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LIQUID DETERGENT COMPOSITION CONTAINING ABRASIVE

The present invention relates to a liquid detergent composition containing an abrasive which is useful for deterging hard surfaces of tablewares, kitchenwares, etc.

5 It has been well known as a matter of course to use a liquid detergent for deterging tablewares, etc.

Recently, liquid compositions containing abrasives have been proposed and they have been disclosed in, for example, the specifications of Japanese Patent Laid-Open Nos.

10 22906/1972 and 50909/1976. However, they are used mainly in virtue of their polishing effects and they have a serious defect that when they are used in a diluted form, their foaming and deterging powers are reduced far more seriously than those of so-called liquid kitchen deter-
15 gents. Though a liquid detergent composition containing an abrasive has been proposed in the specification of

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Japanese Patent Laid-Open No. 38397/1981, the deterging power of the compositions shown in examples given therein is insufficient. Further, though a thickening agent is added thereto to disperse the abrasive therein
5 the stability of the composition containing said agent is not satisfactory. More particularly, the thickening effect of the organic thickening agent is inhibited by a surfactant added as the essential component and the liquid detergent composition is liable to undergo
10 phases separation. This inclination becomes remarkable as the amount of the surfactant is increased. On the other hand, inorganic thickening agents have defects that the viscosity of them changes significantly with time and the stability thereof is reduced by vibration,
15 though the degree of unstabilization thereof due to the surfactant is lower than that of the organic thickening agents.

After intensive investigations made for the purpose of developing an abrasive-containing liquid kitchen
20 detergent composition having a sufficient deterging power, special deterging effects peculiar to the abrasive, particularly, a remarkable improvement in the finish of the tablewares, and excellent storability, the inventors have found that an abrasive-containing liquid
25 detergent composition having an excellent storability and

satisfying the above-mentioned requisites can be obtained by using specified amounts of six components specified below as essential components. The present invention has been completed on the basis of this finding. The present invention provides a liquid detergent composition containing an abrasive characterized by comprising the following components (a) to (f) as essential components:

(a) 10 to 40 wt. % of one or more anionic surfactants selected from the group consisting of polyoxyethylene alkyl ether sulfates, alkylbenzenesulfonates, α -olefin-sulfonates and alkanesulfonates,

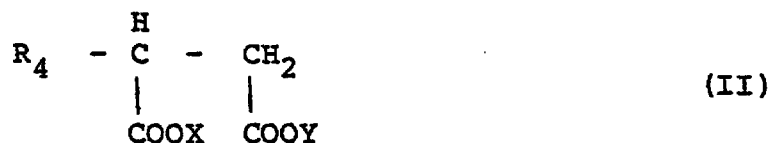
(b) 0.1 to 5 wt. % of a tertiary amine oxide of the following general formula (I):



in which R_1 represents an alkyl or alkenyl group having 10 to 18 carbon atoms and R_2 and R_3 represent each an alkyl group having 1 or 2 carbon atoms,

(c) 1 to 8 wt. % of a higher fatty acid alkanolamide,

(d) 0.2 to 5 wt. % of a succinic acid derivative of the following general formula (II):



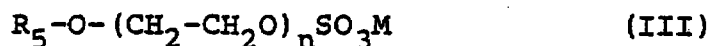
in which R₄ represents an alkyl or alkenyl group having 4 to 18 carbon atoms, and X and Y represent each a hydrogen atom, an alkali metal, ammonium or an alkanolamine,

(e) 1 to 25 wt. % of an abrasive, and

(f) 0.2 to 15 wt. % of an inorganic thickening agent.

As described above, the compositions containing thickening agents have various problems with respect to the stability. However, it has been found that the composition of the present invention comprising the combination of the above-mentioned specific surfactants has a suitable structural viscosity and sufficient storability and stability against vibration. In addition, the composition of the present invention has a sufficient deterging power when it is used as a kitchen detergent and also it satisfies all the requirements as the abrasive-containing liquid detergent.

