition, the content of the component (B) in the

powdered detergent composition for clothing of the invention is 1.5% by mass or more and 10% by mass or less as a value converted into anhydrous magnesium sulfate, that is, in terms of an anhydride, and the content is preferably 1.6% by mass or more, more preferably 1.8% by mass or more, more preferably 2% by mass or more, more preferably 2.2% by mass or more, more preferably 2.5% by mass or more and more preferably 3% by mass or more from the viewpoint of foaming and foam durability at the time of hand-washing. The content of the component (B) in the composition is preferably 8% by mass or less, more preferably 7% by mass or less and more preferably 6% by mass or less as a value converted into anhydrous magnesium sulfate from the viewpoint of economic efficiency, detergency and a feel at the time of hand-washing.

[0038]

The content of component (B) in the powdered detergent composition for clothing of the invention is preferably 8% by mass or less, more preferably 7% by mass or less, more preferably 6% by mass or less, more preferably 5% by mass or less, more preferably 4% by mass or less, more preferably 3% by mass or less and more preferably 2.5% by mass or less as a value converted into anhydrous magnesium sulfate from the viewpoint of detergency for sebum stains.

[0039]

The content of component (B) in the powdered detergent composition for clothing of the invention is 1.5% by mass or more, preferably 1.6% by mass or more, more preferably 1.8% by mass or more, more preferably 2.0% by mass or more, more preferably 2.5% by mass or more, more preferably 3.0% by mass or more, more preferably 4.0% by mass or more and more preferably 5.0% by mass or more and preferably 8.0% by mass or less and more preferably 7.0% by mass or less as a value converted into anhydrous magnesium sulfate from the viewpoint of detergency of mud stains.

[0040]

In addition, the content of component (C) in the powdered detergent composition for clothing of the invention is 8% by mass or less, and it is preferably 7% by mass or less, more preferably 6.5% by mass or less and more preferably 6% by mass or less from the viewpoint of economic efficiency. The content of component (C) in the composition is 8% by mass or less, preferably 7.5% by mass or less, more preferably 7.0% by mass or less, more preferably 6.5% by mass or less, more preferably 6.0% by mass or less, more preferably 5.5% by mass or less and more preferably 5.0% by mass or less from the viewpoint of detergency of mud stains. The content of a zeolite in the composition is preferably 3% by mass or more and more

preferably 4% by mass or more from the viewpoint of detergency for sebum stains and easy weighing of the composition since it is a dry powdered. From the viewpoint of foaming and foam durability at the time of washing, it is more preferable as the content of a tripolyphosphate is lower, and the content thereof in the composition is preferably 3% by mass or less, more preferably 2 mass% or less and more preferably 0% by mass, that is, a tripolyphosphate is not contained. Incidentally, the content of a tripolyphosphate in the component (C) is calculated in terms of an anhydride.

[0041]

The powdered detergent composition for clothing of the invention can contain one or more kinds of compounds selected from an alkali metal carbonate (d1), an alkali metal chloride (d2) and an alkali metal sulfate (d3) as the component (D).

[0042]

The alkali metal carbonate (d1) exhibits an effect to enhance detergency by blending it in the powdered detergent composition for clothing of the invention as an alkali agent. Specific compounds thereof are not particularly limited, but examples thereof include one or more kinds of compounds selected from sodium carbonate and potassium carbonate.

[0043]

The alkali metal chloride (d2) and the alkali metal sulfate (d3) can enhance the ionic strength in the washing liquid and foaming properties and foam durability at the time of washing by blending them in the powdered detergent composition for clothing of the invention. Specific compounds of the alkali metal chloride (d2) are not particularly limited, but examples thereof include one or more kinds of compounds selected from sodium chloride and potassium chloride. In addition, specific compounds of the alkali metal sulfate (d3) are not particularly limited, but examples thereof include one or more kinds of compounds selected from potassium sulfate and sodium sulfate.

[0044]

As the component (D), one or more kinds of compounds selected from the alkali metal carbonate (d1) and the alkali metal sulfate (d3) is preferable from the viewpoint of foaming properties and foam durability at the time of washing. The alkali metal carbonate (d1), especially sodium carbonate among them is contained in the component (D) at preferably 20% by mass or more, more preferably 25% by mass or more and more preferably 30% by mass or more from the viewpoint of detergency of sebum stains. The alkali metal carbonate (d1) is contained in the component (D) at preferably 100% by mass or less, more preferably 90%

by mass or less, more preferably 80% by mass or less and more preferably 70% by mass or less from the viewpoint of foaming properties and foam durability at the time of washing. Incidentally, the content of the component (D) is calculated in terms of an anhydrous form.

[0045]

In addition, the content of component (D) in the powdered detergent composition for clothing of the invention is preferably 40% by mass or more and 70% by mass or less. The content of component (D) in the composition is more preferably 50% by mass or more and more preferably 55% by mass or more from the viewpoint of detergency under a condition to have a high hardness and foaming properties and foam durability at the time of hand-washing and more preferably 65% by mass or less from the viewpoint of economic efficiency.

[0046]

The powdered detergent composition for clothing of the invention can contain the following components.

(i) A surface modifier may be contained from the viewpoint of fluidity and non-caking property of the detergent particles. Examples of the surface modifying coating include a silicate compound such as an aluminosilicate, calcium silicate, silicon dioxide and a crystalline silicate compound, a clay mineral such as bentonite, talc

and clay, and a water-soluble polymer such as a polycarboxylate including carboxymethyl cellulose, polyethylene glycol, polyacrylic acid or a salt thereof and a copolymer of acrylic acid and maleic acid or a salt thereof. The content of the surface modifier in the powdered detergent composition for clothing of the invention is preferably 20% by mass or less and more preferably 15% by mass or less from the viewpoint of storage stability. In addition, the content thereof in the detergent composition of the invention is 1% by mass or more, more preferably 3% by mass or more and more preferably 5% by mass or more from the viewpoint of surface modification

(ii) A dye transferring inhibitor such as polyvinylpyrrolidone

(iii) An enzyme such as cellulase, amylase, pectinase, protease and lipase

(iv) A fluorescent dye, for example, a commercially available fluorescent dye such as Tinopal CBS (trade name, manufactured by Chiba Specialty Chemicals Inc.) or Whitex SA (trade name, manufactured by Sumitomo Chemical Co., Ltd.)

(v) An antioxidant such as butylhydroxytoluene, distyrenated cresol, sodium sulfite and sodium bisulfite

(vii) A coloring matter, a perfume, an antimicrobial

antiseptic, an antifoaming agent such as silicone
(viii) water such as ion exchanged water, tap water and
water prepared by adding sodium hypochlorite to ion
exchanged water at 0.1 to 5 mg/kg relative to the mass of
ion exchanged water

[0047]

The average particle size of the detergent
composition of the invention determined from the particle
size measured by the sieving method using a sieving machine
described in JIS K3362: 2008 (Page 58, Chapter 8, Section
1) is preferably 150 μm or more and 1000 μm or less, and
more preferably 200 μm or more and 900 μm or less and more
preferably 250 μm or more and 800 μm or less from the
viewpoint of solubility at a low temperature and stability.

