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(54) High bulk density granular detergent composition.

(57) A high bulk density granular detergent composition containing.

(a) a sulfonate of a fatty acid lower alkyl ester having 12 to 14 carbon atoms in the fatty acid residue thereof and

(b) a sulfonate of a fatty acid lower alkyl ester having 16 to 18 carbon atoms in the fatty acid residue thereof wherein the ratio by weight of (a)/(b) is 1/9 to 6/4 and the content of the total weight of the component (a) and (b) in the composition is 5 to 30% by weight.

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HIGH BULK DENSITY GRANULAR DETERGENT COMPOSITION

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a high bulk density granular detergent composition having an excellent solubility.

2. Description of the Related Art

Conventional clothing detergents contain extender fillers (usually Glauber's salt or sodium sulfate ($10H_2O$) is used) which contribute almost nothing to the washing performance and are manufactured as bead-like, hollow granules with a bulk density of approximately 0.3 g/cc by spray drying etc. of the same. However, such detergents have low specific gravities and are low in concentration of active agents, so the transport costs are increased and the considerable space is required for storage and display. Still further, they take up too much space at conventional home as well and are difficult to measure out. Therefore, recently, proposal has been made (in Japanese Unexamined Patent Publication (Kokai) No. 60-96698) of a process for the production of a high bulk density granular detergent which enables washing with only a small amount of detergent used and has been placed on the market.

On the other hand, sulfonates of fatty acid lower alkyl esters are superior in cleaning power or detergency, particularly resistance to hard water. Reports have been made (Japanese Unexamined Patent Publication (Kokai) No. 62-597) of high bulk density detergent compositions containing the same formulated therein.

However, high bulk density detergents containing sulfonates of fatty acid lower alkyl esters suffer from the problem that they are insufficiently soluble in water.

SUMMARY OF THE INVENTION

Accordingly, the objects of the present invention are to eliminate the above-mentioned problems of the prior art and to provide a high bulk density granular detergent composition having an excellent solubility.

Other objects and advantages of the present invention will be apparent from the following description.

In accordance with the present invention, there is provided a high bulk density granular detergent composition comprising:

(a) a sulfonate of a fatty acid lower alkyl ester having 12 to 14 carbon atoms in the fatty acid residue thereof; and

(b) a sulfonate of a fatty acid lower alkyl ester having 16 to 18 carbon atoms in the fatty acid residue thereof wherein the ratio by weight of (a)/(b) is 1/9 to 6/4 and the content of the total weight of the components (a) and (b) is 5% to 30% by weight in the composition.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention will be explained in further detail.

The fatty acid lower alkyl ester sulfonates are typically represented by the following general formula (I). These are also called α-sulfo-fatty acid ester salts.

$$R^1-\underset{\underset{SO_3M}{|}}{CH}COOR^2 \qquad (I)$$

wherein R^1: represents an alkyl group, R^2 represents a lower alkyl group having approximately 1 to 3 and M

represents a counter ion.

As the counter ion, a water soluble salt such as an alkali metal salt, particularly a sodium salt, is preferably used.

A sulfonate of a saturated fatty acid lower alkyl ester may be prepared by obtaining a fatty acid lower alkyl ester having a predetermined number of carbon atoms by ester exchange or esterification of fatty acid, then using a usual sulfonation apparatus for a reaction with sulfuric anhydride or another sulfonating agent, aging, if necessary, bleaching, then neutralizing. Further, it may be obtained by lower alkyl esterification of sulfonates of fatty acids.

Further, an unsaturated fatty acid lower alkyl ester sulfonate may be used in the present invention. This is produced in the same manner as mentioned above by using, as a starting material, unsaturated fatty acids and the like having a predetermined number of carbon atoms.

As the starting material fatty acid, fatty acids having a predetermined number of carbon atoms of animal and vegetable sources derived from beef tallow, coconut oil, palm oil, and the like and synthetic fatty acids may be used.