The anionic surfactants used as the components (a) of the composition of the present invention include preferably polyoxyethylene alkyl ether sulfates of the following general formula (III):



in which R_5 represents an alkyl or alkenyl group having 8 to 18 carbon atoms, M represents an alkali metal, ammonium or alkanolamine and n represents a number of 1 to 5 on average, and alkylbenzenesulfonates of the following general formula (IV):



in which R_6 represents an alkyl group having 10 to 16 carbon atoms and M represents an alkali metal, ammonium or alkanolamine.

The inorganic thickening agents used as the component (f) of the composition of the present invention include preferably montmorillonite, hectorite, saponite, vermiculite, nontronite, sauconite and laponite. They are used either alone or in the form of a mixture of two or more of them.

The amount of the anionic surfactant used as the component (a) in the present invention is 10 to 40 wt. %. When the amount is smaller than 10 wt. %, the performance such as the deterging power is insufficient. On the other hand, when the amount exceeds 40 wt. %, the viscosity is increased sharply and

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the high-temperature stability is reduced. The amount of the tertiary amine oxide of the formula (I) used as the component (b) is 0.1 to 5 wt. %. Beyond this range, the stability is reduced and the viscosity is increased sharply disadvantageously.

The succinic acid derivative used as the component (d) is obtained by, for example, reacting an olefin having 4 to 18 carbon atoms with maleic anhydride, hydrogenating the product, if desired, and converting the resulting alkyl or alkenyl-substituted succinic anhydride into a water-soluble salt thereof. The succinic acid derivative is used in an amount of 0.2 to 5 wt. %. When the amount of this derivative is insufficient, the stability, particularly storability and stability against vibration, of the composition is reduced, while when it exceeds 5 wt. %, the effects thereof are no more improved. Though the stabilization effects of the component (d) are quite unique, the mechanism of the stabilization has not been elucidated yet. The higher fatty acid alkanolamide used as the component (c) may be obtained from one or a mixture of two or more of saturated or unsaturated fatty acids having 10 to 18 carbon atoms and a monoethanolamine or diethanolamine. The components (c) include, for example, coconut fatty acid diethanolamide and lauric acid mono-

ethanolamide. The amount of the component (c) used is 1 to 8 wt. %. When the amount is below said range, the stabilization effect is insufficient while when it is above said range, the viscosity is increased to rather lower the stability. Examples of the abrasives used as the component (e) include those used heretofore as water-insoluble abrasives, such as silicon dioxide, aluminum oxide, magnesium oxide, titanium oxide, aluminosilicate, silicon carbide, calcium carbonate, calcium phosphate, chromium oxide, emery, silica, quartz sand, dolomite, sand, pulverized natural products such as shells, powdery mica and powders of plastics such as polystyrene and polyacrylate. The amount of the component (e) is 1 to 25 parts by weight, preferably 5 to 20 parts by weight, for 100 parts by weight of the composition.

The properties of the detergent of the present invention, i.e. deterging power, foaming power, specific deterging effects, particularly remarkable improvement in the finish of tablewares, etc., and excellent storability, cannot be obtained unless the above-mentioned components are used in the above-mentioned amounts. When any of these components is lacking or the amounts of them are not within the ranges specified as above, the intended properties cannot be obtained.

The amount of the abrasive to be incorporated in the liquid detergent according to the present invention is determined suitably so that a suitable abrasive effect can be exhibited, since dirt to which the detergent is to be applied are those easily removable by polishing cleansers but difficultly removable by kitchen detergents. When the amount of the abrasive is insufficient, the effects of the abrasive cannot be obtained while when it is excessive, adverse effects, such as scarring, would be exhibited. Though the abrasives having a large particle size may be used, those having a particle size of 1 to 150 μ are preferred from the viewpoint of the scarring of the substances to be cleaned.

In carrying out the present invention, anionic surfactants other than those specified in the invention, nonionic surfactants, cationic surfactants, amphoteric surfactants, flavors, dyes, antimicrobial agents, solubilizers, etc. may be incorporated into the composition unless the intended effects of the invention are damaged.

As described above, the liquid detergent composition containing the abrasive of the present invention does not undergo phase separation and its viscosity is not changed after the storage for a long

period of time, it is stable against vibration and ambient temperature changes and it has excellent deterging and foaming powers and a suitable abrasive power.

