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(54) Liquid detergent compositions.

(57) This invention relates to a detergent composition which contains a surfactant, a builder, water and a solvent mixture. The solvent mixture comprises hexylene glycol and an aliphatic monohydric alcohol containing at least 6 carbon atoms. The alcohol may be a monoether of a mono-, di- or polyoxyalkylene glycol. The compositions are particularly suitable for cleaning hard surfaces e.g. baths.

EP 0 334 463 A1

LIQUID DETERGENT COMPOSITIONS

The present invention relates to liquid detergent compositions as a household cleaning agent.

Household detergent compositions suitable for cleaning surfaces such as metal, glass ceramic, plastics and linoleum are well known. These compositions are available as liquid or as powder formulations. These compositions are used primarily to cleanse surfaces soiled by soap scum, grease and oil.

The present invention is concerned with liquid detergent compositions. Liquid compositions have the advantage that they can be applied in any desired strength directly to the soiled surface. Other specific advantages of such compositions are described in GB-A-2184453 which claims liquid cleaner compositions comprising

a) from about 0.1 to about 10% of a surfactant;

b) from about 0.5 to about 25% of a diol selected from C_6-C_{16} diols and mixtures thereof;

c) from about 1% to about 30% of a detergency builder; and

d) at least about 60% water.

Some of the diols falling within the scope of these compositions e.g. hexylene glycol, are either poor cleaners or, as in the case of 2-ethyl-1,3-hexane diol, need substantial quantities of hydrotroping agents to form a homogeneous composition.

It has now been found that by using a combination of solvents such problems can be mitigated.

Accordingly, the present invention is a liquid detergent composition comprising

A) from about 0.1% to 10% by weight of a surfactant;

B) from about 0.5% to 25% by weight of a solvent;

C) from about 1% to about 30% by weight of a detergency builder; and

D) at least about 50% by weight of water,

characterised in that the solvent comprises a mixture of

(a) hexylene glycol and

(b) an aliphatic monohydric alcohol having at least six carbon atoms selected from

(i) a simple primary, secondary or tertiary alkyl alcohol and

(ii) a monoether of a mono-, di- or polyoxyalkylene glycol.

The expression "hexylene glycol" as used herein refers to a branded chain glycol of the formula $(CH_3)_2$ $C(OH)CH_2$ $CH(OH)$ CH_3

The surprising feature of the present invention is that the cleaning performance of hexylene glycol when used alone is very poor. However, when combined with the monohydric alcohol, the combination is not only odourless, non-toxic, non-agressive towards acrylics surface and is relatively inexpensive, but the combination also enables reduction of the amount of hydrotroping agents such as sodium cumene sulphonate used in such a detergent composition.

The aliphatic monohydric alcohol in the mixture suitably has at least 7 carbon atoms, preferably at least 8 carbon atoms. The monohydric alcohol may be a simple alcohol such as n-octanol, trimethylpentanol and the like or a monoether of a mono-, di- or polyoxyalkyleneglycol. Particularly preferred are ethers of propanol and polyoxypropylene glycol. Specific examples of such compounds include isobutoxy propanol, n-butoxypropoxypropanol and the like.

The relative amounts of hexylene glycol and the monohydric alcohol in the solvent mixture is such that the amount of the monohydric alcohol is suitably from 10-50% w/w, preferably from 15-30% w/w of the solvent mixture. A typical example is a solvent mixture containing 70-80% w/w of hexylene glycol and 30-20% w/w of n-butoxypropoxypropanol.

The detergent compositions of the present invention contain from 0.1-10% by weight, preferably from 1-10% by weight of a surfactant. Any of the well known surfactants can be used in the detergent compositions of the present invention. A typical list of these surfactants can be found in EP 0120591 and in USP 3,663,961.