[0048]

The apparent density (g/ml) of the detergent
composition of the invention measured by the method
described in JIS K3362: 2008 (Page 59, Chapter 8, Section
2) is preferably 0.15 or more and 1.2 or less, more
preferably 0.2 or more and 1.1 or less, more preferably
0.25 or more and 1.0 or less and more preferably 0.3 or
more and 0.98 or less from the viewpoint of solubility at a
low temperature and stability.

[0049]

The pH of a 1.0% by mass aqueous solution of the

detergent composition of the invention measured at 25°C according to the description of JIS K3362: 2008 (Page 60, Chapter 8, Section 3) is preferably 8 or more and 12 or less, more preferably 9 or more and 11.5 or less, more preferably 9.5 or more and 11 or less and more preferably 10 or more and 11 or less from the viewpoint of washing performance, the quantity of foam and foam durability.

[0050]

The method for producing the detergent composition of the invention is not particularly limited, and the detergent composition can be produced by a known method. It is possible to produce the detergent composition, for example, by 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 rolling granulation method, a stirring granulation method, a compaction-granulation method, a surfactant supporting method and a combination of these.

[0051]

Upon producing the detergent composition of the invention, the component (B) can be mixed with a slurry containing the component (A) and water, but it is preferable that base granules containing the component (A) and water at a low content be produced by spray drying and

then the component (B) is mixed with the base granules from the viewpoint that more favorable fluidity can be maintained even when the powdered detergent composition of the invention is stored.

[0052]

It is preferable that base granules containing the component (A) and water at 10% by mass or less be produced by spray drying and then the component (B) is mixed with the base granules from the viewpoint of favorable foaming at the time of washing. Less than 10% by mass of the entire blending amount of the component (B) may be blended in the base granules. The water content in the base granules containing the component (A) is more preferably 9% by mass or less, more preferably 8% by mass or less, more preferably 7% by mass or less and more preferably 6% by mass or less from the viewpoint that the powdered detergent for clothing of the invention exhibits fluidity.

[0053]

The powdered detergent composition for clothing of the invention is preferably a powdered detergent composition for clothing obtained by the production method including the following Process 1 to Process 3 from the viewpoint of improving detergency of sebum stains or mud stains, foaming properties and foam durability.

Process 1: a process of obtaining a slurry having a water

content of 30% by mass or more and 70% by mass or less by mixing the component (A) and water together.

Process 2: a process of obtaining base granules having a water content of 10% by mass or less by spray-drying the slurry obtained in Process 1.

Process 3: a process of mixing the base granules obtained in Process 2, the component (B) and the component (C) together.

[0054]

Less than 10% by mass of the entire blending amount of the component (B) may be used in Process 1. It is preferable to blend 93% by mass or more of the entire blending amount of the component (B) in Process 3 and the remainder thereof in Process 1, it is more preferable to blend 95% by mass or more of the entire blending amount of the component (B) in Process 3 and the remainder thereof in Process 1, and it is more preferable to blend the entire blending amount of the component (B) in Process 3 from the viewpoint of further improving foam durability.

[0055]

The water content in the slurry obtained in Process 1 above is preferably 35% by mass or more and more preferably 40% by mass or more and preferably 65% by mass or less and more preferably 60% by mass or less from the viewpoint of ease of production.

[0056]

The water content in the base granules obtained in Process 2 above is more preferably 9% by mass or less and more preferably 8% by mass or less, more preferably 7% by mass or less and more preferably 6% by mass or less from the viewpoint that the powdered detergent composition for clothing of the invention exhibits fluidity.

[0057]

The base granules, the component (B) and the component (C) may be mixed simultaneously in Process 3 above. In addition, two kinds of components selected from the base granules, the component (B) and the component (C) may be mixed together and then the remaining component may be mixed with the mixture.

[0058]

In the case of using the component (D) or an arbitrary component, it can be used in any process of Process 1 to Process 3. It is preferable to use the component (D) in Process 1 from the viewpoint of ease of production. Hence, in the case of containing the component (D), the powdered detergent composition for clothing of the invention is preferably a powdered detergent composition for clothing obtained by the production method including the following Process 1' to Process 3'.

Process 1': a process of obtaining a slurry having a water

content of 30% by mass or more and 70% by mass or less by mixing the component (A), the component (D) and water together

Process 2': a process of obtaining the base granules having a water content of 10% by mass or less by spray-drying the slurry obtained in Process 1'

Process 3': a process of mixing the base granules obtained in Process 2' , the component (B) and the component (C) together

[0059]

[Method for hand-washing]

The powdered detergent composition for clothing of the invention is suitable for hand-washing. The powdered detergent composition for clothing of the invention is suitably utilized in hand-washing as a washing liquid mixed with water. The washing method using the powdered detergent composition for clothing of the invention includes a method for washing clothing to hand-wash clothing with a washing liquid prepared by mixing 1 g or more and 10 g or less of the powdered detergent composition for clothing of the invention with 1 liter of water having the German hardness of 5° DH or more and 30° DH or less.

[0060]

In the above washing method, the concentration of the powdered detergent composition of the invention in the

washing liquid is preferably 2.5 g/L or more, more preferably 3 g/L or more and more preferably 3.5 g/L or more from the viewpoint of detergency. On the other hand, the concentration thereof is 10 g/L or less, preferably 8 g/L or less and more preferably 6 g/L or less from the viewpoint of rinsing properties. It is more preferable to use the powdered detergent composition of the invention at a concentration of 3.5 g/L or more and 5 g/L or less.

[0061]

The washing liquid contains the component (A) of the powdered detergent composition for clothing of the invention at a concentration of preferably 0.03% by mass or more and more preferably 0.06% by mass or more, and the washing liquid contains the component (A) at a concentration of preferably 0.12% by mass or less and more preferably 0.09% by mass or less from the viewpoint of economic efficiency.

[0062]

In the above washing method, water used in the preparation of the washing liquid has a hardness of 5° DH or more and 30° DH or less by the German hardness. The hardness is preferably 6° DH or more, more preferably 8° DH or more and more preferably 10° DH or more from the viewpoint that the effect of the invention is more actually recognized in excellent detergency of sebum stains and

excellent foaming properties and foam durability at the time of washing. The hardness is preferably 30° DH or less, more preferably 25° DH or less and more preferably 20° DH or less from the viewpoint of foaming properties and foam durability at the time of washing. The hardness represents the total hardness determined by the chelatometric titration method using disodium ethylenediaminetetraacetate.

[0063]

Hence, in the method for washing clothing of the invention, it is possible to hand-wash clothing with a washing liquid prepared by mixing 1 g or more, preferably 2.5 g or more, more preferably 3 g or more and more preferably 3.5 g or more and 10 g or less, preferably 8 g or less, more preferably 6 g or less and more preferably 5 g or less of the powdered detergent composition for clothing of the invention with 1 liter of water having the German hardness of 5° DH or more, preferably 6° DH or more, more preferably 8° DH or more and more preferably 10° DH or more and 30° DH or less, preferably 25° DH or less and more preferably 20° DH or less.

