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⑤④ **Cleaning compositions.**

⑤⑦ Cleaning compositions (particularly liquid water-based compositions such as liquid detergents and hard surface cleaners) are described which contain at least two principal amphoteric surfactants and at least one non-ionic surfactant. One of the two amphoteric surfactants is of the acylamino type and the other is of the alkylamino or alkoxypropylamino type.

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CLEANING COMPOSITIONS

This invention concerns compositions for cleaning a wide range of items including hard surfaces and soft goods such as textiles both for commercial and home use.

The invention is primarily concerned with  
5 liquid water-based cleaning compositions such as liquid detergents, carpet cleaners, dishwashing liquids and hard surface cleaners, but the same principles are equally applicable to solid compositions for example in powder form.

10 Prior to this invention various suggestions have been made for obtaining synergistic detergency between one amphoteric and one or more nonionic surfactants. To my surprise I have found considerable further benefits of synergistic detergency, low  
15 temperature cleaning, and improved compatibility characteristics by using more than one principal (cleaning) amphoteric surfactant with at least one non-ionic surfactant.

The invention thus provides a cleaning composition  
20 (preferably in liquid water-based form) which comprises at least two amphoteric surfactants and at least one non-ionic surfactant.

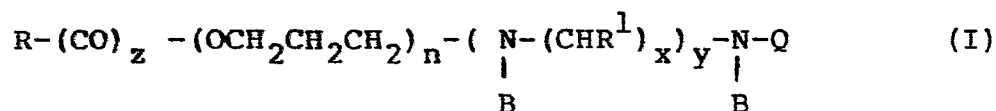
These compositions offer many advantages including particular:

- 25 a) Improved detergency at low concentrations and low cost  
b) Very wide applicability to various cleaning uses  
c) Outstanding detergency at low temperatures  
30 with consequent energy saving  
d) Ability to produce highly concentrated liquid detergent compositions even in the presence of alkaline builder

Wide compatibility of the detergent system with many types of additives normally used in detergent compositions to confer specific additional properties.

Depending on the intended use, the compositions may also contain additives conventionally included in cleaning formulations. For example other surfactant may be added for specific properties, for examples to add bactericidal properties, to boost foam or to confer softening properties. A further feature of this invention is the ease of incorporation of such additional surfactants without problems such as surfactant compatibility and stability of the formulation. Other additives may include alkaline builders to improve detergency, chelating or sequestering agents to avoid problems with heavy metal ions, optical brightening agents, solvents, dyes and perfumes.

The amphoteric surfactants may be of the type having the general formula (I)



where R is a C<sub>8-20</sub> hydrocarbyl group, optionally substituted;

R<sup>1</sup> is H or C<sub>1-6</sub> alkyl;

B is H, alkyl or substituted alkyl, or a group Q as defined below;

Q is an anionic moiety;

x is 2 to 6;

y is 0 to 5;

z is 0 or 1; and

n is 0 or 1 (z being 0 when n is 1).

The compositions generally contain one or more (first) amphoteric surfactant(s) in which z is 0 and preferably one or more (second) amphoteric surfactant(s) in which z is 1.

In these compounds, R may for example be a straight or branched alkyl or alkenyl group; a or cycloalkyl-alkyl (e.g. cyclohexyl-alkyl) group; an aralkyl or aralkenyl group in which the alkyl  
 5 or alkenyl portion contains at least 6 carbon atoms; or the hydrocarbyl portion of a resinic acid containing at least two fused rings, e.g. as in the tricyclic pine resin acids such as abietic acid.

R is preferably a  $C_{10-16}$  alkyl group, e.g.  
 10 a  $C_{12}$  group and an example of a branched chain group is  $C_{16}H_{33}CH(CH_3)-$ . The aliphatic portion of R may for example be the hydrocarbyl portion of lauric or coconut fatty acid, both of which contain high portion of  $C_{12}$  constituents. An example  
 15 of an unsaturated R group is oleyl. R may for example be substituted by hydroxy, as in hydroxystearyl, or by  $-COOH$  (e.g. at the 2- position).

In most surfactants of the formula(1) type, n is 0.

20  $R^1$  is usually a hydrogen atom, but may be an alkyl group such as methyl.

When B is an alkyl group, it may have 1 6, preferably 2 - 4, carbon atoms, and is preferably a straight chain group. Examples of such groups  
 25 are methyl and ethyl. The alkyl group may be substituted, for example by hydroxy, as 2-hydroxyethyl, or by amino.