Examples of water soluble anionic surfactants include the salts of alkyl benzene sulphonates, paraffin sulphonates, alpha-olefin sulphonates, alkyl glyceryl ether sulphonates and 2-acyloxy alkane-1-sulphonate, and beta-alkyloxy alkane sulphonate. Similarly, salts of alkyl sulphates, alkyl polyalkoxy ether sulphates, alpha-sulpho-carboxylates and their esters, fatty acid monoglyceride sulphates and sulphonates and alkyl phenol polyalkoxy ether sulphates may also be used.

Suitable examples of the above surfactants are the salts of linear straight chain alkyl benzene

sulphonates (LAS) having alkyl groups with 8-16 carbon atoms and methyl branched alkyl sulphates having 8-16 carbon atoms which are also effective. Byprox (Regd Trade Mark), a commercial surfactant sold by BP Detergents Ltd is preferred.

Other anionic detergent compounds suitable for use herein include the sodium alkyl glyceryl ether sulphonates derived from tallow and coconut oil; sodium fatty acid monoglyceride sulphonates and sulphates derived from coconut oil; and sodium or potassium salts of C_8-C_{12} alkyl phenol alkylene oxide ether sulphate containing up to 10 alkylene oxide units per molecule. Mixtures of anionic surfactant may also be used.

A substantial list of such compounds can be found in e.g. McCutcheon's Dictionary of Emulsifiers and Detergents, International Edition (1981), published by the Manufacturing Confectioner Publishing Co. and in "Surfactants Europa: A Directory of Surface Active Agents available in Europe", Ed. Gordon L. Hollis, Vol 1 (1982), published by George Goodwin.

The nonionic surfactants which may be used in the present invention are condensates of an alkylene oxide e.g. ethylene oxide with a hydrophobic group to form a surfactant having an appropriate hydrophilic-lipophilic balance (HLB) in the range from 8 to 17, suitably from 9.5 to 13.5, preferably from 10 to 12.5. The hydrophobic group may be an aliphatic or aromatic type and the length of the polyoxyethylene group condensed therewith can be readily adjusted to yield a water-soluble compound having the desired degree of HLB.

Examples of suitable nonionic surfactants include:

(a) The polyethylene oxide condensates of alkyl phenol in which the alkyl group e.g. contains from 6 to 12 carbon atoms and in which from 3 to 30 moles, preferably 5 to 14 moles of ethylene oxide are present. Other examples include a mole of dodecylphenol condensed with 9 moles of ethylene oxide, a mole of dinonylphenol condensed with 11 moles of ethylene oxide and a mole of nonylphenol and octadecylphenol condensed with 13 moles of ethylene oxide.

(b) The nonionic surfactant may also be formed as a condensation product of a mole of primary or secondary C_8-C_{24} aliphatic alcohols with from 2 to 40 moles, preferably 2 to 9 moles of ethylene oxide.

Specific examples of nonionic surfactants useful for the purposes of the invention include the various grades of Dobanol (Registered Trade Mark, supplied by Shell) Lutensol (Registered Trade Mark, supplied by BASF) and Synperonics (Registered Trade Mark, supplied by ICI).

Other useful nonionic surfactants include the synthetic nonionic detergents available on the market under "Pluronics"(Registered Trade Mark) and supplied by Wyandotte Chemicals Corporation.

Zwitterionic compounds such as betaines and sulphobetaines, particularly those with a C_8-C_{16} alkyl substituent on the nitrogen atom can also be used as surfactants.

The detergent compositions in accordance with the present invention contain one or more detergent builder salts which will be well known to those skilled in the art and may comprise from 1-30% of the composition. Suitable examples of detergent builder salts useful herein can be of the polyvalent inorganic and polyvalent organic types or mixtures thereof. Examples of suitable water-soluble, inorganic alkaline detergent builder salts include the alkali metal carbonates, borates, phosphates, pyrophosphates, tripolyphosphates and bicarbonates.

Examples of suitable organic alkaline detergency builder salts are water-soluble polycarboxylates such as the salts of nitrilotri-acetic acid and citric acid.

The detergent compositions of the present invention can contain optional ingredients such as hydrotroping agents, chelating agents, suds suppressing agents and the like.

