(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 842 256 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
22.01.2003 Bulletin 2003/04

(21) Application number: **96920530.1**

(22) Date of filing: **28.05.1996**

(51) Int Cl.[7]: **C11D 17/00**, C11D 1/83, C11D 3/39

(86) International application number:
PCT/US96/07814

(87) International publication number:
WO 97/000938 (09.01.1997 Gazette 1997/03)

(54) **NONAQUEOUS, PARTICULATE-CONTAINING LIQUID DETERGENT COMPOSITIONS WITH ALKYL BENZENE SULFONATE SURFACTANT**

NICHTWÄSSRIGE, TEILCHEN ENTHALTENDE, FLÜSSIGE WASCHMITTELZUSAMMENSETZUNGEN MIT ALKYLBENZOLSULFONATTENSID

COMPOSITIONS DETERGENTES LIQUIDES NON AQUEUSES CONTENANT DES PARTICULES ET UN AGENT TENSIOACTIF A BASE DE SULFONATE DE BENZENE D'ALKYLE

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU NL PT SE

(30) Priority: **20.06.1995 US 345 P**

(43) Date of publication of application:
20.05.1998 Bulletin 1998/21

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Description

FIELD OF THE INVENTION

[0001] This invention relates to liquid laundry detergent products which are nonaqueous in nature and which are in the form of stable dispersions of particulate material such as bleaching agents and/or other detergent composition adjuvants.

BACKGROUND OF THE INVENTION

[0002] Liquid detergent products are often considered to be more convenient to use than are dry powdered or particulate detergent products. Liquid detergents have therefore found substantial favor with consumers. Such liquid detergent products are readily measurable, speedily dissolved in the wash water, capable of being easily applied in concentrated solutions or dispersions to soiled areas on garments to be laundered and are non-dusting. They also usually occupy less storage space than granular products. Additionally, liquid detergents may have incorporated in their formulations materials which could not withstand drying operations without deterioration, which operations are often employed in the manufacture of particulate or granular detergent products.

[0003] Although liquid detergents have a number of advantages over granular detergent products, they also inherently possess several disadvantages. In particular, detergent composition components which may be compatible with each other in granular products may tend to interact or react with each other in a liquid, and especially in an aqueous liquid, environment. Thus such components as enzymes, surfactants, perfumes, brighteners, solvents and especially bleaches and bleach activators can be especially difficult to incorporate into liquid detergent products which have an acceptable degree of chemical stability.

[0004] One approach for enhancing the chemical compatibility of detergent composition components in liquid detergent products has been to formulate nonaqueous (or anhydrous) liquid detergent compositions. In such nonaqueous products, at least some of the normally solid detergent composition components tend to remain insoluble in the liquid product and hence are less reactive with each other than if they had been dissolved in the liquid matrix. Nonaqueous liquid detergent compositions, including those which contain reactive materials such as peroxygen bleaching agents, have been disclosed for example, in Hepworth et al., U.S. Patent 4,615,820, Issued October 17, 1986; Schultz et al., U.S. Patent 4,929,380, Issued May 29, 1990; Schultz et al., U.S. Patent 5,008,031, Issued April 16, 1991; Elder et al., EP-A-030,096, Published June 10, 1981; Hall et al., WO 92/09678, Published June 11, 1992 and Sanderson et al., EP-A-565,017, Published October 13, 1993.

[0005] WO92/02610 describes stable, substantially non-aqueous washing agents which contain nonionic surfactants, at least 8% by weight of anionic surfactants and a peroxy bleach in wich the weight ratio of nonionic to anionic surfactants is 4:1 to 1:2,5 and which are obtained by the wet-grinding of a mixture of these ingredients.

[0006] Even though chemical compatibility of components may be enhanced in nonaqueous liquid detergent compositions, physical stability of such compositions may become a problem. This is because there is a tendency for such products to phase separate as dispersed insoluble solid particulate material drops from suspension and settles at the bottom of the container holding the liquid detergent product. As one consequence of this type of problem, there can also be difficulties associated with incorporating enough of the right types and amounts of surfactant materials into nonaqueous liquid detergent products. Surfactant materials must, of course, be selected such that they are suitable for imparting acceptable fabric cleaning performance to such compositions but utilization of such materials must not lead to an unacceptable degree of composition phase separation. Phase stabilizers such as thickeners or viscosity control agents can be added to such products to enhance the physical stability thereof. Such materials, however, can add cost and bulk to the product without contributing to the laundering/cleaning performance of such detergent compositions.

[0007] It is also possible to select surfactant systems for such liquid laundry detergent products which can actually impart a structure to the liquid phase of the product and thereby promote suspension of particulate components dispersed within such a structured liquid phase. An example of such a product with a structured surfactant system is found in van der Hoeven et al.; U.S. Patent 5,389,284; Issued February 14, 1995, which utilizes a structured surfactant system based on relatively high concentrations of alcohol alkoxylate nonionic surfactants and anionic defloculating agents. In products which employ a structured surfactant system, the structured liquid phase must be viscous enough to prevent settling and phase separation of the suspended particulate material, but not so viscous that the pourability and dispensability of the detergent product is adversely affected.

[0008] Given the foregoing, there is clearly a continuing need to identify and provide liquid, particulate-containing detergent compositions in the form of nonaqueous liquid products that have a high degree of chemical, e.g., bleach and enzyme, stability along with commercially acceptable phase stability, pourability and detergent composition laundering, cleaning or bleaching performance. Accordingly, it is an object of the present invention to provide nonaqueous,

particulate-containing liquid detergent products which have such especially desirable chemical and physical stability characteristics as well as outstanding pourability and fabric laundering/bleaching performance characteristics.

SUMMARY OF THE INVENTION

[0009] The present invention provides nonaqueous liquid detergent compositions comprising a stable suspension of solid, substantially insoluble particulate material dispersed throughout a structured, surfactant-containing liquid phase. Such compositions comprise A) from 35% to 99% by weight of the composition of a nonaqueous liquid phase; and B) from 1% to 65% by weight of the composition of one or more types of particulate materials.

[0010] The nonaqueous liquid phase itself comprises from 30% to 65% by weight of this liquid phase of a certain type of dissolved anionic surfactant. This anionic surfactant component comprises a material selected from the alkali metal salts of C_{10}-C_{16} alkylbenzene sulfonic acids.

[0011] In addition to the anionic surfactant component, the nonaqueous liquid phase of the compositions herein also comprises from 35% to 70% by weight of the liquid phase of a nonaqueous liquid diluent. Such a diluent comprises both i) alcohol alkoxylates of the formula $R^1(OC_mH_{2m})_nOH$ wherein R^1 is a C_8-C_{16} alkyl group, m is from 2 to 4, and n is from about 2 to 12; and ii) a nonaqueous, low-polarity organic solvent selected from (1) mono, di, tri, tetra C_2-C_3 alkylene glycol mono C_2-C_6 alkyl ethers and (2) non-vicinal alkylene glycols containing from 4 to 8 carbon atoms. These components are present in the nonaqueous liquid diluent in an alcohol alkoxylate to organic solvent weight ratio of from 50:1 to 1:50.

[0012] The particulate material suspended in the nonaqueous liquid phase of the compositions herein ranges in size from 0.1 to 1500 microns and is substantially insoluble in the nonaqueous compositions herein. This insoluble particulate material preferably comprises a peroxygen bleaching agent, but may also comprise bleach activators, ancillary anionic surfactants, organic detergent builders, inorganic alkalinity sources and combinations of these particulate material types.