The group Q may for example be of the formula  $-R^2COOM$  where  $R^2$  is a  $C_{1-6}$  alkylene group (such  
 30 as methylene or ethylene) and M is hydrogen or an alkali metal, alkaline earth metal, ammonium or substituted ammonium ion (e.g. mono-, di- or tri-hydroxyethylammonium). M is preferably sodium, and  $R^2$  is preferably methylene.

35 For the purposes of this invention, and because of the change of ionic properties with pH shown by amphoteric surfactants, the free  $-COOH$  group

is considered equivalent to  $-\text{COONa}$  or  $-\text{COOK}$  and ammonium or amine or other carboxylic acid salts.

The composition of this invention preferably contains a first amphoteric surfactant of formula

5 (I) where R is a  $\text{C}_{8-20}$  hydrocarbyl group derived from coco or tallow fatty acids;

$\text{R}^1$  is H,

B is H or Q as defined below

Q is an anionic moiety, preferably  $\text{CH}_2\text{COONa}$  or

10  $-\text{CH}_2\text{CH}_2\text{COONa}$ ,

x is 2 to 4,

y is 0 to 4,

z is 0, and

n is 0;

15 in combination with a second amphoteric surfactant of formula (II) where:

R is a  $\text{C}_{8-20}$  hydrocarbyl group derived from coco, oleic or tall oil fatty acid,

$\text{R}^1$  is H,

20 B is H, hydroxyethyl or a group Q as defined below,

Q is an anionic moiety, preferably  $\text{CH}_2\text{COONa}$  or

$\text{CH}_2\text{CH}_2\text{COONa}$ ,

x is 2,

y is 1,

25 z is 1, and

n is 0.

Commercially available examples of the first amphoteric surfactant include Deriphat 151, Deriphat-154, and the full sodium salts of Deriphat 151C,

30 Deriphat 161C, Amphoram CPl, Diamphoram CPl, Triamphoram CPl, and Polyamphoram CPl and Ampholak QTE (Deriphats available from Henkel, Amphorams from Ceca and Ampholak QTE from Amphoterics International Ltd.).

35 Commercially available examples of the second amphoteric surfactant include products classed as cocoamphoglycinate or cocoamphopropionate (and similar products made from the other fatty acids listed), or cocamphocarboxyglycinate or cocoamphocarboxy-

propionate (and similar products made from the other fatty acids listed), for example Miranol CM, C2M or C2MSF.

5 In general the relative (weight) concentrations of the two amphoteric surfactants used is from 90:10 to 10:90, preferably 3:1 to 2:1 (first amphoteric: second amphoteric).

10 The non-ionic surfactants used are preferably ethylene oxide or propylene oxide/ethylene oxide adducts of alkylphenols (e.g. nonylphenol) or long chain alcohols or alkylamines (e.g. C<sub>12-14</sub> alcohols or C<sub>12-18</sub> alkylamines). The weight ratio of the principal amphoteric surfactants to the non-ionic surfactant(s) is generally from 10:1 to 1:2, preferably 15 from 2.5:1 to 1.5:1 (e.g. about 2:1).

The non-ionic surfactant may for example be a nonylphenol-ethylene oxide adduct containing 6 -12 moles ethylene oxide, a C<sub>12-14</sub> alcohol-ethylene oxide adduct containing 7 - 10 moles ethylene oxide, 20 a C<sub>12-18</sub> alkylamine-ethylene oxide adduct containing 7 - 15 moles ethylene oxide or an equivalent ethylene oxide/propylene oxide block copolymer adduct.

When a second non-ionic surfactant is included, it is may be of the same general type but is preferably 25 more lipophilic than the main non-ionic surfactant. The second material may for example be a nonylphenol-ethylene oxide adduct containing 4 - 6 moles ethylene oxide, a C<sub>12-14</sub> alcohol-ethylene oxide adduct containing 4 - 6 moles ethylene oxide, a C<sub>12-18</sub> alkylamine- 30 ethylene oxide adduct containing 2 - 5 moles ethylene oxide or an equivalent ethylene oxide/propylene oxide block copolymer adduct. A second non-ionic surfactant of this kind is generally used at a lower concentration than the first; for example, 35 the weight ratio of the first to second surfactants may generally be from 100:1 to 60:40 or 70:30 in compositions containing a builder.

One of the advantages of the invention is that the choice of non-ionic surfactant is not as critical as in conventional detergent systems, for example as regards the balance of detergent  
5 properties and water solubility required particularly in built systems. The amphoteric surfactants also solubilise the non-ionic surfactants in formulations containing a builder.