It is sometimes possible with specific combinations falling within the scope of the invention that they are relatively unstable and have a tendency to lose their homogeneity. In such cases it is advisable to use a hydrotroping agent which aids solubilisation and stabilisation of such compositions. Examples of such agents include primarily the inorganic salts of aromatic sulphonates such as benzene sulphonates, toluene sulphonates, isopropybenzene sulphonates and xylene sulphonates. The alkali metal, especially sodium, ammonium and trialkanolammonium salts of these sulphonates are preferred. Sodium cumeme sulphonate is most preferred. The hydrotroping agent is suitably present in an amount from 0.1 to 15% by weight of the total composition.

In addition suds suppressing agents can be used to facilitate removal of the surfactant from the treated substrate surface. Suds suppressing agents which can be useful in the detergent compositions of the invention are suitable selected from silicone, wax, vegetable and hydrocarbon oil and phosphate ester varieties. Suitable silicone suds controlling agents include polydimethylsiloxanes having a molecular weight in the range from 200 to 200,000 and a kinematic viscosity in the range from 20 to 2,000,000 mm^2/s (cSt), preferably from 3000 to 30,000 mm^2/s (cSt), and mixtures of siloxanes and hydrophobic silanated (e.g.

trimethylsilanated) silica having a particle size in the range from 10 to 20 millimicrons and a specific surface area above 50 m^2/g. Suitable waxes include microcrystalline waxes having a melting point in the range from 65 °C to 100 °C, a molecular weight in the range from 4,000-10,000 and a penetration value of at least 6, measured at 77 °C by ASTM-D1321 and also paraffin waxes, synthetic waxes and natural waxes. Suitable phosphate esters include mono- and/or di-C_{16}-C_{22} alkyl or alkenyl phosphate esters, and the corresponding mono- and/or di alkyl or alkenyl ether phosphates containing up to 6 ethoxy groups per molecule.

The suds suppressing agent, if used, is suitably present in an amount from 0.01-1% by weight of the total composition.

The detergent compositions of the present invention are particularly suitable for use as hard surface cleaning compositions e.g. for baths. Thus, these compositions were subjected to simulated bath tub soil cleaning tests according to the method described in GB-A-2184453. In these tests the compositions of the present invention were found to be as good as if not better than conventional detergent formulations.

The present invention is further illustrated with reference to the following Examples.

Examples

Preparation of simulated bath tub soil

Into 270 grams of isopropyl alcohol is placed 30 grams of the calcium salt of stearic acid. The mixture is stirred (in a blender) and 0.2 grams of finely divided charcoal is added. The material is stirred until the charcoal is well blended. The calcium stearate solution is placed in a Pre-Val sprayer. The soil is sprayed onto smooth 3 inch x 13 inch procelain plates in fume hood. The plates are laid lengthwise inclined at a slight (15°) angle. An even flow of soil is established. The sprayer is held 18 inches from the plate, while spraying across the plates four times (counting left to right and back as one). The plates are baked at 180 °C for 20 minutes. After cooling, the plates are ready for use in cleaning tests.

Cleaning of simulated bath tub soil

A Sheen Wet Abrasion Scrub Tester Model 902 HD, a device for mechanically passing a sponge across a flat surface in a uniform and reproducible manner, was used for soil removal testing. A sponge was moistened with water to a weight of 25 grams and 1.0 grams of product was added; a weight (1300g) was added to the sponge carriage.

The porcelain plates were cleaned with each product being tested to about 99% clean by visual observation. The strokes needed to reach this level of cleaning were recorded. The number of strokes needed were entered into the following formula to determine the cleaning index:

$$\text{Cleaning index} = \frac{\text{no. of scrub strokes for reference sample}}{\text{no. of scrub strokes for test sample}}$$

wherein the value for reference sample is assumed to be 100.