[0064]

In the above washing method, the ratio of the volume (L) of the washing liquid containing the powdered detergent composition for clothing of the invention to the mass (kg)

of clothing (hereinafter, referred to as the bath ratio) is preferably 3 or more and more preferably 5 or more by $[\text{volume of washing liquid (L)}]/[\text{mass of clothing (kg)}]$ from the viewpoint of ease of washing at the time of hand-washing. The bath ratio is preferably 20 or less and more preferably 10 or less from the viewpoint of detergency and foaming and foam durability at the time of washing.

[0065]

In addition, another specific method to use the powdered detergent composition of the invention also includes a method of washing clothing in contact with water by scrubbing while the powdered detergent composition for clothing of the invention is sprinkled on a part of the clothing immersed in the water used for washing. In addition, the effect of the invention can be more actually recognized by a method in which the washing liquid is prepared by taking an appropriate amount of the powdered detergent composition of the invention in hand and immersing the hand in water used for washing and then mixing with water while stirring, and clothing is immersed in this washing liquid and washed by rubbing.

[0066]

The invention further discloses the following powdered detergent composition for clothing and method for washing clothing in relation to the embodiment described

above.

[0067]

<1> A powdered detergent composition for clothing containing:

the following component (A) at 10% by mass or more and 30% by mass or less;

the following component (B) at 1.5% by mass or more and 10% by mass or less as a value converted into anhydrous magnesium sulfate; and

the following component (C) at 8% by mass or less, in which

a mass ratio of a component (a1) to a component (a2), that is, component (a1)/component (a2) is 0.5 or more and 5 or less, and

the component (a1) and the component (a2) are contained in the component (A) at 60% by mass or more and 100% by mass or less in total.

Component (A): a surfactant containing the following component (a1) and component (a2)

Component (a1): an alkylbenzenesulfonate

Component (a2): an alkylsulfate

Component (B): one or more kinds of compounds selected from anhydrous magnesium sulfate and a magnesium sulfate hydrate

Component (C): one or more kinds of compounds selected from a zeolite and a tripolyphosphate.

[0068]

<2> The powdered detergent composition for clothing according to <1>, in which the component (B) is a magnesium sulfate hydrate.

[0069]

<3> The powdered detergent composition for clothing according to <2>, the powdered detergent composition containing:

the following component (A) at 10% by mass or more and 30% by mass or less;

the following component (B) at 1.5% by mass or more and 10% by mass or less as a value converted into anhydrous magnesium sulfate; and

the following component (C) at 8% by mass or less, in which

a mass ratio of a component (a1) to a component (a2), that is, component (a1)/component (a2) is 0.5 or more and 5 or less, and

the component (a1) and the component (a2) are contained in the component (A) at 60% by mass or more and 100% by mass or less in total.

Component (A): a surfactant containing the following component (a1) and component (a2)

Component (a1): an alkylbenzenesulfonate

Component (a2): an alkylsulfate

Component (B): magnesium sulfate heptahydrate

Component (C): one or more kinds of compounds selected from
a zeolite and a tripolyphosphate

[0070]

<4> The powdered detergent composition for clothing according to any of <1> to <3>, in which the component (a1) is an alkylbenzenesulfonate having an alkyl group and preferably a linear alkyl group having 8 or more, preferably 10 or more and more preferably 12 or more and 20 or less and preferably 16 or less carbon atoms.

[0071]

<5> The powdered detergent composition for clothing according to any of <1> to <4>, in which the component (a2) is an alkylsulfate having an alkyl group and preferably a linear alkyl group having 10 or more and 16 or less carbon atoms.

[0072]

<6> The powdered detergent composition for clothing according to any of <1> to <5>, in which the component (a2) is an alkylsulfate having a proportion of a linear alkyl group in the entire alkyl groups of 50% by mass or more, preferably 70% by mass or more, more preferably 90% by mass or more, more preferably 99% by mass or more and more preferably 100% by mass, that is, the component (a2) is a linear alkylsulfate.

[0073]

<7> The powdered detergent composition for clothing according to any of <1> to <6>, in which the component (a2) is an alkylsulfate having a proportion of a linear alkyl group having 12 or more and 16 or less carbon atoms in the entire alkyl groups of 50% by mass or more and a proportion of a linear alkyl group having 12 carbon atoms in the entire alkyl groups of preferably 40% by mass or more, more preferably 50% by mass or more and more preferably 60% by mass or more.

[0074]

<8> The powdered detergent composition for clothing according to any of <1> to <7>, in which a mass ratio of the component (a1) to the component (a2), that is, component (a1)/component (a2) is 0.5 or more, preferably 0.6 or more, more preferably 0.7 or more and more preferably 0.9 or more and 5 or less, preferably 4.8 or less, more preferably 4.6 or less, more preferably 4.3 or less, more preferably 2.5 or less and more preferably 1.8 or less.

[0075]

<9> The powdered detergent composition for clothing according to any of <1> to <8>, in which the component (a1) and the component (a2) are contained in the component (A) at 60% by mass or more, preferably 70% by mass or more,

more preferably 80% by mass or more and more preferably 90% by mass or more and 100% by mass or less and preferably 100% by mass in total.

[0076]

<10> The powdered detergent composition for clothing according to any of <1> to <9>, the powdered detergent composition containing the component (A) at 10% by mass or more, preferably 12% by mass or more, more preferably 14% by mass and more preferably 16% by mass or more and 30% by mass or less, preferably 25% by mass or less, more preferably 23% by mass or less and more preferably 19% by mass or less.

[0077]

<11> The powdered detergent composition for clothing according to any of <1> to <10>, in which magnesium sulfate heptahydrate has a powdery shape or a granular shape.

[0078]

<12> The powdered detergent composition for clothing according to any of <1> to <11>, the powdered detergent composition containing the component (B) at 1.5% by mass or more, preferably 1.6% by mass or more, more preferably 1.8% by mass or more, more preferably 2% by mass or more, more preferably 2.5% by mass or more and more preferably 3% by mass or more and 10% by mass or less, preferably 8% by mass or less, more preferably 7% by mass or less and more

preferably 6% by mass or less as a value converted into anhydrous magnesium sulfate.

[0079]

<13> The powdered detergent composition for clothing according to any of <1> to <12>, the powdered detergent composition containing a zeolite as the component (C).

[0080]

<14> The powdered detergent composition for clothing according to any of <1> to <13>, the powdered detergent composition containing a tripolyphosphate as the component (C).

[0081]

<15> The powdered detergent composition for clothing according to any of <1> to <14>, the powdered detergent composition containing the component (C) at preferably 7% by mass or less, more preferably 6.5% by mass or less and more preferably 6% by mass or less.

[0082]

<16> The powdered detergent composition for clothing according to any of <1> to <15>, in which a content of a zeolite of the component (C) is 3% by mass or more and preferably 4% by mass or more in the composition.