The compositions may also contain, depending  
10 on the intended use, additives such as builders (e.g. sodium metasilicate (anhydrous or pentahydrate), tetrapotassium pyrophosphate, caustic soda or nitrilotriacetic acid), chelating or sequestering agents (e.g. trisodium nitrilotriacetic acid, tetrasodium  
15 ethylenediamine tetracetic acid and trisodium hydroxyethylethylenediamine triacetic acid), solvents (e.g. glycolethers such as butyl glycol ether, butyl cellosolve), fabric conditioners (e.g. quaternary ammonium salts, such as a di-fatty (usually tallow)  
20 dimethylammonium chloride (e.g. Arquad 2 HT) or a di-fatty (usually tallow) imidazoline methosulphate or ethosulphate quaternary salt (e.g. Ammonyx 4080 (Millmaster-Onyx), Imisoft 75 (M & S Chemicals) & Ampholak TQ (Amphoterics International)), foam  
25 boosters (such as alkyl betaines or amine oxides, e.g. Emigen BB & BT, Aromox DMDC (Akzo) and Empigen OB (Albright & Wilson), Ammonyx LO and CDO (Millmaster-Onyx)), bactericides (e.g. a bactericidal surfactant such as a benzalkonium chloride (e.g. Imiquat BKC)  
30 or BTC 2125), optical brighteners (e.g. Tinopal CBS-X & Tinopal 5BMS-X (Ciba)), dyes and perfumes.

The quantity of such additives used will vary according to the application and the nature of the particular additive. In general however  
35 liquid systems may contain 1-40% of a builder, 1-20% chelating agent, 1-10% solvent, 1-5% fabric conditioner, 1-5% foam booster, 1-5% bactericide, 0.1-1% optical brightener and 0.1-1% dyes and /or

perfumes (percentages herein are by weight unless otherwise stated).

Liquid compositions which do not contain a builder may for example contain up to 50 % of the principal amphoteric surfactants and up to 25 % non-ionic surfactants, e.g. up to 40% first amphoteric surfactant, up to 10% second amphoteric surfactant, up to 20% first non-ionic surfactant and up to 5% second non-ionic surfactant.

(Percentages given herein for the amphoteric and non-ionic surfactants are on the basis of 30% active for the amphoterics and 100% active for the non-ionics; 'active' refers to concentration relative to the undiluted material).

Liquids detergents of the invention may for example have the following compositions:

|                         | General | Preferred |
|-------------------------|---------|-----------|
| First amphoteric        | 10-25%  | 18-22%    |
| Second amphoteric       | 2-6%    | 3-5%      |
| Non-ionic surfactant(s) | 3-15%   | 8-12%     |
| Builder                 | 1-40%   | 10-20%    |
| Chelating agent         | 1-20%   | 5-10%     |
| Fabric conditioner      | 1-5%    | 2-4%      |
| Optical brightener      | 0.1-1%  | 0.2-0.6%  |
| Dye, perfume            | 0.1%-1% | 0.2-0.6%  |
| Water                   | to 100% |           |

It will be appreciated that the overall compositions can be varied widely within the above ranges.

The preferred concentration ranges refer to compositions of conventional dilution, but one of the advantages of the invention is that it offers the possibility of very highly concentrated solutions. Such compositions may for example contain up to 35% (e.g. 20-35%) of the builder (e.g. sodium metasilicate), up to 90% (e.g. 10-50%) of the two principal amphoteric



surfactants (e.g. 9-40% of the first type and 1-15% of the second type) and up to 15% (e.g. 3-15%) of non-ionic surfactant(s). Examples of such compositions are

|    | Builder | First<br>Amphoteric | Second<br>Amphoteric | Non-ionic | Water |
|----|---------|---------------------|----------------------|-----------|-------|
| 5  |         |                     |                      |           |       |
|    | 30%     | 9%                  | 1%                   | 3%        | 57%   |
|    | 25%     | 17%                 | 5%                   | 8%        | 46%   |
|    | 22%     | 23%                 | 4%                   | 11%       | 40%   |
| 10 |         |                     |                      |           |       |

Hard surface cleaners of the invention may for example have the following composition:

|    |                         | General | Preferred |
|----|-------------------------|---------|-----------|
| 15 |                         |         |           |
|    | Amphoteric - 1          | 2-8%    | 3-5%      |
|    | Amphoteric - 2          | 1-4%    | 1.5-2.5%  |
|    | Non-ionic surfactant(s) | 1-6%    | 2-4%      |
| 20 | Solvent                 | 1-5%    | 2-4%      |
|    | Builder                 | 0-15%   | 8-12%     |
|    | Foam booster            | 1-5%    | 2-4%      |
|    | Bactericide             | 1-5%    | 2-4%      |
|    | Water                   | to 100% |           |
| 25 |                         |         |           |

The following examples illustrate the invention.