DETAILED DESCRIPTION OF THE INVENTION

[0013] The nonaqueous liquid detergent compositions of this invention comprise a surfactant - and low-polarity solvent-containing liquid phase having dispersed therein as a solid phase certain types of particulate materials. The essential and optional components of the liquid and solid phases of the detergent compositions herein, as well as composition form, preparation and use, are described in greater detail as follows: (All concentrations and ratios are on a weight basis unless otherwise specified.)

LIQUID PHASE

[0014] The liquid phase will generally comprise from 35% to 99% by weight of the detergent compositions herein. More preferably, the liquid phase will comprise from 50% to 95% by weight of the compositions. Most preferably, the liquid phase will comprise from 45% to 75% by weight of the compositions herein. The liquid phase of the detergent compositions herein essentially contains relatively high concentrations of a certain type anionic surfactant combined with a certain type of nonaqueous, liquid diluent.

(A) Essential Anionic Surfactant

[0015] The anionic surfactant essentially utilized as an essential component of the nonaqueous liquid phase is one selected from the alkali metal salts of alkylbenzene sulfonic acids in which the all group contains from about 10 to 16 carbon atoms, in straight chain or branched chain configuration. (See U.S. Patents 2,220,099 and 2,477,383, incorporated herein by reference.) Especially preferred are the sodium and potassium linear straight chain alkylbenzene sutfonates (LAS) in which the average number of carbon atoms in the alkyl group is from about 11 to 14. Sodum C_{11}-C_{14} LAS is especially preferred.

[0016] The alkylbenzene sulfonate anionic surfactant will be dissolved in the nonaqueous liquid diluent which makes up the second essential component of the nonaqueous phase. To form the structured liquid phase required for suitable phase stability and acceptable rheology, the alkylbenzene sulfonate anionic surfactant is generally present to the extent of from 30% to 65% by weight of the liquid phase. More preferably, the alkylbenzene sulfonate anionic surfactant will comprise from 35% to 50% by weight of the nonaqueous liquid phase of the compostions herein. Utilization of this anionic surfactant in these concentrations corresponds to an anionic surfactant concentration in the total composition of from 15% to 60% by weight, more preferably from 20% to 40% by weight, of the composition.

(B) Nonaqueous Liquid Diluent

[0017] To form the liquid phase of the detergent compositions, the hereinbefore described alkylbenzene sulfonate anionic surfactant is combined with a nonaqueous liquid diluent which contains two essential components. These two components are a liquid alcohol alkoxylate materiat and a nonaqueous, low-polarity organic solvent.

i) Alcohol Alkoxylates

[0018] One essential component of the liquid diluent used to form the compositions herein comprises an alkoxylated fatty alcohol material. Such materials are themselves also nonionic surfactants. Such materials correspond to the general formula:

$$R^1(C_mH_{2m}O)_nOH$$

wherein R^1 is a C_8 - C_{16} alkyl group, m is from 2 to 4, and n ranges from about 2 to 12. Preferably R^1 is an alkyl group, which may be primary or secondary, that contains from 9 to 15 carbon atoms, more preferably from 10 to 14 carbon atoms. Preferably also the alkoxylated fatty alcohols will be ethoxylated matesiats that contain from 2 to 12 ethylene oxide moieties per molecule, more preferably from 3 to 10 ethylene oxide moieties per molecule.

[0019] The alkoxylated fatty alcohol component of the liquid diluent will frequently have a hydrophilic-lipophilic balance (HLB) which ranges from 3 to 17. More preferably, the HLB of this material will range from 6 to 15, most preferably from 8 to 15.

[0020] Examples of fatty alcohol alkoxylates useful as one of the essential components of the nonaqueous liquid diluent in the compositions herein will include those which are made from alcohols of 12 to 15 carbon atoms and which contain 7 moles of ethylene oxide. Such materials have been commercially marketed under the trade names Neodol 25-7 and Neodol 23-6.5 by Shell Chemical Company. Other useful Neodols include Neodol 1-5, an ethoxylated fatty alcohol averaging 11 carbon atoms in its alkyl chain with about 5 moles of ethylene oxide; Neodol 23-9, an ethoxylated primary C_{12} - C_{13} alcohol having 9 moles of ethylene oxide and Neodol 91-10, an ethoxylated C_9 - C_{11} primary alcohol having about 10 moles of ethylene oxide. Alcohol ethoxylates of this type have also been marketed by Shell Chemical Company under the Dobanol tradename. Dobanol 91-5 is an ethoxylated C_9-C_{11} fatty alcohol with an average of 5 moles ethylene oxide and Dobanol 25-7 is an ethoxylated C_{12}-C_{15} fatty alcohol with an average of 7 moles of ethylene oxide per mole of fatty alcohol.

[0021] Other examples of suitable ethoxylated alcohols include Tergitol 15-S-7 and Tergitol 15-S-9 both of which are linear secondary alcohol ethoxylates that have been commercially marketed by Union Carbide Corporation. The former is a mixed ethoxylation product of C_{11} to C_{15} linear secondary alkanol with 7 moles of ethylene oxide and the latter is a similar product but with 9 moles of ethylene oxide being reacted.

[0022] Other types of alcohol ethoxylates useful in the present compositions are higher molecular weight nonionics, such as Neodol 45-11, which are similar ethylene oxide condensation products of higher fatty alcohols, with the higher fatty alcohol being of 14-15 carbon atoms and the number of ethylene oxide groups per mole being 11. Such products have also been commercially marketed by Shell Chemical Company.

[0023] The alcohol alkoxylate component which is essentially utilized as part of the liquid diluent in the nonaqueous compositions herein will generally be present to the extent of from 1% to 60% of the liquid phase composition. More preferably, the alcohol alkoxylate component will comprise 5% to 40% of the liquid phase. Most preferably, the essentially utilized alcohol alkoxylate component will comprise from 5% to 30% of the detergent composition liquid phase. Utilization of alcohol alkoxytate in these concentrations in the liquid phase corresponds to an alcohol alkoxylate concentration in the total composition of from 1% to 60% by weight, more preferably from 2% to 40% by weight, and most preferably from 5% to 25% by weight, of the composition.

ii) Nonaqueous Low-Polarity Organic Solvent

[0024] A second essential component of the liquid diluent which forms part of the liquid phase of the detergent compositions herein comprises nonaqueous, low-polarity organic solvent(s). The term "solvent" is used herein to connote the non-surface active carrier or diluent portion of the liquid phase of the composition. While some of the essential and/or optional components of the compositions herein may actually dissolve in the "solvent"-containing liquid phase, other components will be present as particulate material dispersed within the "solvent"-containing liquid phase. Thus the term "solvent" is not meant to require that the solvent material be capable of actually dissolving all of the detergent composition components added thereto.

[0025] The nonaqueous organic materials which are employed as solvents herein are those which are liquids of low

polarity. For purposes of this invention, "low-polarity" liquids are those which have little, if any, tendency to dissolve one of the preferred types of particulate material used in the compositions herein, i.e., the peroxygen bleaching agents, sodium perborate or sodium percarbonate. Thus relatively polar solvents such as ethanol should not be utilized. Suitable types of low-polarity solvents useful in the nonaqueous liquid detergent compositions herein do are include the non-vicinal C_4-C_8 branched or straight chain alkylene glycols. Materials of this type include hexylene glycol (4-methyl-2,4-pentanediol), 1,6-hexanediol, 1,3-butylene glycol and 1,4-butylene glycol. Hexylene glycol is the most preferred.

[0026] Also included are the mono-, di-, tri-, or tetra- C_2-C_3 alkylene glycol mono C_2-C_6 alkyl ethers. The specific examples of such compounds include diethytene glycol monobutyl ether, tetraethylene glycol monobutyl ether, dipropolyene glycol monoethyl ether, and dipropylene glycol monobutyl ether. Diethylene glycol monobutyl ether and dipropylene glycol monobutyl ether are especially preferred. Compounds of the type have been commercially marketed under the tradenames Dowanol, Carbitol, and Cellosolve.