[0083]

<17> The powdered detergent composition for clothing according to any of <1> to <16>, in which a content of

tripolyphosphate of the component (C) is 3% by mass or less, preferably 2% by mass or less and more preferably 0% by mass in the composition.

[0084]

<18> The powdered detergent composition for clothing according to any of <1> to <17>, the powdered detergent composition further containing one or more kinds of compounds selected from an alkali metal carbonate (d1), an alkali metal chloride (d2) and an alkali metal sulfate (d3) as a component (D) at 40% by mass or more and 70% by mass or less in the composition.

[0085]

<19> The powdered detergent composition for clothing according to <18>, in which the alkali metal carbonate (d1) is one or more kinds of compounds selected from sodium carbonate and potassium carbonate.

[0086]

<20> The powdered detergent composition for clothing according to <18> or <19>, in which the alkali metal chloride (d2) is one or more kinds of compounds selected from sodium chloride and potassium chloride.

[0087]

<21> The powdered detergent composition for clothing according to any of <18> to <20>, in which the alkali metal sulfate (d3) is one or more kinds of compounds selected

from potassium sulfate and sodium sulfate.

[0088]

<22> The powdered detergent composition for clothing according to any of <18> to <21>, the powdered detergent composition containing the component (D) at 40% by mass or more, preferably 50% by mass or more and more preferably 55% by mass or more and 70% by mass or less and preferably 65% by mass or less in the composition.

[0089]

<23> The powdered detergent composition for clothing according to any of <1> to <22>, the powdered detergent composition being used for hand-washing.

[0090]

<24> A method for washing clothing including:

hand-washing clothing with a washing liquid prepared by mixing 1 g or more, preferably 2.5 g or more, more preferably 3 g or more and more preferably 3.5 g or more and 10 g or less, preferably 8 g or less, more preferably 6 g or less and more preferably 5 g or less of the powdered detergent composition for clothing according to any one of <1> to <23> with 1 liter of water having the German hardness of 5° DH or more, preferably 6° DH or more, more preferably 8° DH or more and more preferably 10° DH or more and 30° DH or less, preferably 25° DH or less and more preferably 20° DH or less.

[0091]

<25> The powdered detergent composition for clothing according to any of <1> to <17>, the powdered detergent composition being obtained by a production method including the following Process 1 to Process 3.

Process 1: a process of obtaining a slurry having a water content of 30% by mass or more and 70% by mass or less by mixing the component (A) and water together

Process 2: a process of obtaining base granules having a water content of 10% by mass or less by spray-drying the slurry obtained in Process 1

Process 3: a process of mixing the base granules obtained in Process 2, the component (B) and the component (C) together

[0092]

<26> The powdered detergent composition for clothing according to any one of <18> to <22>, the powdered detergent composition being obtained by a production method including the following Process 1' to Process 3'.

Process 1': a process of obtaining a slurry having a water content of 30% by mass or more and 70% by mass or less by mixing the component (A), the component (D) and water together

Process 2': a process of obtaining base granules having a water content of 10% by mass or less by spray-drying the

slurry obtained in Process 1'

Process 3': a process of mixing the base granules obtained in Process 2', the component (B) and the component (C) together

Examples

The following Examples illustrate the implementation of the invention. Examples are intended to illustrate the invention but are not intended to limit the same.

[0093]

The components used in Examples are as follows.

[Component (A)]

(a1-1): sodium dodecylbenzenesulfonate [component (a1)]

(a2-1): sodium alkylsulfate [component (a2), composition of the alkyl group: lauryl group/myristyl group/palmityl group = 67/28/5 (mass ratio)]

(a3-1): polyoxyethylene (average added mole number of ethylene oxide: 21) lauryl ether

[0094]

[Component (B)]

The numbers in Tables represent the % by mass converted into anhydrous magnesium sulfate.

(b-1): magnesium sulfate heptahydrate

(b-2): anhydrous magnesium sulfate

[0095]

[Component (C)]

(c-1): zeolite [4A-type zeolite, average particle size: 3 μm (manufactured by TOSOH CORPORATION)]

(c-2): sodium tripolyphosphate

[0096]

[Component (D)]

(d1-1): sodium carbonate

(d3-1): sodium sulfate

[0097]

[Optional components]

(e-1): sodium silicate No. 2: sodium silicate (40% by mass) (manufactured by TOKUYAMA SIAM SILICA CO., LTD., the % by mass of the active component is presented in Tables)

(e-2): sodium polyacrylate (40% by mass aqueous solution, weight average molecular weight: 8000, the % by mass of the active component is presented in Tables)

[0098]

<Example 1>

A homogeneous slurry having a water content of 50% by mass was prepared by mixing 18.62 kg of an aqueous solution of sodium dodecylbenzenesulfonate having a concentration of 65% by mass, 22.00 kg of a sodium alkylsulfate paste having a concentration of 30% by mass, 30.25 kg of an aqueous solution of sodium silicate No. 2 having a concentration of 40% by mass, 22.00 kg of sodium carbonate, 44.00 kg of

sodium sulfate, 1.1 kg of an aqueous solution of sodium polyacrylate having a concentration of 40% by mass and water together. Subsequently, this slurry was dried by spray drying to obtain the base granules (water content: 2.5% by mass). Furthermore, a powdered detergent composition was obtained by mixing 90.9 parts by weight of the granules thus obtained, 5 parts by weight of zeolite and 4.1 parts by weight of magnesium sulfate heptahydrate together using a concrete mixer [manufactured by KYC Machine Industry Co., Ltd.]. The powdered detergent composition had an average particle size of 262 μm and an apparent density by JIS K3362 of 0.37 g/mL. The composition of the powdered detergent composition thus obtained was presented in Table 1.

[0099]

<Example 2>

A homogeneous slurry having a water content of 50% by mass was prepared by mixing 19.97 kg of an aqueous solution of sodium dodecylbenzenesulfonate having a concentration of 65% by mass, 23.60 kg of a sodium alkylsulfate paste having a concentration of 30% by mass, 32.44 kg of an aqueous solution of sodium silicate No. 2 having a concentration of 40% by mass, 24 kg of sodium carbonate, 47.19 kg of sodium sulfate, 1.18 kg of an aqueous solution of sodium polyacrylate having a concentration of 40% by mass and

water together. Subsequently, this slurry was dried by spray drying to obtain the base granules (water content: 2.36% by mass). Furthermore, a powdered detergent composition was obtained by mixing 84.76 parts by weight of the base granules thus obtained, 5 parts by weight of zeolite and 10.24 parts by weight of magnesium sulfate heptahydrate together using a concrete mixer [manufactured by KYC Machine Industry Co., Ltd.]. The powdered detergent composition had an average particle size of 261 μm and an apparent density by JIS K3362 of 0.36 g/mL. The composition of the powdered detergent composition thus obtained was presented in Table 1.