- 5 The following examples will further illustrate the present invention, which by no means limit the invention.

Example 1

Compositions are shown in Table 1 were prepared
10 and the deterging and foaming powers, viscosity and storability of each of them were examined. The results are shown in Table 1. The amounts are shown in terms of parts by weight and the data were obtained by the following test methods:

15 <Test methods>

(Deterging power)

0.1 % of Sudan III (a red dyestuff) used as an indicator was added to beef tallow. 5 g of the mixture was applied to a porcelain dish having a diameter of
20 25 cm. It was then rubbed by means of a sponge impregnated with 10 g of a detergent and 20 g of water. The number of the plates from which the beef tallow could be removed with the sponge was examined.

(Foaming power)

- 25 The foaming power of a 0.5 % detergent solution

containing 0.1 % of a commercially available butter as a dirt was examined. More particularly, 40 cc of the detergent solution containing the butter was placed in a glass cylinder having a diameter of 5 cm and stirred by rotation for 10 min and the height of the foams was measured immediately after stopping the stirring.

(Viscosity)

Each composition was placed in a viscosity beaker kept at a given temperature and the viscosity thereof was measured with a Brookfield viscometer (rotor No. 4, 60 rpm).

(Storability)

Sample: each composition was placed in a 200 cc polymer bottle.

1. Temperature stability:

The samples were stored at various temperatures for one month and the appearances of them were examined macroscopically.

2. Vibration stability:

Transportation tests (two round trips between Tokyo and Osaka) were conducted by means of a truck and the appearances of them were examined macroscopically.

The results of the tests 1 and 2 were judged on the basis of the following criteria:

O : no phase separation (stable)

Δ : slight separation

X : complete separation.

3. Viscosity stability:

5 The viscosity of each product stored at room temperature for 6 months was measured and the results were compared with that determined immediately after the preparation.

O : no change

10 Δ : slight change

X : remarkable change

Table 1

Composition No. Component	Invention											
	1 #4 (Comp.)	2 (Comp.)	3 (Comp.)	4 (Comp.)	5 #4 (Inven- tion)	6 (Inven- tion)	7 (Inven- tion)	8 (Comp.)	9 (Comp.)	10 (Comp.)	11 (Comp.)	12 (Inven- tion)
Sodium dodecylbenzenesulfonate	20	20	20	20	20	15	15					
Sodium α -olefinsulfonate ($\overline{Cn}=14$)						5						
Sodium polyoxyethylene (3.0) lauryl ether sulfate							5	20	20	20	20	20
Lauryldimethylamine oxide	1	1		1	1	1	1	1	1		1	1
Coconut fatty acid diethanolamide	5	5	5		5	5	5	5	5	5		5
Sodium octenylsuccinate		2	2	2	2	2	2	2	2	2	2	2
Powdery silica #1	10	10	10	10	10	10	10	10	10	10	10	10
Montmorillonite #2	2		2	2	2	2	2	2		2	2	2
Water	B #3	B	B	B	B	B	B	B	B	B	B	B
Deterging power (number of plates)	10	12	9	8	13	12	14	14	15	11	11	16
Foaming power (mm)	60	80	55	60	85	80	90	65	90	65	60	95
Viscosity (25°C, cp)	2500	1600	2100	1900	2200	2000	2400	3700	1200	2500	2300	3000
Temp. stability	50°C	Δ	X	X	○	○	○	X	X	X	Δ	○
	20°C	○	○	○	○	○	○	○	X	○	○	○
	-10°C	X	○	Δ	○	○	○	X	X	○	X	○
Vibration stability		X	X	Δ	○	○	○	X	X	X	X	○
Viscosity stability		X	X	Δ	○	○	○	X	X	Δ	Δ	○

*1: particle size of the powdery silica: 5 to 120 μ (15 μ on average),

*2: "Kunipia", a product of Kunimine Kogyo Co., Ltd.,

*3: symbol "B" means the balance, and

*4: "Comp." and "Invention" mean a comparative product and a product of the present invention, respectively.