#### Example 1

A hard surface cleaner was made using 4% of the first type of amphoteric (Ampolak YCE), 2% of the second type of amphoteric (e.g. cocoamphoglycinate) together with 2% nonyl phenol 9 mole ethoxylate and 1% nonyl phenol 5.5 mole ethoxylate. This basic surfactant composition together with builders such as sodium metasilicate pentahydrate or tetra potassium pyrophosphate (10%) gave excellent cleaning results. Furthermore it was found possible to incorporate a bactericide of the 'benzalkonium chloride' type (3%) as well as a solvent such as

butyl glycol ether (3%). Higher concentrations of the same type of formulation were easily possible without loss of stability. The results obtained were such as to give considerably better performance  
5 that conventional hard surface cleaners.

3-5% of amine oxide and about 2% NaCl was also found useful to increase the viscosity of this formulation, as well as increasing flash foam.

Furthermore, such products are normally based  
10 on anionic and nonionic surfactants where inclusion of a cationic bactericide gives problems of compatibility. Also, the amount of alkaline electrolyte which can be included in conventional products is limited by the level of surfactant (and vice versa). In  
15 such cases the addition of hydrotrope such as sodium xylene sulphonate is necessary in substantial amounts to confer stability.

#### Example 2

A liquid laundry detergent was prepared using,  
20 as base surfactant composition, 16% of the first type of amphoteric and 4% of the second type of amphoteric (as in Example 1) together with 8% nonyl phenol 9 mole ethoxylate and 2% nonyl phenol 5.5 mole ethoxylate. This was formulated with 15%  
25 sodium metasilicate pentahydrate, 2% chelating agent (sodium nitrilotriacetic acid), and optional brighteners (0.4%), dye and perfume.

Washing at 30°C, or even 20°C, gave superior results as compared to both to a conventional type  
30 of liquid laundry detergent based on anionic and nonionic surfactants and also conventional powder detergents, both as regards detergency and whitening. Furthermore, because of the compatibility of the surfactant system described in this invention,  
35 it was found possible to include easily a cationic bactericide of the type mentioned above and also a cationic fabric conditioning product (3% Ampholak TQ, described as a di-fatty imidazoline quaternary).

Since the amphoteric surfactants used were calculated to be 30% active, the net active content of the surfactant base described was only about one quarter of the active content of the comparative  
5 conventional laundry detergent and functioned better when used at only half the dosage level of the latter under the same conditions.

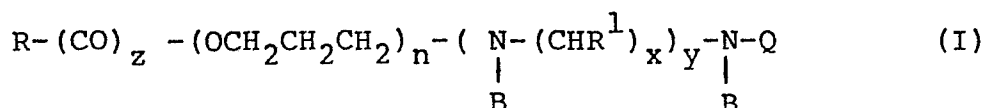
It was also found possible to prepare the compositions of Example 2 in more concentrated  
10 form, containing for example up to and over twice the stated concentrations of the various ingredients.

Furthermore, it is well known that conventional liquid laundry detergents of about 40% active surfactant content and above require the addition of solubiliser  
15 or hydrotrope to confer stability and the addition of alkaline builder to such a system is virtually impossible without total loss of stability. The type of formulation described in this invention, however, provided a considerably better performing  
20 detergent composition into which alkaline builder was easily included.

By use of combinations of two types of amphoteric surfactant together with one or more nonionic surfactants it was found possible to obtain excellent detergency  
25 even at low temperature coupled with ease of incorporation into alkaline 'built' products and with greater flexibility regarding the possible incorporation of useful cationic additives. Not only does this offer better performance at lower cost but further  
30 savings are possible by omission of otherwise non-functional ingredients such as solubilisers and hydrotropes. Such is the ease of formulation with this system that it is possible to produce highly concentrated products or combinations of products,  
35 thus reducing the weight and volume of product for a given purpose, reducing the amount of water needed in such products and thus offering cheaper packaging costs, and offering energy saving by possible use at lower temperatures.

CLAIMS

1. A cleaning composition which comprises at least two amphoteric surfactants and at least one non-ionic surfactant, <sup>the former being</sup> of the type having the general formula (I)



10

where R is a C<sub>8-20</sub> hydrocarbyl group, optionally substituted;

R<sup>1</sup> is H or C<sub>1-6</sub> alkyl;

B is H, alkyl or substituted alkyl, or a

15

group Q as defined below;

Q is an anionic moiety;

x is 2 to 6;

y is 0 to 5;

z to 0 or 1; and

20

n is 0 or 1 (z being 0 when n is 1);

the composition containing at least a first amphoteric surfactant as defined above in which z is 0.