[0027] The nonaqueous, low-polarity organic solvent(s) employed should, of course, be compatible and non-reactive with other composition components, e.g., bleach and/or activators, used in the liquid detergent compositions herein. Such a solvent component will generally be utilized in an amount of from 1% to 70% by weight of the liquid phase. More preferably, the nonaqueous, low-polarity organic solvent will comprise from 10% to 60% by weight of the liquid phase, most preferably from 20% to 50% by weight, of the liquid phase of the composition. Utilization of this organic solvent in these concentrations in the liquid phase corresponds to a solvent concentration in the total composition of from 1% to 50% by weight, more preferably from 5% to 40% by weight, and most preferably from 10% to 30% by weight, of the composition.

iii) Alcohol Alkoxylate To Solvent Ratio

[0028] The ratio of alcohol alkoxylate to organic solvent within the liquid diluent can be used to vary the theological properties of the detergent compositions eventually formed. Generally, the weight ratio of alcohol alkoxylate to organic solvent will range from 50:1 to 1:50. More preferably, this ratio will range from 3:1 to 1:3.

iv) Liquid Diluent Concentration

[0029] As with the concentration of the alkylbenzene sulfonate anionic surfactant mixture, the amount of total liquid diluent in the nonaqueous liquid phase herein will be determined by the type and amounts of other composition components and by the desired composition properties. Generally, the liquid diluent will comprise from 35% to 70% of the nonaqueous liquid phase of the compositions herein. More preferably, the liquid diluent will comprise from 50% to 65% *of* the nonaqueous liquid phase. This corresponds to a nonaqueous liquid diluent concentration in the total composition of from 15% to 70% by weight, more preferably from 20% to 50% by weight, of the composition.

SOLID PHASE

[0030] The nonaqueous detergent compositions herein also essentially comprise from 1% to 65% by weight, more preferably from 5% to 50% by weight, of a solid phase of particuste material which is dispersed and suspended within the liquid phase. Generally such particulate material will range in size from 0.1 to 1500 microns. More preferably such material will range in size from 5 to 200 microns.

[0031] The particulate material utilized herein can comprise one or more types of detergent composition components which in particulate form are substantially insoluble in the nonaqueous liquid phase of the composition. The types of particulate materials which can be utilized are described in detail as follows:

(A) Peroxygen Bleaching Agent With Optional Bleach Activators

[0032] The most preferred type of paniculate material useful for forming the solid phase of the detergent compositions herein comprises particles of a peroxygen bleaching agent. Such peroxygen bleaching agents may be organic or inorganic in nature. Inorganic peroxygen bleaching agents are frequently utilized in combination with a bleach activator.

[0033] Useful organic peroxygen bleaching agents include percarboxylic acid bleaching agents and salts thereof. Suitable examples of this class of agents include magnesium monoperoxyphthalate hexahydrate, the magnesium salt of metachloro perbenzoic acid, 4-nonylamino-4-oxoperoxybutyric acid and diperoxydodecanedioic acid. Such bleaching agents are disclosed in U.S. Patent 4,483,781, Hartman, Issued November 20, 1984; European Patent Application EP-A-133,354, Banks et al., Published February 20, 1985; and U.S. Patent 4,412,934, Chung et al., Issued November 1, 1983. Highly preferred bleaching agents also include 6-nonylamino-6-oxoperoxycaproic acid (NAPAA) as described in U.S. Patent 4,634,551, Issued January 6, 1987 to Bums et al.

[0034] Inorganic peroxygen bleaching agents may also be used in particulate form in the detergent compositions

herein. Inorganic bleaching agents are in fact preferred. Such inorganic peroxygen compounds include alkali metal perborate and percarbonate materials, most preferably the percarbonates. For example, sodium perborate (e.g. mono- or tetra-hydrate) can be used. Suitable inorganic bleaching agents can also include sodium or potassium carbonate peroxyhydrate and equivalent "percarbonate" bleaches, sodium pyrophosphate peroxyhydrate, urea peroxyhydrate, and sodium peroxide. Persulfate bleach (e.g., OXONE, manufactured commercially by DuPont) can also be used. Frequently inorganic peroxygen bleaches will be coated with silicate, borate, sulfate or water-soluble surfactants. For example, coated percarbonate particles are available from various commercial sources such as FMC, Solvay Interox, Tokai Denka and Degussa.

[0035] Inorganic peroxygen bleaching agents, e.g., the perborates, the percarbonates, etc., are preferably combined with bleach activators, which lead to the *in situ* production in aqueous solution (i.e., during use of the compositions herein for fabric laundering/bleaching) of the peroxy acid corresponding to the bleach activator. Various non-limiting examples of activators are disclosed in U.S. Patent 4,915,854, Issued April 10, 1990 to Mao et al.; and U.S. Patent 4,412,934 Issued November 1, 1983 to Chung et al. The nonanoyloxybenzene sulfonate (NOBS) and tetraacetyl ethylene diamine (TAED) activators are typical. Mixtures thereof can also be used. See also the hereinbefore referenced U.S. 4,634,551 for other typical bleaches and activators useful herein.

[0036] Other useful amido-derived bleach activators are those of the formulae:

$$R^1N(R^5)C(O)R^2C(O)L$$

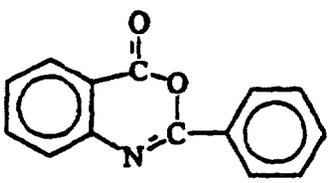
or

$$R^1C(O)N(R^5)R^2C(O)L$$

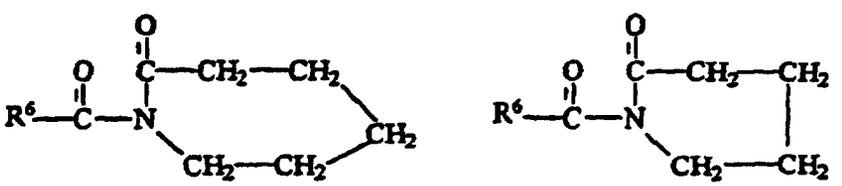
wherein R^1 is an alkyl group containing from about 6 to about 12 carbon atoms, R^2 is an alkylene containing from 1 to about 6 carbon atoms, R^5 is H or alkyl, aryl, or alkaryl containing from about 1 to about 10 carbon atoms, and L is any suitable leaving group. A leaving group is any group that is displaced from the bleach activator as a consequence of the nucleophilic attack on the bleach activator by the perhydrolysis anion. A preferred leaving group is phenol sulfonate.

[0037] Preferred examples of bleach activators of the above formulae include (6-octanamido-caproyl)oxybenzenesulfonate, (6-nonanamidocaproyl) oxybenzenesulfonate, (6-decanamido-caproyl)oxybenzenesulfonate and mixtures thereof as described in the hereinbefore referenced U.S. Patent 4,634,551. Such mixtures are characterized herein as (6-C_8-C_{10} alkamido-caproyl)oxybenzenesulfonate.