[0100]

<Example 3>

A homogeneous slurry having a water content of 50% by mass was prepared by mixing 20.46 kg of an aqueous solution of sodium dodecylbenzenesulfonate having a concentration of 65% by mass, 24.18 kg of a sodium alkylsulfate paste having a concentration of 30% by mass, 33.25 kg of an aqueous solution of sodium silicate No. 2 having a concentration of 40% by mass, 24.18 kg of sodium carbonate, 48.36 kg of sodium sulfate, 1.21 kg of an aqueous solution of sodium polyacrylate having a concentration of 40% by mass and water together. Subsequently, this slurry was dried by spray drying to obtain the base granules (water content:

0.31% by mass). Furthermore, a powdered detergent composition was obtained by mixing 82.71 parts by weight of the base granules thus obtained, 5 parts by weight of zeolite and 12.3 parts by weight of magnesium sulfate heptahydrate together using a concrete mixer [manufactured by KYC Machine Industry Co., Ltd.]. The powdered detergent composition had an average particle size of 265 μm and an apparent density by JIS K3362 of 0.38 g/mL. The composition of the powdered detergent composition thus obtained was presented in Table 1.

[0101]

<Example 4>

A homogeneous slurry having a water content of 50% by mass was prepared by mixing 14.39 kg of an aqueous solution of sodium dodecylbenzenesulfonate having a concentration of 65% by mass, 31.17 kg of a sodium alkylsulfate paste having a concentration of 30% by mass, 30.25 kg of an aqueous solution of sodium silicate No. 2 having a concentration of 40% by mass, 22.00 kg of sodium carbonate, 44.00 kg of sodium sulfate, 1.1 kg of an aqueous solution of sodium polyacrylate having a concentration of 40% by mass and water together. Subsequently, this slurry was dried by spray drying to obtain the base granules (water content: 2.5% by mass). Furthermore, a powdered detergent composition was obtained by mixing 90.9 parts by weight of

the base granules thus obtained, 5 parts by weight of zeolite and 4.1 parts by weight of magnesium sulfate heptahydrate together using a concrete mixer [manufactured by KYC Machine Industry Co., Ltd.]. The powdered detergent composition had an average particle size of 290 μm and an apparent density by JIS K3362 of 0.37 g/mL. The composition of the powdered detergent composition thus obtained was presented in Table 1.

[0102]

<Example 5>

A homogeneous slurry having a water content of 50% by mass was prepared by mixing 15.43 kg of an aqueous solution of sodium dodecylbenzenesulfonate having a concentration of 65% by mass, 33.43 kg of a sodium alkylsulfate paste having a concentration of 30% by mass, 32.44 kg of an aqueous solution of sodium silicate No. 2 having a concentration of 40% by mass, 23.60 kg of sodium carbonate, 47.19 kg of sodium sulfate, 1.18 kg of an aqueous solution of sodium polyacrylate having a concentration of 40% by mass and water together. Subsequently, this slurry was dried by spray drying to obtain the base granules (water content: 2.36% by mass). Furthermore, a powdered detergent composition was obtained by mixing 84.76 parts by weight of the base granules thus obtained, 5 parts by weight of zeolite and 10.24 parts by weight of magnesium sulfate

heptahydrate together using a concrete mixer [manufactured by KYC Machine Industry Co., Ltd.]. The powdered detergent composition had an average particle size of 289 μm and an apparent density by JIS K3362 of 0.38 g/mL. The composition of the powdered detergent composition thus obtained was presented in Table 1.

[0103]

<Example 6>

A homogeneous slurry having a water content of 50% by mass was prepared by mixing 25.30 kg of an aqueous solution of sodium dodecylbenzenesulfonate having a concentration of 65% by mass, 18.33 kg of a sodium alkylsulfate paste having a concentration of 30% by mass, 30.25 kg of an aqueous solution of sodium silicate No. 2 having a concentration of 40% by mass, 22.00 kg of sodium carbonate, 44 kg of sodium sulfate, 1.1 kg of an aqueous solution of sodium polyacrylate having a concentration of 40% by mass and water together. Subsequently, this slurry was dried by spray drying to obtain the base granules (water content: 5.5% by mass). Furthermore, a powdered detergent composition was obtained by mixing 90.9 parts by weight of the base granules thus obtained, 5 parts by weight of zeolite and 4.1 parts by weight of magnesium sulfate heptahydrate together using a concrete mixer [manufactured by KYC Machine Industry Co., Ltd.]. The powdered detergent

composition had an average particle size of 267 μm and an apparent density by JIS K3362 of 0.34 g/mL. The composition of the powdered detergent composition thus obtained was presented in Table 1.

[0104]

<Example 7>

A homogeneous slurry having a water content of 50% by mass was prepared by mixing 16.92 kg of an aqueous solution of sodium dodecylbenzenesulfonate having a concentration of 65% by mass, 36.67 kg of a sodium alkylsulfate paste having a concentration of 30% by mass, 30.25 kg of an aqueous solution of sodium silicate No. 2 having a concentration of 40% by mass, 22.00 kg of sodium carbonate, 44.00 kg of sodium sulfate, 1.1 kg of an aqueous solution of sodium polyacrylate having a concentration of 40% by mass and water together. Subsequently, this slurry was dried by spray drying to obtain the base granules (water content: 5.5% by mass). Furthermore, a powdered detergent composition was obtained by mixing 90.9 parts by weight of the base granules thus obtained, 5 parts by weight of zeolite and 4.1 parts by weight of magnesium sulfate heptahydrate together using a concrete mixer [manufactured by KYC Machine Industry Co., Ltd.]. The powdered detergent composition had an average particle size of 290 μm and an apparent density by JIS K3362 of 0.35 g/mL. The

composition of the powdered detergent composition thus obtained was presented in Table 1.

[0105]

<Example 8>

A homogeneous slurry having a water content of 50% by mass was prepared by mixing 18.20 kg of an aqueous solution of sodium dodecylbenzenesulfonate having a concentration of 65% by mass, 21.51 kg of a sodium alkylsulfate paste having a concentration of 30% by mass, 29.57 kg of an aqueous solution of sodium silicate No. 2 having a concentration of 40% by mass, 21.51 kg of sodium carbonate, 43.01 kg of sodium sulfate, 1.08 kg of an aqueous solution of sodium polyacrylate having a concentration of 40% by mass and water together. Subsequently, this slurry was dried by spray drying to obtain the base granules (water content: 10.60% by mass). Furthermore, a powdered detergent composition was obtained by mixing 93 parts by weight of the base granules thus obtained, 5 parts by weight of zeolite and 2 parts by weight of anhydrous magnesium sulfate together using a concrete mixer [manufactured by KYC Machine Industry Co., Ltd.]. The powdered detergent composition had an average particle size of 275 μm and an apparent density by JIS K3362 of 0.32 g/mL. The composition of the powdered detergent composition thus obtained was presented in Table 1.

[0106]

<Examples 9 to 18>

The powdered detergent compositions for clothing of the invention were produced by appropriately changing the kind or amount of each component in Example 1 so as to have the compositions presented in Table 2 or Table 3. At that time, magnesium sulfate heptahydrate was blended in the slurry before being spray-dried (used in Process 1) in Example 18.