The present invention improves the solubility by combined use, in specific ratios, of two components (a) and (b) having the following specific numbers of carbon atoms, in the above-mentioned fatty acid lower alkyl ester sulfonates:

(a) Sulfonates with C_{12-14} fatty acid residues

(b) Sulfonates with C_{16-18} fatty acid residues

These two components are combined in a weight ratio of (a)/(b) of 1/9 to 6/4, preferably (a)/(b) of 2/8 to 5/5. When this ratio is less than 1/9, the solubility is not sufficiently improved, while when it is more than 6/4, the detergent power is deteriorated.

Further the above-mentioned two components (a) and (b) are contained in a total weight of 5 to 30% by weight, preferably 8 to 25% by weight, in the detergent composition. When the amount combined is less than 5% by weight, sufficient detergent power cannot be obtained, while when it is more than 30% by weight, the commercial production becomes difficult.

The high bulk density detergent composition according to the present invention may include, in addition to the essential components of the above-mentioned (a) and (b), other surface active agents, builders, and other desired optional components.

As the anionic surface active agent, for example, the following may be mentioned.

1) Straight chained alkyl benzene sulfonates having an alkyl group with 8 to 16 carbon atoms on average.

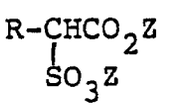
2) α-olefin sulfonates having 10 to 20 carbon atoms on average.

3) Alkyl sulfates having 10 to 20 carbon atoms on average.

4) Alkyl ester sulfates or alkenyl ester sulfates having straight or branched alkyl groups of alkenyl groups with 10 to 20 carbon atoms on average and having 0.5 to 8 addition moles of ethylene oxide on average.

5) Saturated or unsaturated fatty acid salts having 10 to 22 carbon atoms on average.

6) α-sulfo-fatty acid salts having the following general formula



wherein, Z is a counter ion, R is an alkyl group having 10 to 22 carbon atoms.

As the counter ions in these anionic surface active agents, salts of alkali metal such as sodium, potassium or the like are generally suitable.

As the nonionic surface active agent, the following are preferable.

(1) ED addition type nonionic surface active agents comprised of primary or secondary alcohols having 8 to 18 carbon atoms to which an average of 4 to 25 moles of ethylene oxide (ED) has been added.

(2) EO-PO addition type nonionic surface active agents comprised of primary or secondary alcohols having 8 to 18 carbon atoms to which an average of 4 to 25 moles of ethylene oxide (EO) and an average of 3 to 15 moles of propylene oxide (PO) have been added.

Further, zeolite (aluminosilicates), sodium tripolyphosphate, sodium pyrophosphate, and other inorganic builders; sodium citrate, sodium ethylene diamine tetraacetate, nitro triacetate, sodium polyacrylate, sodium acrylate-sodium maleic anhydride copolymer, polyacetal carboxylate, and other calcium ion catching builders; carbonates, silicates, and other alkaline builders; carboxymethylcellulose, polyethylene glycol and

other recontamination preventers; soap and other rinsing improvers; para-toluene sulfonates, toluene sulfonates, xylene sulfonates, urea and other viscosity adjusters; protease, lipase, cellulase, amylase (in particular alkaline lipase and the like having activity in alkaline environments), and other enzymes; quaternary ammonium salts, bentonite, and other softeners; bleaching agents, brighteners, fragrants, colors, and the like.

The detergent composition according to the present invention can be obtained by granulating the above-mentioned components to make a high bulk composition having a bulk density of 0.5 to 1.2 g/cc. As the method of granulation, as disclosed in the above-mentioned Japanese Unexamined Patent Publication (Kokai) No. 62-597, the fatty acid lower alkyl ester sulfonates and other detergent components may be kneaded with a kneader, mixed, milled by a mill of the cutter mill type or the like, granulated, and further mixed with a water-insoluble fine powder. Further, all or part of the detergent components may be spray dried, the remaining detergent compositions kneaded and mixed in with the spray dried components, and thus the desired high bulk density granular detergent composition can be produced. As for the enzymes and other components, they may be blended as powders with the granulated detergent.