[0038] Another class of useful bleach activators comprises the benzoxazin-type activators disclosed by Hodge et al. in U.S. Patent 4,966, 723, Issued October 30, 1990, incorporated herein by reference. A highly preferred activator of the benzoxazin-type is:



[0039] Still another class of useful bleach activators indudes the acyl lactam activators, especially acyl caprolactams and acyl valerolactams of the formulae:



wherein R^6 is H or an alkyl, aryl, alkoxyaryl, or alkaryl group containing from 1 to about 12 carbon atoms. Highly preferred lactam activators include benzoyl caprolactam, octanoyl caprolactam, 3,5,5-trimethylhexanoyl caprolactam,

nonanoyl caprolactam, decanoyl caprolactam, undecenoyl caprolactam, benzoyl valerolactam, octanoyl valerolactam, decanoyl valerolactam, undecenoyl valerolactam, 3,5,5-trimethylhexanoyl valerolactam and mixtures thereof. See also U.S. Patent 4,545,784, Issued to Sanderson, October 8, 1985, incorporated herein by reference, which discloses acyl caprolactams, including benzoyl caprolactam, adsorbed into sodium perborate.

[0040] If peroxygen bleaching agents are used as all or part of the essentially present particulate material, they will generally comprise from 1% to 30% by weight of the composition. More preferably, peroxygen bleaching agent will comprise from 1% to 20% by weight of the composition. Most preferably, peroxygen bleaching agent will be present to the extent of from 3% to 15% by weight of the composition. If utilized, bleach activators can comprise from 0.5% to 20%, more preferably from 1% to 10%, by weight of the composition. Frequently, activators are employed such that the molar ratio of bleaching agent to activator ranges from 1:1 to 10:1, more preferably from 1.5:1 to 5:1.
In addition, it has been found that bleach activators, when agglomerated with certain acids such as citric acid, are more chemically stable.

(B) Ancillary Anionic Surfactants

[0041] Another possible type of particulate material which can be suspended in the nonaqueous liquid detergent compositions herein includes ancillary anionic surfactants which are fully or partially insoluble in the nonaqueous liquid phase. The most common type *of anionic* surfactant with such solubility properties comprises primary or secondary alkyl sulfate anionic surfactants. Such surfactants are those produced by the sulfation of higher C_8-C_{20} fatty alcohols.

[0042] Conventional primary alkyl sutfate surfactants have the general formula

$$ROSO_3^-M^+$$

wherein R is typically a linear C_8 - C_{20} hydrocarbyl group, which may be straight chain or branched chain, and M is a water-solubilizing cation. Preferably R is a C_{10} - C_{14} alkyl, and M is alkali metal. Most preferably R is about C_{12} and M is sodium.

[0043] Conventional secondary alkyl sulfates may also be utilized as the essential anionic surfactant component of the solid phase of the compositions herein. Conventional secondary alkyl sulfate surfactants are those materials which have the sulfate moiety distributed randomly along the hydrocarbyl "backbone" of the molecule. Such materials may be depicted by the structure:

$$CH_3(CH_2)_n(CHOSO_3^-M^+)\ (CH_2)_mCH_3$$

wherein m and n are integers of 2 or greater and the sum of m + n is typically about 9 to 15, and M is a water-solubilizing cation.

[0044] If utilized as all or part of the requisite particulate material, ancillary anionic surfactants such as alkyl sulfates will generally comprise from 1% to 10% by weight of the composition, more preferably from 1% to 5% by weight of the composition. Alkyl sulfate used as all or part of the particulate material is prepared and added to the compositions herein separately from the unalkoxylated alkyl sulfate material which may form part of the alkyl ether sulfate surfactant component essentially utilized as part of the liquid phase herein.

(C) Organic Builder Material

[0045] Another possible type of paniculate material which can be suspended in the nonaqueous liquid detergent compositions herein comprises an organic detergent builder material which serves to counteract the effects of calcium, or other ion, water hardness encountered during laundering/bleaching use of the compositions herein. Examples of such rnataials include the alkali metal, citrates, succinates, malonates, fatty acids, carboxymethyl succinates, carboxylates, polycarboxylates and polyacetyl carboxylates. Specific examples include sodium, potassium and lithium salts of oxydisuccinic acid, mellitic acid, benzene polycarboxylic acids and citric acid. Other examples of organic phosphonate type seguestering agents such as those which have been sold by Monsanto under the Dequest tradename and alkanehydroxy phosphonates. Citrate salts are highly preferred.

[0046] Other suitable organic builders include the higher molecular weight polymers and copolymers known to have builder properties. For example, such materials include appropriate polyacrylic acid, polymaleic acid, and polyacrylic/polymaleic acid copolymers and their salts, such as those sold by BASF under the Sokalan trademark.

[0047] Another suitable type of organic builder comprises the water-soluble salts of higher fatty *acids*, *i.e.*, "*soaps*". *These* include alkali metal soaps such as the sodium, potassium, ammonium, and alkylolammonium salts of higher

fatty adds containing from about 8 to about 24 carbon atoms, and preferably from about 12 to about 18 carbon atoms. Soaps can be made by direct saponification of fats and oils or by the neutralization of free fatty acids. Particularly useful are the sodium and potassium salts of the mixtures of fatty acids derived from coconut oil and tallow, i.e., sodium or potassium tallow and coconut soap.

[0048] If utilized as all or part of the requisite particulate material, insoluble organic detergent builders can generally comprise from 2% to 20% by weight of the compositions herein. More preferably, such builder material can comprise from about 4% to 10% by weight of the composition.

(D) Inorganic Alkalinity Sources

[0049] Another possible type of particulate material which can be suspended in the nonaqueous liquid detergent compositions herein can comprise a material which serves to render aqueous washing solutions formed from such compositions generally alkaline in nature. Such materials may or may not also act as detergent builders, i.e., as materials which counteract the adverse effect of water hardness on detergency performance.

[0050] Examples of suitable alkalinity sources include water-soluble alkali metal carbonates, bicarbonates, borates, silicates and metasilicates. Although not preferred for ecological reasons, water-soluble phosphate salts may also be utilized as alkalinity sources. These include alkali metal pyrophosphates, orthophosphates, potyphosphates and phosphonates. Of all of these alkalinity sources, alkali metal carbonates such as sodium carbonate are the most preferred.

[0051] The alkalinity source, if in the form of a hydratable salt, may also serve as a desiccant in the nonaqueous liquid detergent compositions herein. The presence of an alkalinity source which is also a desiccant may provide benefits in terms of chemically stabilizing those composition components such as the peroxygen bleaching agent which may be susceptible to deactivation by water.

[0052] If utilized as all or part of the particulate material component, the alkalinity source will generally comprise from 1% to 25% by weight of the compositions herein. More preferably, the alkalinity source can comprise from about 2% to 15% by weight of the composition. Such materials, while water-soluble, will generally be insoluble in the nonaqueous detergent compositions herein. Thus such materials will generally be dispersed in the nonaqueous liquid phase in the form of discrete particles.

OPTIONAL COMPOSITION COMPONENTS

[0053] In addition to the essential composition liquid and solid phase components as hereinbefore described, the detergent compositions herein can, and preferably will, contain various optional components. Such optional components may be in either liquid or solid form. The optional components may either dissolve in the liquid phase or may be dispersed within the liquid phase in the form of fine particles or droplets. Some of the materials which may optionally be utilized in the compositions herein are described in greater detail as follows:

(a) Optional Surfactants

[0054] Besides the essentially utilized alkylbenzene sulfonate surfactant materials and the alcohol alkoxylate component of the liquid diluent, the detergent compositions herein may, in addition to the optional alkyl sulfates hereinbefore described, also contain other types of surfactant materials. Such additional optional surfactants must, of course, be compatible with other composition components and must not substantially adversely affect composition rheology, stability or performance. Optional surfactants can be of the anionic, nonionic, cationic, and/or amphoteric type. If employed, optional surfactants will generally comprise from 1% to 20% by weight of the compositions herein, more preferably from 5% to 10% by weight of the compositions herein.