Incidentally, the detergent compositions were prepared by the above-described production method including Process 1 to Process 3 in Examples 1 to 18. The component (B) was used in Process 3 in Examples 1 to 17 and in Process 1 in Example 18.

[0107]

<Comparative Example 1>

A homogeneous slurry having a water content of 50% by mass was prepared by mixing 17.81 kg of an aqueous solution of sodium dodecylbenzenesulfonate having a concentration of 65% by mass, 21.05 kg of a sodium alkylsulfate paste having a concentration of 30% by mass, 28.95 kg of an aqueous solution of sodium silicate No. 2 having a concentration of 40% by mass, 21.05 kg of sodium carbonate, 42.11 kg of sodium sulfate, 1.05 kg of an aqueous solution of sodium polyacrylate having a concentration of 40% by mass and

water together. Subsequently, this slurry was dried by spray drying to obtain the base granules (water content: 12.6% by mass). Furthermore, a powdered detergent composition was obtained by mixing 95 parts by weight of the base granules thus obtained and 5 parts by weight of zeolite together using a concrete mixer [manufactured by KYC Machine Industry Co., Ltd.]. The powdered detergent composition had an average particle size of 263 μm and an apparent density by JIS K3362 of 0.39 g/mL. The composition of the powdered detergent composition thus obtained was presented in Table 1.

[0108]

<Comparative Example 2>

A homogeneous slurry having a water content of 50% by mass was prepared by mixing 17.99 kg of an aqueous solution of sodium dodecylbenzenesulfonate having a concentration of 65% by mass, 21.26 kg of a sodium alkylsulfate paste having a concentration of 30% by mass, 29.23 kg of an aqueous solution of sodium silicate No. 2 having a concentration of 40% by mass, 21.26 kg of sodium carbonate, 42.52 kg of sodium sulfate, 1.06 kg of an aqueous solution of sodium polyacrylate having a concentration of 40% by mass and water together. Subsequently, this slurry was dried by spray drying to obtain the base granules (water content: 11.68% by mass). Furthermore, a powdered detergent

composition was obtained by mixing 94.08 parts by weight of the base granules thus obtained, 5 parts by weight of zeolite and 0.92 parts by weight of magnesium sulfate heptahydrate together using a concrete mixer [manufactured by KYC Machine Industry Co., Ltd.]. The powdered detergent composition had an average particle size of 292 μm and an apparent density by JIS K3362 of 0.35 g/mL. The composition of the powdered detergent composition thus obtained was presented in Table 1.

[0109]

<Comparative Example 3>

A homogeneous slurry having a water content of 50% by mass was prepared by mixing 27.08 kg of an aqueous solution of sodium dodecylbenzenesulfonate having a concentration of 65% by mass, 3.67 kg of a sodium alkylsulfate paste having a concentration of 30% by mass, 30.25 kg of an aqueous solution of sodium silicate No. 2 having a concentration of 40% by mass, 22.00 kg of sodium carbonate, 44.00 kg of sodium sulfate, 1.1 kg of an aqueous solution of sodium polyacrylate having a concentration of 40% by mass and water together. Subsequently, this slurry was dried by spray drying to obtain the base granules (water content: 8.5% by mass). Furthermore, a powdered detergent composition was obtained by mixing 90.9 parts by weight of the base granules thus obtained, 5 parts by weight of

zeolite and 4.1 parts by weight of magnesium sulfate heptahydrate together using a concrete mixer [manufactured by KYC Machine Industry Co., Ltd.]. The powdered detergent composition had an average particle size of 278 μm and an apparent density by JIS K3362 of 0.39 g/mL. The composition of the powdered detergent composition thus obtained was presented in Table 1.

[0110]

<Comparative Example 4>

A homogeneous slurry having a water content of 50% by mass was prepared by mixing 10.15 kg of an aqueous solution of sodium dodecylbenzenesulfonate having a concentration of 65% by mass, 11.00 kg of a sodium alkylsulfate paste having a concentration of 30% by mass, 8.8 kg of polyoxyethylene lauryl ether (EO = 21.0), 30.25 kg of an aqueous solution of sodium silicate No. 2 having a concentration of 40% by mass, 22.00 kg of sodium carbonate, 44.00 kg of sodium sulfate, 1.1 kg of an aqueous solution of sodium polyacrylate having a concentration of 40% by mass and water together. Subsequently, this slurry was dried by spray drying to obtain the base granules (water content: 8.5% by mass). Furthermore, a powdered detergent composition was obtained by mixing 90.9 parts by weight of the base granules thus obtained, 5 parts by weight of zeolite and 4.1 parts by weight of magnesium sulfate

heptahydrate together using a concrete mixer [manufactured by KYC Machine Industry Co., Ltd.]. The powdered detergent composition had an average particle size of 285 μm and an apparent density by JIS K3362 of 0.38 g/mL. The composition of the powdered detergent composition thus obtained was presented in Table 1.

[0111]

<Comparative Examples 5 to 10>

The powdered detergent compositions for clothing were produced by appropriately changing the kind or amount of each component in Comparative Example 1 so as to have the compositions presented in Table 2.

Incidentally, the detergent compositions were prepared by the above-described production method including Process 1 to Process 3 in Comparative Examples 1 to 10. The component (B) was used in Process 3 in Comparative Examples in the case of blending it.

[0112]

<Performance Evaluation>

The powdered detergent compositions obtained in Examples and Comparative Examples were subjected to the following evaluations. The results are presented in Tables 1 to 3. The powdered detergent composition which exhibits the performance satisfying the acceptance criteria in the following evaluation method is a powdered detergent

composition for clothing of the invention that is suitable for hand-washing.

[0113]

(1) Evaluation on detergency

(1-1) Evaluation on detergency for sebum stains

<Preparation of artificially stained cloth>

The artificially stained cloth used was prepared by gravure-coating the model sebum stains having the following composition on a 6 cm × 6 cm sheet of dyed broadcloth of cotton/polyester blend (ratio of cotton/polyester = 35/65, purchased from TANIGASHIRA SHOTEN, hereinafter, referred to as the "original cloth") so that one sheet is coated with 100 mg of the stains.

· Model sebum stains

The model sebum stains having the following composition was used.

0.44% by mass of lauric acid, 3.15% by mass of myristic acid, 2.35% by mass of pentadecanoic acid, 6.31% by mass of palmitic acid, 0.44% by mass of heptadecanoic acid, 1.6% by mass of stearic acid, 7.91% by mass of oleic acid, 13.33% by mass of triolein, 2.22% by mass of n-hexadecyl palmitate and 6.66% by mass of squalene

[0114]

<Washing condition>

Five sheets of the cloth artificially stained with

the model sebum stains were put in the washing liquid (30°C) prepared by introducing 0.2 g of the model sebum stains, 0.3 ml of glacial acetic acid and 3.5 g of the powdered detergent composition described in Tables 1 to 3 into 1 liter of water having a hardness of 10° DH (Ca/Mg = 6/4, mass ratio). Next, a 6 cm × 12 cm cotton/polyester broadcloth mixed spinning dyed cloth was put therein, and the bath ratio was adjusted to 20. Washing was performed using Terg-O-Tometer under the condition of 180 rotation and 3 minutes.