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Example 2

Composition No.		13 (Invention)	14 (Comp.)
	sodium dodecylbenzenesulfonate	20	20
	laurylamide oxide	1	1
5	coconut fatty acid diethanolamide	5	5
	sodium octenylsuccinate	2	2
	powdery silica (the same as in Ex. 1)	15	0
	montmorillonite (" ")	3	3
	ethanol	3	3
10	water	balance	balance

<In-home use tests on the specific deterging effects>

The above-mentioned compositions Nos. 13 and 14 were used practically by 30 housewives in their kitchens. The specific deterging effects of the compositions judged by them were as follows:

(Criteria)

- +2: composition No. 13 was more effective,
- +1: composition No. 13 was a little more effective,
- 0: compositions Nos. 13 and 14 were equivalent,
- 1: composition No. 14 was a little more effective,
- 2: composition No. 14 was more effective.

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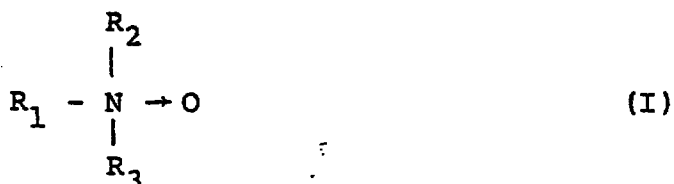
	+2	+1	0	-1	-2
Finish of glasses	21	4	5	0	0
Finish of teacups	13	7	8	2	0
Removal of curry sticking to a pan	23	4	3	0	0

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CLAIMS:

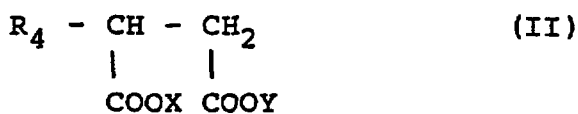
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- 5 A liquid detergent composition which comprises:
- (a) 10 to 40 wt. % of one or more anionic surfactants selected from the group consisting of polyoxyethylene alkyl ether sulfates, alkylbenzenesulfonates, α -olefinsulfonates and alkanesulfonates,
- 10 (b) 0.1 to 5 wt. % of a tertiary amine oxide of the following general formula (I):



- 15 in which R_1 represents an alkyl or alkenyl group having 10 to 18 carbon atoms and R_2 and R_3 represent each an alkyl group having 1 or 2 carbon atoms,
- (c) 1 to 8 wt. % of a higher fatty acid alkanolamide.
- 20 (d) 0.2 to 5 wt. % of a succinic acid derivative of the following general formula (II):





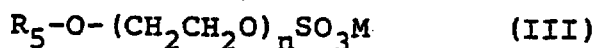
in which R_4 represents an alkyl or alkenyl group having 4 to 18 carbon atoms, and X and Y represent each a hydrogen atom, an alkali metal, ammonium or an alkanolamine,

(e) 1 to 25 wt. % of an abrasive, and

(f) 0.2 to 15 wt. % of an inorganic thickening agent.

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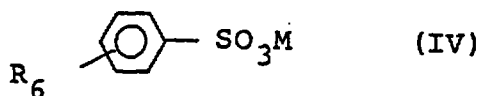
A liquid detergent composition as claimed in Claim 1, in which the component (a) is a polyoxyethylene alkyl ether sulfate of the formula (III):



in which R_5 represents an alkyl or alkenyl group having 8 to 18 carbon atoms, M represents an alkali metal, ammonium or an alkanolamine and n represents a number of 1 to 5 on average.

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A liquid detergent composition as claimed in Claim 1, in which the component (a) is an alkylbenzenesulfonate of the formula (IV):



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in which R_6 represents an alkyl group having 10 to 16 carbon atoms and M represents an alkali metal, ammonium or an alkanolamine.

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5 A liquid detergent composition as claimed in any of Claims 1, 2 and 3, in which the component (f) is one or more inorganic thickening agents selected from the group consisting of montmorillonite, hectorite, saponite, vermiculite, nontronite, sauconite and laponite.

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A liquid detergent composition substantially as described with reference to Example 1, Compositions 5 or 6 or 7 or 12 and with reference to Example 2 Composition 13.