[0055] One common type of anionic surfactant material which may be optionally added to the detergent compositions herein comprises the alkyl polyalkoxylate sulfates. Alkyl polyalkoxylate sulfates are also known as alkoxylated alkyl sulfates or alkyl ether sulfates. Such materials are those which correspond to the formula

$$R^2\text{-}O\text{-}(C_mH_{2m}O)_n\text{-}SO_3M$$

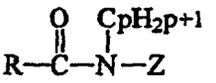
wherein R^2 is a C_{10}-C_{22} alkyl group, m is from 2 to 4, n is from about 1 to 15, and M is a salt-forming cation. Preferably, R^2 is a C_{12}-C_{18} alkyl, m is 2, n is from about 1 to 10, and M is sodium, potassium, ammonium, alkylammonium or alkanolammonium. Most preferably, R^2 is a C_{12}-C_{16}, m is 2, n is from about 1 to 6, and M is sodium. Ammonium, alkylammonium and alkanolammonium counterions are preferably avoided when the solid phase materials used in the compositions herein include a peroxygen bleaching agent.

[0056] Another common type of anionic surfactant material which may be optionally added to the detergent compo-

sitions herein comprises carboxylate-type anionics. Carboxylate-type anionics include the C_{10}-C_{18} alkyl alkoxy carboxylates (especially the EO 1 to 5 ethoxycarboxylates) and the C_{10}-C_{18} sarcosinates, especially oleoyl sarcosinate. Another common type of anionic surfactant material which may be optionally employed comprises other sulfonated anionic surfactants such as the C_8-C_{18} paraffin sulfonates and the C_8-C_{18} olefin sulfonates.

[0057] A preferred type of optional nonionic surfactant comprises surfactants which are ethylene oxide (EO) - propylene oxide (PO) block polymers. Materials of this type are well known nonionic surfactants which have been marketed under the tradename Pluronic. These materials are formed by adding blocks of ethylene oxide moieties to the ends of polypropylene glycol chains to adjust the surface active properties of the resulting block polymers. EO-PO block polymer nonionics of this type are described in greater detail in Davidsohn and Milwidsky; Synthetic Detergents, 7th Ed.; Longman Scientific and Technical (1987) at pp. 34-36 and pp. 189-191 and in U.S. Patents 2,674,619 and 2,677,700. All of these publications are incorporated herein by reference. These Pluronic type nonionic surfactants are believed to function as effective suspending agents for the particulate material which is dispersed in the liquid phase of the detergent compositions herein.

[0058] Another preferred type of optional nonionic surfactant for use in the compositions herein comprises polyhydroxy fatty acid amide surfactants. Materials of this type of nonionic surfactant are those which conform to the formula:



wherein R is a C_{9-17} alkyl or alkenyl, p is from 1 to 6, and Z is glycityl derived from a reduced sugar or alkoxylated derivative thereof. Such materials include the C_{12}-C_{18} N-methyl glucamides. Examples are N-methyl N-1-deoxyglucityl cocoamide and N-methyl N-1-deoxyglucityl oleamide. Processes for making polyhydroxy fatty acid, amides are know and can be found, for example, in Wilson, U.S. Patent 2,965,576 and Schwartz, U.S. Patent 2,703,798, the disclosures of which are incorporated herein by reference. The materials themselves and their preparation are also described in greater detail in Honsa, U.S. Patent 5,174,937, Issued December 26, 1992, which patent is also incorporated herein by reference.

(b) Optional Inorganic Detergent Builders

[0059] The detergent compositions herein may also optionally contain one or more types of inorganic detergent builders beyond those listed hereinbefore that also function as alkalinity sources. Such optional inorganic builders can include, for example, aluminosilicates such as zeolites. Aluminosilicate zeolites, and their use as detergent builders are more fully discussed in Corkill et al., U.S. Patent No. 4,605,509; Issued August 12, 1986, the disclosure of which is incorporated herein by reference. Also crystalline layered silicates, such as those discussed in this '509 U.S. patent, are also suitable for use in the detergent compositions herein. If utilized, optional inorganic detergent builders can comprise from 2% to 15% by weight of the compositions herein.

(c) Optional Enzymes

[0060] The detergent compositions herein may also optionally contain one or more types of detergent enzymes. Such enzymes can include proteases, amylases, cellulases and lipases. Such materials are known in the art and are commercially available. They may be incorporated into the nonaqueous liquid detergent compositions herein in the form of suspensions, "marumes" or "prills". Another suitable type of enzyme comprises those in the form of slurries of enzymes in nonionic surfactants, e.g., the enzymes marketed by Novo Nordisk under the tradename "SL" or the microencapsulated enzymes marketed by Novo Nordisk under the tradename "LDP."

[0061] Enzymes added to the compositions herein in the form of conventional enzyme prills are especially preferred for use herein. Such prills will generally range in size from 100 to 1,000 m-6 (microns), more preferably from 200 to 800 m-6 (microns) and will be suspended throughout the nonaqueous liquid phase of the composition. Prills in the compositions of the present invention have been found, in comparison with other enzyme forms, to exhibit especially desirable enzyme stability in terms of retention of enzymatic activity over time. Thus, compositions which utilize enzyme prills need not contain conventional enzyme stabilizing such as must frequently be used when enzymes are incorporated into aqueous liquid detergents.

[0062] If employed, enzymes will normally be incorporated into the nonaqueous liquid compositions herein at levels sufficient to provide up to about 10 mg by weight, more typically from about 0.01 mg to about 5 mg, of active enzyme per gram of the composition. Stated otherwise, the nonaqueous liquid detergent compositions herein will typically comprise from 0.001% to 5%, preferably from 0.01% to 1% by weight, of a commercial enzyme preparation. Protease

enzymes, for example, are usually present in such commercial preparations at levels sufficient to provide from 0.005 to 0.1 Anson units (AU) of activity per gram of composition.

(d) Optional Chelating Agents

[0063] The detergent compositions herein may also optionally contain a chelating agent which serves to chelate metal ions, e.g., iron and/or manganese, within the nonaqueous detergent compositions herein. Such chelating agents thus serve to form complexes with metal impurities in the composition which would otherwise tend to deactivate composition components such as the peroxygen bleaching agent. Useful chelating agents can include amino carboxylates, phosphonates, amino phosphonates, polyfunctionally-substiuted aromatic chelating agents and mixtures thereof.

[0064] Amino carboxylates useful as optional chelating agents include ethylenediaminetetraacetates, N-hydroxyethyl-ethylenediaminetriacetates, nitrilotriacetates, ethylene-diamine tetrapropionates, triethylenetetraaminehexacetates, diethylenetriaminepentaacetates, ethylenediaminedisucci-nates and ethanoldiglycines. The alkali metal salts of these materials are preferred.

[0065] Amino phosphonates are also suitable for use as chelating agents in the compositions of this invention when at least low levels of total phosphorus are permitted in detergent compositions, and include ethylenediaminetetrakis (methylene-phosphonates) as DEQUEST. Preferably, these amino phosphonates do not contain alkyl or alkenyl groups with more than about 6 carbon atoms.

[0066] Preferred chelating agents include hydroxy-ethyldiphosphonic acid (HEDP), diethylene triamine penta acetic acid (DTPA), ethylenediamine disuccinic acid (EDDS) and dipicolinic acid (DPA) and salts thereof. The chelating agent may, of course, also act as a detergent builder during use of the compositions herein for fabric laundering/bleaching. The chelating agent, if employed, can comprise from 0.1% to 4% by weight of the compositions herein. More preferably, the chelating agent will comprise from 0.2% to 2% by weight of the detergent compositions herein.