[0115]

For detergency, the reflectivity of the original cloth before being stained and the cloth stained with the model sebum stains before and after washing at 550 nm was measured by a colorimetric color difference meter (Z-300A manufactured by NIPPON DENSHOKU INDUSTRIES Co., LTD.), and the washed rate (%) was determined by the following Equation. The washed rate was measured for each of the 5 sheets of the stained cloth and the average value thereof was determined. The acceptance line of the washed rate is 60% or more, and it is more preferable that the numerical value be greater.

Washed rate (%) = $100 \times [(\text{reflectivity of the cloths stained with model sebum stains after washing} - \text{reflectivity of the cloths stained with model sebum stains$

before washing)/(reflectivity of original cloth -
reflectivity of the cloths stained with model sebum stains
before washing)]

[0116]

(1-2) Evaluation on detergency for mud stains

<Preparation of cloth stained with mud>

The artificially stained cloth used was a cloth
stained with mud prepared using a 10 cm × 10 cm sheet of
cotton knit (100% cotton, purchased from TANIGASHIRA
SHOTEN, hereinafter, referred to as the "original cloth")
by the preparation method described in paragraphs 0030 to
0038 of JP-A 10-204769.

[0117]

<Operation of detergency test>

Into a polypropylene wash basin having a diameter of
36 cm, a depth of 13 cm and a capacity of 11 L, 5 L of
water having a temperature of 30°C and a hardness of 10° DH
(Ca/Mg = 6/4, mass ratio) was poured. Into water in the
wash basin, 17.5 g of the powdered detergent composition
for clothing was introduced. Water was stirred by hand
while paying attention so as not to fly off from the wash
basin in order to homogeneously disperse or dissolve the
powdered detergent composition for clothing, thereby
preparing a washing liquid. One sheet of the cloth stained
with mud was attached to 1 piece of Gunze YG underwear of L

size by sewing. Five sheets of this underwear were immersed in the above washing liquid for 30 minutes. After immersing, the washer rubbed the underwear 50 times by hands while rubbing the cloths which were stained with mud stains and attached to the underwear by sewing together. At that time, a rubbing force applied at that time was the rubbing force that can provide 45% of detergency for mud-stained cloth by rubbing cloths together in the same manner by use of the powdery detergent composition for clothing of Comparative Example 1. Thereafter, the underwear was placed in 5 L of water having a temperature of 30°C and a hardness of 10° DH (Ca/Mg = 6/4, mass ratio). The operation to grasp the neck of 1 piece of underwear and to put in and out from water was repeated 10 times. The operation was performed for each of the 5 pieces of underwear. After squeezing the underwear by hand, cloth stained with mud was removed from the underwear, dried using a press drier, and subjected to the measurement of detergency.

[0118]

For detergency, the reflectivity of the original cloth before being stained and the cloth stained with mud before and after washing at 550 nm was measured by a colorimetric color difference meter (Z-300A manufactured by NIPPON DENSHOKU INDUSTRIES Co., LTD.), and the washed rate (%) was determined by the following Equation. The

acceptance line of the washed rate is 50% or more, and it is more preferable that the numerical value be greater.

Washed rate (%) = $100 \times [(\text{reflectivity of the cloths stained with mud after washing} - \text{reflectivity of the cloths stained with mud before washing}) / (\text{reflectivity of original cloth} - \text{reflectivity of the cloths stained with mud before washing})]$

[0119]

(2) Evaluation on foam durability

Into a cylindrical glass tube (diameter: 5 cm and height: 90 cm), 200 mL of the washing liquid (temperature 30°C) from which all the cloths were taken out after testing for (1-1) evaluation on detergency for sebum stains described above was poured over 30 seconds and left to stand for 5 minutes, and then the height (cm) of foam was measured.

The relative value of foam durability of Examples and Comparative Examples to be compared was calculated according to the following Equation by taking 9.3 cm that is the height of foam of Comparative Example 1 as the reference. The relative value of foam durability for acceptance is 1.1 or more, and it is more preferable that the numerical value be greater.

Relative value of foam durability = [height (cm) of foam of Examples and Comparative Examples to be

compared]/[height (cm) of foam of Comparative Example 1
(reference composition)]

[0120]

(3) Evaluation on feel at the time of hand-washing

For the evaluation on feel at the time of hand-washing, the sensory evaluation by the palm was performed by the following method. The results are presented in Tables 1 to 3.

· Evaluation method

One hand was slowly put in 5 liters of water (hardness of 10° DH (Ca/Mg = 6/4, mass ratio)) 18g of detergent composition was lightly grasped with one hand and, directly, the hand was slowly put into 5L of water (hardness of 10° DH (Ca/Mg = 6/4, mass ratio)) having a temperature of 30°C.

The feel of the palm for 1 minute immediately after putting the hand in water in the state of holding the detergent composition was evaluated by 5 panels (2 women and 3 men in their thirties) who were skilled in evaluating the feel of the hand according to the following criteria, and the average value thereof was determined. The average value for acceptance is 0.8 or more.

* Criteria

0: the feel of the palm is warmer (hot) than the powdered detergent composition of Example 8.

1: the feel of the palm is significantly slightly warm (hot) but is not much warmer (hot) compared to the powdered detergent composition of Example 8.

[0121]

[Table 1]

					Examples								Comparative examples			
					1	2	3	4	5	6	7	8	1	2	3	4
Powdered detergent composition for hand-washing	Blended component(% by mass)	(A)	(a1)	(a1-1)	11	11	11	8.5	8.5	15	10	11	11	11	16	6
			(a2)	(a2-1)	6	6	6	8.5	8.5	5	10	6	6	6	1	3
			(a3)	(a3-1)												8
		(B)	(b-1)		2	5	6	2	5	2	2			0.45	2	2
			(b-2)									2				
		(C)		(c-1)	5	5	5	5	5	5	5	5	5	5	5	5
		(D)	(d1)	(d1-1)	20	20	20	20	20	20	20	20	20	20	20	20
			(d3)	(d3-1)	34	34	34	34	34	34	34	34	34	34	34	34
		Optional component		(e-1)	11	11	11	11	11	11	11	11	11	11	11	11
				(e-2)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
				Water	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance
		Total			100	100	100	100	100	100	100	100	100	100	100	100
		Average particle size (μm)			262	261	265	290	289	267	290	275	263	292	278	285
		Apparent density (g/mL)			0.37	0.36	0.38	0.37	0.38	0.34	0.35	0.32	0.39	0.35	0.39	0.38
		Content of component (A) (% by mass)			17	17	17	17	17	20	20	17	17	17	17	17
		Total content of components (a1) and (a2) (% by mass)			17	17	17	17	17	20	20	17	17	17	17	9
		Total content of components (a1) and (a2) in component (A) (% by mass)			100	100	100	100	100	100	100	100	100	100	100	53
	(a1)/(a2) (mass ratio)			1.8	1.8	1.8	1	1	3	1	1.8	1.8	1.8	16	2	
Evaluation results	Detergency		Sebum stains(%)		63.7	60.3	60.5	63.2	62.8	60.6	64.2	63.5	63.4	62.6	55.5	59.1
			Mud stains(%)		53	57	57	58	58	55	58	53	45	46	45	46
	Foam durability		Height of foam after 5 minutes(mm)		11.1	16.6	16.9	12.2	16.6	14.6	12.1	11.2	9.3	9.4	9.5	1.2
			Relative value of foam durability		1.2	1.8	1.8	1.3	1.8	1.6	1.3	1.2	1 (Stand ar d)	1.0	1.0	0.13
	Feel at the time of hand-washing			1	1	1	1	1	1	1	1	(Stand ar d)	1	1	1	1