According to the present invention, it is possible to improve the solubility of a high bulk density detergent composition by the combined use of the above-mentioned two types of fatty acid lower alkyl ester sulfonates having specific carbon atom chain lengths.

EXAMPLES

The present invention will now be further illustrated by, but is by no means limited to, the following Examples. The evaluation was effected as follows.

Solubility Test

Water having a temperature of 25° C was placed in beakers. Into these beakers, cells for measurement of electroconductivity were inserted. Next, 1 g each of the detergent compositions having the compositions shown in the following Table 1 were placed in the water. The mixture was agitated using a fixed speed stirrer at a speed of 250 rpm and the time for 90 percent of the detergent granules added was measured and designated as T_{90} (sec). Here, as the conductivity meter, a Horiba Conductive Meter Model DS-8F was used.

Examples 1 to 3 and Comparative Example 1

The high bulk density granular detergent compositions having a bulk density 0.78 g/cc and the compositions shown in Table 1 given below were prepared.

The components of the following Table 1, except for the enzyme, were mixed with a kneader. The dense mixture pellets having a 2 cm square thus obtained and type A zeolite were fed at a constant speed to a mill (manufactured by a Okada Seiko, Speed Mill ND-30). At this time, along with the milling material, cold air having a temperature of 15° C was introduced at a rate of 15 liters per kilogram of milling material. The mill had 15 cm diameter milling blades rotating at 3000 rpm in four stages crosswise and used punched metal with a 20% holes of 2 mm diameter as the screen.

Thereafter, the milled product obtained above and type A zeolite with an average primary particle diameter of 3 μm were fed at a constant speed at a ratio of 97:3 to a rotating drum (D = 30 cm, L = 60 cm) and the coated product was discharged at 30 rpm after a residence time of 5 minutes. The resultant high bulk density detergent composition was evaluated as to its solubility. The results are shown in Table 1.

Table 1

	Example			Comp. Ex.
	1	2	3	1
Composition (%)				
(a) $C_{12-14}\alpha$-SF-Na*1	5	7	10	-
(b) $C_{16-18}\alpha$-SF-Na*2	15	13	10	20
C_{14-18}AOS-K*3	15	15	15	15
Zeolite	20	20	20	20
Sodium carbonate	15	15	15	15
Potassium carbonate	15	15	15	15
Enzyme	1	1	1	1
Water, sodium sulfate ($Na_2SO_4 \cdot 10H_2O$)	Balance			
Evaluation				
Solubility (sec)	60	50	40	120

*1) Sodium α-sulfofatty acid (C_{12-14})methylester
*2) Sodium α-sulfofatty acid (C_{16-18})methylester
*3) Potassium α-olefin (C_{14-18})sulfonate

Claims

1. A high bulk density granular detergent composition comprising:
(a) a sulfonate of a fatty acid lower alkyl ester having 12 to 14 carbon atoms in the fatty acid residue thereof; and
(b) a sulfonate of a fatty acid lower alkyl ester having 16 to 18 carbon atoms in the fatty acid residue thereof wherein the ratio by weight of (a)/(b) is 1/9 to 6/4 and the content of the total weight of the components (a) and (b) is 5 to 30% by weight in the composition.

2. A detergent composition as claimed in claim 1, wherein said sulfonate is represented by the formula (I):

(I)

wherein R^1 represents an alkyl group having 11 to 13 carbon atoms in the case of the sulfonate (a) or having 15 to 17 carbon atoms in the case of the sulfonate (b), R^2 represent a lower alkyl group, and M represents a counter ion.

3. A detergent composition as claimed in claim 1, wherein the ratio by weight of (a)/(b) is 2/8 to 5/5.

4. A detergent composition as claimed in claim 1, wherein the content of the components (a) and (b) is 8 to 25% by weight.