(e) Optional Thickening, Viscosity Control and/or Dispersing Agents

[0067] The detergent compositions herein may also optionally contain a polymeric material which serves to enhance the ability of the composition to maintain its solid particulate components in suspension. Such materials may thus act as thickeners, viscosity control agents and/or dispersing agents. Such materials are frequently polymeric polycarboxylates but can include other polymeric materials such as polyvinylpyrrolidone (PVP).

[0068] Polymeric polycarboxylate materials can be prepared by polymerizing or copolymerizing suitable unsaturated monomers, preferably in their acid form. Unsaturated monomeric acids that can be polymerized to form suitable polymeric polycarboxylates include acrylic acid, maleic acid (or maleic anhydride), fumaric acid, itaconic acid, aconitic acid, mesaconic acid, citraconic acid and methylenemalonic acid. The presence in the polymeric polycarboxylates herein of monomeric segments, containing no carboxylate radicals such as vinylmethyl ether, styrene, ethylene, etc. is suitable provided that such segments do not constitute more than about 40% by weight of the polymer.

[0069] Particularly suitable polymeric polyearboxylates can be derived from acrylic acid. Such acrylic acid-based polymers which are useful herein are the water-soluble salts of polymerized acrylic acid. The average molecular weight of such polymers in the acid form preferably ranges from about 2,000 to 10,000, more preferably from about 4,000 to 7,000, and most preferably from about 4,000 to 5,000. Water-soluble salts of such acrylic acid polymers can include, for example, the alkali metal, salts. Soluble polymers of this type are known materials. Use of polyacrylates of this type in detergent compositions has been disclosed, for example, Diehl, U.S. Patent 3,308,067, issued March 7, 1967. Such materials may also perform a builder function.

[0070] If utilized, the optional thickening, viscosity control and/or dispersing agents should be present in the compositions herein to the extent of from about 0.1% to 4% by weight. More preferably, such materials can comprise from about 0.5% to 2% by weight of the detergents compositions herein.

(f) Optional Liquid Bleach Activators

[0071] The detergent compositions herein may also optionally contain bleach activators which are liquid in form at room temperature and which can be added as liquids to the nonaqueous liquid phase of the detergent compositions herein. One such liquid bleach activator is acetyl triethyl citrate (ATC). Other examples include glycerol triacetate and nonanoyl valerolactam. Liquid bleach activators can be dissolved in the nonaqueous liquid phase of the compositions herein.

(g) Optional Brighteners, Suds Suppressors, Dyes and/or Perfumes

[0072] The detergent compositions herein may also optionally contain conventional brighteners, suds suppressors,

silicone oils, bleach catalysts, dyes and/or perfume materials. Such brighteners, suds suppressors, silicone oils, bleach catalysts, dyes and perfumes must, of course, be compatible and non-reactive with the other composition components in a nonaqueous environment. If present, brighteners suds suppressors, dyes and/or perfumes will typically comprise from 0.0001% to 2% by weight of the compositions herein. Suitable bleach catalysts include the manganese based complexes disclosed in US 5,246,621, US 5,244,594, US 5,114,606 and US 5,114,611.

COMPOSITION FORM

[0073] As indicated, the nonaqueous liquid detergent compositions herein are in the form of bleaching agent and/or other materials in particulate form as a solid phase suspended in and dispersed throughout a nonaqueous liquid phase. Generally, the nonaqueous liquid phase will comprise from 35% to 99%, more preferably from 50% to 95%, by weight of the composition with the dispersed solid phase comprising from 1% to 65%, more preferably from 5% to 50%, by weight of the composition.

[0074] The particulate-containing liquid detergent compositions of this invention are substantially nonaqueous (or anhydrous) in character. While very small amounts of water may be incorporated into such compositions as an impurity in the essential or optional components, the amount of water should in no event exceed 5% by weight of the compositions herein. More preferably, water content of the nonaqueous detergent compositions herein will comprise less than 1% by weight.

[0075] The particulate-containing nonaqueous liquid detergent compositions herein will be relatively viscous and phase stable under conditions of commercial marketing and use of such compositions Frequently the viscosity of the compositions herein will range from about 300 to 5,000 mPa/s (cps), more preferably from 500 to 3,000 mPa/s (cps). For purposes of this invention, viscosity is measured with a Brookfield Viscometer using a RV #5 spindle at 50 rpm.

COMPOSITION PREPARATION AND USE

[0076] The nonaqueous liquid detergent compositions herein can be prepared by combining the essential and optional components thereof in any convenient order and by mixing, e.g., agitating, the resulting component combination to form the phase stable compositions herein. In a typical process for preparing such compositions, essential and certain preferred optional components will be combined in a particular order and under certain conditions.

[0077] In the first step of such a typical preparation process, an admixture of the alkylbenzene sulfonate anionic surfactant and the two essential components of the nonaqueous diluent is formed by heating a combination of these materials to a temperature from 30°C to 100°C.

[0078] In a second process step, the heated admixture formed as hereinbefore described is maintained under shear agitation at a temperature from 40°C to 100°C for a period of from 2 minutes to 20 hours. Optionally, a vaccuum can be applied to the admixture at this point. This second process step serves to completely dissolve the anionic surfactant in the nonaqueous liquid phase.

[0079] In a third process step, this liquid phase combination of materials is cooled to a temperature of from 0°C to 35°C. This cooling step serves to form a structured, surfactant-containing liquid base into which the particulate material of the detergent compositions herein can be added and dispersed.

[0080] Particulate material is added in a fourth process step by combining the particulate material with the liquid base which is maintained under conditions of shear agitation. When more than one type of particulate material is to be added, it is preferred that a certain order of addition be observed. For example, while shear agitation is maintained, essentially all of any optional surfactants in solid particulate form can be added in the form of particles ranging in size from 0.2 to 1,000 10^{-6} m (microns). After addition of any optional surfactant partides, particles of substantially all of an organic builder, e.g., citrate and/or fatty acid, and/or an alkalinity source, e.g., sodium carbonate, can be added while continuing to maintain this admixture of composition components under shear agitation. Other solid form optional ingredients can then be added to the composition at this point. Agitation of the mixture is continued, and if necessary, can be increased at this point to form a uniform dispersion of insoluble solid phase particulates within the liquid phase.

[0081] After some or all of the foregoing solid materials have been added to this agitated mixture, the particles of the highly preferred peroxygen bleaching agent can be added to the composition, again while the mixture is maintained under shear agitation. By adding the peroxygen bleaching agent material last, or after all or most of the other components, and especially after alkalinity source particles, have been added, desirable stability benefits for the peroxygen bleach can be realized. If enzyme prills are incorporated, they are preferably added to the nonaqueous liquid matrix last.

[0082] As a final process step, after addition of all of the particulate material, agitation of the mixture is continued for a period of time sufficient to form compositions having the requisite viscosity and phase stability characteristics. Frequently this will involve agitation for a period of from 1 to 30 minutes.

[0083] As a variation of the composition preparation procedure hereinbefore described, one or more of the solid components may be added to the agitated mixture as a slurry of particles premixed with a minor portion of one or more

of the liquid components. Thus a premix of a small fraction of the alcohol alkoxylate and/or nonaqueous, low-polarity solvent with particles of the organic builder material and/or the particles of the inorganic alkalinity source and/or particles of a bleach activator may be separately formed and added as a slurry to the agitated mixture of composition components. Addition of such slurry premixes should precede addition of peroxygen bleaching agent and/or enzyme particles which may themselves be part of a premix slurry formed in analogous fashion.

[0084] The compositions of this invention, prepared as hereinbefore described, can be used to form aqueous washing solutions for use in the laundering and bleaching of fabrics. Generally, an effective amount of such compositions is added to water, preferably in a conventional fabric laundering automatic washing machine, to form such aqueous laundering/bleaching solutions. The aqueous washing/bleaching solution so formed is then contacted, preferably under agitation, with the fabrics to be laundered and bleached therewith.