[0122]

[Table 2]

					Examples								Comparative examples						
					9	10	11	12	13	14	15	16	5	6	7	8	9	10	
Powdered detergent for hand-washing	Blended component(% by mass)	(A)	(a1)	(a1-1)	12	12	12	6	15	10.3	12	12	12	7	16	3	12	12	
			(a2)	(a2-1)	6	6	6	12	3	5.2	6	6	6	3	2	15	6	6	
			(a3)	(a3-1)							2.5			8					
		(B)	(b-1)		1.5	5	8	5	5	5	2	2		5	5	5	1	2	
			(b-2)																
		(C)	(c-1)		5	5	5	5	5	5	5	5	5	5	5	5	5		
			(c-2)															10	
		(D)	(d1)	(d1-1)	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
			(d3)	(d3-1)	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
		Optional component	(e-1)		11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
			(e-2)		0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
			Water		Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance
		Total			100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	Average particle size(μm)			260	263	263	292	260	271	268	262	262	273	265	298	261	267		
	Apparent density(g/mL)			0.36	0.38	0.37	0.34	0.34	0.35	0.36	0.36	0.39	0.39	0.38	0.37	0.38	0.37		
	Content of component (A) (% by mass)			18	18	18	18	18	18	18	18	18	18	18	18	18	18		
	Total content of components (a1) and (a2) (% by mass)			18	18	18	18	18	18	15.5	18	18	18	18	18	18	18		
	Total content of components (a1) and (a2) in component (A)(% by mass)			100	100	100	100	100	100	86	100	100	56	100	100	100	53		
	(a1)/(a2) (mass ratio)			2.0	2.0	2.0	0.5	5.0	2.0	2.0	2.0	2.0	2.0	8.0	0.2	2.0	2.0		
Results of evaluation	Detergency	Sebum stains(%)		64.0	61.1	60.5	62.2	60.3	60.1	61.1	62.1	63.7	58.5	54.2	63.2	63.7	62.5		
		Mud stains(%)		50	58	53	58	50	55	55	54	47	45	47	57	47	50		
	Foam durability	Hight of foam after 5 minutes (mm)		11.4	17.1	18.1	12.4	17.1	11.4	11.4	11.4	9.5	4.8	15.2	8.6	9.8	8.6		
		Relative value of foam durability		1.2	1.8	1.9	1.3	1.8	1.2	1.2	1.2	1.0	0.5	1.6	0.9	1.1	0.9		
	Feel at the time of hand-washing			1	1	1	1	1	1	1	1	1	1	1	1	1	1		

[0123]

[Table 3]

					Examples	
					17	18
Powdered detergent composition for hand-wasing	Blended component (% by mass)	(A)	(a1)	(a1-1)	11	11
			(a2)	(a2-1)	6	6
		(B)		(b-1)	4	4
		(C)		(c-1)	5	5
		(D)	(d1)	(d1-1)	20	20
			(d3)	(d3-1)	34	34
		Arbitrary component		(e-1)	11	11
				(e-2)	0.4	0.4
				Water	Balance	Balance
		Total				100
	Average particle size (μm)				263	265
	Apparent density (g/mL)				0.37	0.35
	Content of component (A) (% by mass)				17	17
	Total content of components (a1) and (a2) (% by mass)				17	17
	Total content of components (a1) and (a2) in component (A) (% by mass)				100	100
(a1)/(a2) (mass ratio)				1.8	1.8	
Blending timing of component (B)				Step 3	Step 1	
Results of evaluation	Detergency	Sebum stains(%)			62.5	60.2
		Mud stains(%)			57	51
	Foam durability	Hight of foam after 5 minutes(mm)			16.0	10.6
		Relative value of foam durability			1.8	1.1
	Feel at the time of hand-washing				1	1

[0124]

In Tables, the % by mass of the component (B) and the component (D) is based on the amount in terms of an anhydride.

Claims

1. A powdered detergent composition for clothing comprising:

the following component (A) at 10% by mass or more and 30% by mass or less;

the following component (B) at 1.5% by mass or more and 10% by mass or less as a value converted into anhydrous magnesium sulfate; and

the following component (C) at 8% by mass or less, wherein

a mass ratio of the component (a1) to the component (a2), that is, $\text{component (a1)}/\text{component (a2)}$ is 0.5 or more and 5 or less, and

the component (a1) and the component (a2) are contained in the component (A) at 60% by mass or more and 100% by mass or less in total.

Component (A): a surfactant containing the following component (a1) and component (a2)

Component (a1): an alkylbenzenesulfonate

Component (a2): an alkylsulfate

Component (B): one or more kinds of compounds selected from anhydrous magnesium sulfate and a magnesium sulfate hydrate

Component (C): one or more kinds of compounds

selected from a zeolite and a tripolyphosphate

2. The powdered detergent composition for clothing according to claim 1, wherein the component (B) is a magnesium sulfate hydrate.

3. The powdered detergent composition for clothing according to claim 1 or 2, wherein the component (B) is magnesium sulfate heptahydrate.

4. The powdered detergent composition for clothing according to any one of claims 1 to 3, wherein the component (C) is a zeolite.

5. The powdered detergent composition for clothing according to any one of claims 1 to 4, comprising one or more kinds of compounds selected from the group consisting of an alkali metal carbonate (d1), an alkali metal chloride (d2) and an alkali metal sulfate (d3) as a component (D) at 40% by mass or more and 70% by mass or less in the composition.

6. The powdered detergent composition for clothing according to claim 5, wherein the alkali metal carbonate is contained in the component (D) at 20% by mass or more and

100% by mass or less.

7. The powdered detergent composition for clothing according to any one of claims 1 to 5, the powdered detergent composition being used for hand-washing.

8. A method for laundering clothing comprising:
hand-washing clothing with a washing liquid prepared by mixing 1 g or more and 10 g or less of the powdered detergent composition for clothing according to any one of claims 1 to 7 with 1 liter of water having the German hardness of 5° DH or more and 30° DH or less.