The results obtained using various formulations (quantities refer red to are all by weight) are tabulated below:

TABLE

Component	Refl **	1	2	3	4	5	6	Ref 2
Water	72.0	72.0	71.8	75.6	75.2	71.0	70.8	71.0
Tetrapotassium pyrophosphate	11.5	11.5	11.5	11.5	11.5	10.0	10.0	10.0
ByProx*	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sodium cumene sulphonate	6.0	6.0	6.2	2.4	2.8	6.0	6.2	6.0
Hexylene glycol	9.5	6.7	7.6	7.6	8.5	6.7	7.6	9.5
n-Butoxypropoxypropanol		2.8				2.8		
n-Hexanol			1.9				1.9	
Iso-Butoxypropanol				1.9				
244 Trimethylpentanol					1.0			
Sodium Carbonate						2.5	2.5	2.5
CLEANING INDEX	100	200	300	200	220	250	410	240

* Registered Trademark.

** All cleaning indices calculated on the basis of reference test 1.

The above results show that the solvents of the present system improve the performance of the detergent composition whether or not sodium carbonate is present.

Claims

1. A liquid detergent composition comprising

A) from about 0.1% to 10% by weight of a surfactant;

B) from about 0.5% to 25% by weight of a solvent;

C) from about 1% to about 30% by weight of a detergency builder; and

D) at least about 50% by weight of water,

characterised in that the solvent comprises a mixture of

a) hexylene glycol and

b) an aliphatic monohydric alcohol having at least six carbon atoms selected from

(i) a simple primary, secondary or tertiary alkyl alcohol and

(ii) a monoether of a mono-, di- or polyoxyalkylene glycol.

2. A composition according to claim 1 wherein the aliphatic monohydric alcohol has at least 7 carbon atoms.

3. A composition according to claim 1 or 2 wherein the aliphatic monohydric alcohol is n-octanol, trimethylpentanol, or, an ether of propanol or polyoxypropylene glycol.

4. A composition according to any one of the preceding claims wherein the aliphatic monohydric alcohol is isobutoxypropanol or n-butoxypropoxypropanol.

5. A composition according to any one of the preceding claims wherein the amount of the monohydric alcohol in the solvent mixture ranges from 10-50%w/w of the total solvent mixture.

6. A composition according to any one of the preceding claims wherein the solvent mixture contains 70-80%w/w of hexylene glycol and 30-20%w/w of n-butoxypropoxypropanol.

7. A composition according to any one of the preceding claims wherein the surfactant is either a linear straight chain alkyl benzene sulphonate or methyl branched alkyl sulphate each of which contains 8-16 carbon atoms in the alkyl chain.

8. A composition according to any one of the preceding claims wherein the surfactant (A) is present in an amount from 1-10%w/w.

9. A composition according to any one of the preceding claims wherein the detergency builder (C) is a water-soluble, inorganic alkaline detergent builder salt selected from the alkali metal carbonates, borates, phosphates, pyrophosphates, tripolyphosphates and bicarbonates.

10. A composition according to any one of the preceding claims wherein said composition is a hard surface cleaning composition.

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EUROPEAN SEARCH REPORT

Application Number

EP 89 20 0881

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)
X	US-A-3 367 878 (A. MAKOWICH) * Whole document *	1	C 11 D 3/44
X	EP-A-0 105 063 (PROCTER & GAMBLE) * Page 19, lines 1-7; claims *	1	
X	US-A-3 463 735 (M.E. STONEBRAKER et al.) * Column 3, line 34; claims *	1	
X	US-A-3 829 387 (L.M. WISE et al.) * Example 1; claims *	1	
A	CH-B- 3 255 (SANDOZ)(1975) * Claims *	1,2	
A	EP-A-0 227 195 (PROCTER & GAMBLE) * Table 1; claim 1 *	1	
A	US-A-3 761 429 (T. YAMANO et al.) * Examples *	1	TECHNICAL FIELDS SEARCHED (Int. Cl.4)
A	US-A-3 839 234 (C.J. ROSCOE) * Example III; claims *	1	C 11 D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	12-07-1989	GOLLER P.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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