[0085] An effective amount of the liquid detergent compositions herein added to water to form aqueous laundering/bleaching solutions can comprise amounts sufficient to form from 500 to 7,000 ppm of composition in aqueous solution. More preferably, from 800 to 3,000 ppm of the detergent compositions herein will be provided in aqueous washing/bleaching solution.

EXAMPLE

[0086] The following example illustrates the compositions of the present invention, but are not necessarily meant to limit or otherwise define the scope of the invention herein.

[0087] A bleach-containing nonaqueous liquid laundry detergent is prepared having the composition as set forth in Table I.

Table I

Component	Wt. %
Liquid Phase	
Na C_{12} Linear alkylbenzene sulfonate (LAS)	27.3
C_{12-14}, EO=5 alcohol ethoxylate	13.6
Hexylene glycol	27.3
Perfume	0.4
Solids	
Protease enzyme	0.4
Na_3 Citrate, anhydrous	4.3
Sodium perborate	3.4
Sodium nonanoyloxybenzene sulfonate (NOBS)	8.0
Sodium carbonate	13.9
Diethyl triamine pentaacetic acid (DTPA)	0.9
Brightener	0.4
Suds Suppressor	0.1
Minors	0.4
	100%

[0088] Such a composition is prepared by mixing the LAS, hexylene glycol and alcohol ethoxylate together at 54°C (130°F) for 1/2 hour. This mixture is then cooled to 29°C (85°F) whereupon the remaining components are added. The resulting composition is then stirred at 29°C (85°F) for another 1/2 hour.

[0089] The resulting composition is a stable anhydrous heavy duty liquid laundry detergent which provides excellent stain and soil removal performance when used in normal fabric laundering operations.

Claims

1. A nonaqueous, liquid heavy-duty detergent composition in the form of a suspension of a solid, substantially insoluble particulate material dispersed throughout a structured, surfactant-containing liquid phase, said composition being further **characterized in that** it comprises:

A) from 35% to 99% by weight of the composition of a nonaqueous liquid phase which comprises:

i) from 30% to 65% by weight of said nonaqueous liquid phase of a dissolved anionic surfactant selected from alkali metal salts of C_{10}-C_{16} alkylbenzene sulfonic acid; and
ii) from 35% to 70% by wieght of said nonaqueous liquid phase of a nonaqueous liquid diluent which comprises:

a) alcohol alkoxylates of the formula $R^1(OC_mH_{2m})_nOH$ wherein R^1 is a C_8-C_{16} alkyl group, m is from 2 to 4 and n is from 2 to 12; and
b) a nonaqueous organic solvent which is selected from:

i) mono, di, tri, tetra C_2-C_3 alkylene glycol mono C_2-C_6 alkyl ethers; and
ii) non-vicinal alkylene glycols containing from 4 to 8 carbon atoms;

in an alcohol alkoxylate to organic solvent weight ratio of from 50:1 to 1:50; and

B) from 1% to 65% by weight of the composition of particulate material which ranges in size from 0.1 to 1,500 μm (microns), which is substantially insoluble in said nonaqueous liquid phase and which is selected from peroxygen bleaching agents, bleach activators, ancillary anionic surfactants, organic detergent builders, inorganic alkalinity sources and combinations of said particulate material types.

2. A composition according to Claim 1 wherein

(A) the alkyl group of said alkylbenzene sulfonic acid is linear and contains from 11 to 14 carbon atoms;
(B) said alcohol alkoxylate component comprises ethoxylated materials containing from 8 to 15 carbon atoms in the alkyl group and having from 3 to 10 ethylene oxide moieties per molecule;
and
(C) said particulate material comprises peroxygen bleaching agents selected from percarboxylic acids and salts thereof and alkali metal perborates and percarbonates.

3. A composition according to Claim 2 wherein

(A) said alkylbenzene sulfonic anionic surfactant comprises from 15% to 60% by weight of the composition;
(B) said nonaqueous liquid diluent comprises from 15% to 70% by weight of the composition and has an alcohol ethoxylate to organic solvent ratio of from 3:1 to 1:3; and
(C) said particulate material comprises from 5% to 50% by weight of the composition.

4. A composition according to Claim 3 wherein

(A) said peroxygen bleaching agent is selected from alkali metal perborates and percarbonates and comprises from 1% to 30% by weight of the composition; and
(B) said particulate material also comprises from 0.5% to 20% by weight of the composition of particles of a bleach activator which can react with said peroxygen bleaching agent to form a peroxy acid.

5. A composition according to Claim 4 which also contains from 1% to 20% by weight of the composition of an additional nonionic surfactant comprising ethylene oxide-propylene oxide block polymers.

6. A composition according to Claim 4 wherein said particulate material also comprises from 2% to 20% by weight of the composition of an organic detergent builder selected from alkali metal citrates, succinates, malonates, carboxymethylsuccinates, carboxylates, polycarboxylates, polyacetylcarboxylates and fatty acid soaps.

7. A composition according to Claim 6 wherein said organic detergent builder is sodium citrate.

8. A composition according to Claim 4 wherein said particulate material also comprises from 1% to 25% by weight of the composition of an alkalinity source selected from water-soluble alkali metal carbonates, bicarbonates, borates, silicates and metasilicates.

9. A composition according to Claim 8 wherein said alkalinity source is sodium carbonate.

10. A composition according to Claim 4 which additionally contains from 0.1% to 4% by weight of the composition of a chelating agent selected from amino carboxylates, phosphonates, amino phosphonates, polyfunctional substituted aromatic chelating agents and combinations of these chelating agents.

11. A composition according to Claim 10 wherein said chelating agent is selected from diethylene triamine pentaacetic acid, ethylene diamine disuccinic acid, dipicolinic acid and hydroxyethyldiphosphonic acid and the salts of these chelating agents.

12. A composition according to Claim 4 which additionally contains from 0,001% to 5% by weight of the composition of enzyme prills wherein said prills range in size from about 100 to 1,000 μm (microns), and wherein said enzyme is selected from proteases, amylases, cellulases, and lipases.

13. A composition according to Claim 4 which additionally contains

(A) from 0.1% to 4% by weight of the composition of a thickening, viscosity control and/or dispersing agent selected from acrylic acid-based polymers having a molecular weight ranging from 2,000 to 10,000; and/or
(B) from 0.0001% to 2% by weight of a compatible brightener; suds suppressor, silicone oil, bleach catalyst, dye and/or perfume.

14. A nonaqueous liquid heavy-duty detergent composition in the form of a suspension of solid, substantially insoluble particulate peroxygen bleaching agent material dispersed throughout a structured, surfactant-containing liquid phase having a viscosity of from 300 to 5,000 mPa/s (cps), said composition being further **characterized in that** it comprises:

(A) from 15% to 60% by weight of the composition of an alkali metal C_{11}-C_{14} linear alkyl benzene sulfonate surfactant;
(B) from 15% to 70% by weight of the composition of a nonaqueous liquid diluent which comprises:

i) an alcohol ethoxylate component comprising C_{10}-C_{14} alcohols containing from 3 to 10 moles of ethylene oxide; and
ii) a nonaqueous organic solvent selected from diethylene glycol monobutyl ether, dipropylene glycol monobutyl ether and hexylene glycol; in an alcohol ethoxylate to organic solvent weight ratio of from 3:1 to 1:3; and

(C) from 1% to 20% by weight of the composition of particles of a peroxygen bleaching agent selected from sodium and potassium perborates and percarbonates, said particles ranging in size from 5 to 200 μm (microns).