2. A composition according to claim 1 which contains a first amphoteric surfactant in which z is 0 and a second in which z is 1.

3. A composition according to claim 1 which contains a first amphoteric surfactant of formula (1) where R is a C<sub>8-20</sub> hydrocarbyl group derived from coco or tallow fatty acids;

30 R<sup>1</sup> is H,

B is H or Q as defined below

Q is -CH<sub>2</sub>COONa or -CH<sub>2</sub>CH<sub>2</sub>COONa,

x is 2 to 4,

y is 0 to 4,

35 z is 0, and

n is 0;

in combination with a second amphoteric surfactant of formula (I) where:

R is a C<sub>8-20</sub> hydrocarbyl group derived from coco,  
oleic or tall oil fatty acid,

R<sup>1</sup> is H,

B is H, hydroxyethyl or a group Q as defined below,

5 Q is -CH<sub>2</sub>COONa or CH<sub>2</sub>CH<sub>2</sub>COONa,

x is 2,

y is 1,

z is 1, and

n is 0.

10 4. A composition according to claim 1 which  
contains two non-ionic surfactants, the second  
of which is more lipophilic than the first and  
is present at a lower concentration than the first.

5. A composition according to claim 1 in which  
15 the weight ratio of the first amphoteric surfactant  
to the second amphoteric surfactant is from 3:1  
to 2:1 and the weight ratio of the first and second  
amphoteric surfactants to the non-ionic surfactant(s)  
is from 2.5:1 to 1.5:1.

20 6. A composition according to claim 1 which  
contains one or more builders, chelating or sequestering  
agents, solvents, fabric conditioners, foam boosters,  
bactericides, optical brightners, dyes or perfumes  
as additives.

25 7. A composition according to claim 1 in the  
form of a liquid water-based composition.

8. A composition according to claim 1 in the  
form of a liquid detergent having the composition  
A or B below, by weight:

| 30                      | <u>A</u> | <u>B</u> |
|-------------------------|----------|----------|
| First amphoteric        | 10-25%   | 18-22%   |
| Second amphoteric       | 2-6%     | 3-5%     |
| Non-ionic surfactant(s) | 3-15%    | 8-12%    |
| Builder                 | 1-40%    | 10-20%   |
| 35 Chelating agent      | 1-20%    | 5-10%    |
| Fabric conditioner      | 1-5%     | 2-4%     |
| Optical brightener      | 0.1-1%   | 0.2-0.6% |
| Dye, perfume            | 0.1%-1%  | 0.2-0.6% |
| Water                   | to 100%  |          |

9. A composition according to claim 1 in the form of a highly concentrated liquid detergent containing 10-50% of the first and second amphoteric surfactants, 3-15% of the non-ionic surfactant(s) and 20-35% of the builder, by weight.

- 5 10. A composition according to claim 1 in the form of a hard surface cleaner having the composition A or B below, by weight

|    | <u>A</u>                | <u>B</u>      |
|----|-------------------------|---------------|
| 10 |                         |               |
|    | First amphoteric        | 2-8% 3-5%     |
|    | Second amphoteric       | 1-4% 1.5-2.5% |
|    | Non-ionic surfactant(s) | 1-6% 2-4%     |
|    | Solvent                 | 1-5% 2-4%     |
| 15 | Builder                 | 0-15% 8-12%   |
|    | Foam booster            | 1-5% 2-4%     |
|    | Bactericide             | 1-5% 2-4%     |
|    | Water                   | to 100%       |



European Patent  
Office

## EUROPEAN SEARCH REPORT

0162600

Application number

EP 85 30 2875

| DOCUMENTS CONSIDERED TO BE RELEVANT   |   |  |  |
|---|---|--|--|
| Category  | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim  | CLASSIFICATION OF THE APPLICATION (Int. Cl. 4) |
|   | No relevant documents have been disclosed<br><br>-----                        |  | C 11 D 1/88<br>C 11 D 1/94                     |
|   |   |  | TECHNICAL FIELDS SEARCHED (Int. Cl. 4)         |
|   |   |  | C 11 D 1/00                                    |
| The present search report has been drawn up for all claims  |   |  |  |
| Place of search<br>BERLIN   |   | Date of completion of the search<br>11-07-1985   | Examiner<br>SCHULTZE D                         |
| <b>CATEGORY OF CITED DOCUMENTS</b>  |   |  |  |
| X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document |   | T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br><br>& : member of the same patent family, corresponding document |  |