15. A composition according to Claim 14 wherein said composition further comprises from 1% to 10% by weight of the composition of particles of a bleach activator which can react with said peroxygen bleaching agent to form a peroxy acid.

16. A composition according to Claim 15 which additionally contains from 4% to 10% by weight of the composition or an organic detergent builder selected from alkali metal citrates, succinates, malonates, carboxymethylsuccinates, carboxylates, polycarboxylates, polyacetylcarboxylates and fatty acid soaps.

17. A composition according to Claim 16 which additionally contains from 2% to 15% by weight of an alkalinity source selected from water-soluble alkali metal carbonates, bicarbonates, borates, silicates and metasilicates.

18. A nonaqueous, bleach-containing liquid heavy-duty detergent composition which comprises:

(A) from 20% to 40% by weight of the composition of a sodium C_{11-14} linear alkylbenzene sulfonate anionic surfactant;
(B) from about 5% to 25% by weight of the composition of a C_{10}-C_{14}, 1-3 EO alcohol ethoxylate;
(C) from 10% to 30% by weight of the composition of hexylene glycol or dipropylene glycol monobutyl ether,
(D) from 1% to 20% by weight of the composition of particles of a peroxygen bleaching agent selected from sodium and potassium perborates and percarbonates;
(E) from 1% to 10% by weight of the composition of particles of a bleach activator selected from nonanoyloxybenzene sulfonate, (6-C_8-C_{10} alkamidocaproyl) oxybenzene sulfonate and tetraacetyl ethylene diamine; and

(F) from 2% to 15% by weight of the composition of particles of alkali metal carbonate; and

wherein said composition is in the form of a suspension of particulate material comprising said particles, dispersed throughout said liquid detergent composition with said particulate material ranging in size from 0.1 to 1500 μm (microns).

19. A composition according to Claim 18 which has from 50% to 95% by weight of the composition of a liquid phase and from 5% to 50% by weight of the composition of a solid particulate phase.

20. A composition according to Claim 19 which has a viscosity of from 500 to 3,000 mPa/s (cps).

Patentansprüche

1. Nichtwäßrige, flüssige Universalwaschmittelzusammensetzung in Form eines Suspension eines festen, im wesentlichen unlöslichen Teilchenmaterials, disperglert in einer strukturierten tensidhaltigen, flüssigen Phase, wobei die Zusammensetzung weiterhin **dadurch gekennzeichnet ist, daß** sie umfaßt:

A) 35 bis 99 Gew.-% der Zusammensetzung einer nichtwäßrigen flüssigen Phase, welche umfaßt:

1) 30 bis 65 Gew.-% der nichtwäßrigen flüssigen Phase eines gelösten, anionischen Tensids, gewählt aus Alkalimetallsalzen von C_{10}-C_{16}-Alkylbenzolsulfonsäure;
ii) 35 bis 70 Gew.-% der nichtwäßrigen flüssigen Phase eines nichtwäßrigen flüssigen Verdünnungsmittels, welches umfaßt:

a) Alkoholalkoxylate der Formel $R^1(OC_mH_{2m})_nOH$, worin R^1 eine C_8-C_{16}-Alkylgruppe ist, m 2 bis 4 ist und n 2 bis 12 ist; und
b) ein nichtwäßriges organisches Lösungsmittel, welches gewählt ist aus:

1) Mono-, Di-, Tri-, Tetra-C_2-C_3-Alkylenglykolmono-C_2-C_6-alkylethern; und
ii) nichtvicinalen Akylenglykolen enthaltend 4 bis 8 Kohlenstoffatome;

in einem Gewichtsverhältnis von Alkoholalkoxylat zu organischem Lösungsmittel von 50:1 bis 1.50; und

B) 1 bis 65 Gew.-% der Zusammensetzung eines Teilchenmaterials mit einer Größe im Bereich von 0,1 bis 1500 μm (microns), das im wesentlichen in der nichtwäßrigen flüssigen Phase unlöslich ist, und das gewählt ist aus Persauerstoff-Bleichmitteln, Bleichaktivatoren, zusätzlichen anionischen Tensiden, organischen Detergensbuildern, anorganischen Alkalinitätsquellen und Kombinationen dieser Teilchen-Materialtypen.

2. Zusammensetzung nach Anspruch 1, wobei

(A) die Alkylgruppe der Alkylbenzolsulfonsäure linear ist und 11 bis 14 Kohlenstoffatome enthält;
(B) die Alkoholalkoxylatkomponente ethoxylierte Materialien umfaßt, enthaltend 8 bis 15 Kohlenstoffatome in der Alkylgruppe, und welche 3 bis 10 Ethylenoxideinheiten pro Molekül aufweisen; und
(C) das Teilchenmaterial Persauerstoff-Bleichmittel umfaßt, gewählt aus Percarbonsäuren und Salzen hiervon und Alkalimetallperboraten und -percarbonaten.

3. Zusammensetzung nach Anspruch 2, wobei

(A) das anionische Alkylbenzolsulfonsäure-Tensid 15 bis 60 Gew.-% der Zusammensetzung ausmacht;
(B) das nichtwäßrige flüssige Verdünnungsmittel 15 bis 70 Gew.-% der Zusammensetzung ausmacht und ein Verhältnis von Alkoholethoxylat zu organischem Lösungsmittel von 3:1 bis 1:3 aufweist; und
(C) das Teilchenmaterial 5 bis 50 Gew.-% der Zusammensetzung ausmacht.

4. Zusammensetzung nach Anspruch 3, wobei

(A) das Persauerstoff-Bleichmittel gewählt ist aus Alkallmetallperboraten und -percarbonaten und 1 bis 30

Gew.-% der Zusammensetzung ausmacht; und
(B) das Teilchenmaterial ebenfalls 0,5 bis 20 Gew.-% der Zusammensetzung Teilchen aus einem Bleichaktivator umfaßt, welche mit dem Persauerstoff-Bleichmittel reagieren können, um eine Peroxysäure zu bil den.

5. Zusammensetzung nach Anspruch 4, welche ebenso 1 bis 20 Gew.-% der Zusammensetzung eines zusätzlichen nichtionischen Tensids enthält, umfassend Ethylenoxid-Propylenoxid-Blockpolymere.

6. Zusammensetzung nach Anspruch 4, wobei das Teilchenmaterial ebenso 2 bis 20 Gew.-% der Zusammensetzung eines organischen Detergensbuilders umfaßt, gewählt aus Alkalimetallcitraten, Succinaten, Malonaten, Carboxymethylsuccinaten, Carboxylaten, Polycarboxylaten, Polyacetylcarboxylaten und Fettsäureseifen.

7. Zusammensetzung nach Anspruch 6, wobei der organische Detergensbuilder Natriumcitrat ist.

8. Zusammensetzung nach Anspruch 4, wobei das Teilchenmaterial ebenso 1 bis 25 Gew.-% der Zusammensetzung einer Alkalinitätsquelle umfaßt, gewählt aus wasserlöslichen Alkalimetallcarbonaten, -bicarbonaten, -boraten, -silicaten und -metasilicaten.

9. Zusammensetzung nach Anspruch 8, wobei die Alkalinitätsquelle Natriumcarbonat ist.

10. Zusammensetzung nach Anspruch 4, welche zusätzlich 0,1 bis 4 Gew.-% der Zusammensetzung eines Komplexbildners enthält, gewählt aus Aminocarboxylaten, Phosphonaten, Aminophosphonaten, polyfunktionellen substituierten aromatischen Komplexbildnern und Kombinationen dieser Komplexbildner.

11. Zusammensetzung nach Anspruch 10, wobei der Komplexbildner gewählt ist aus Diethylentriaminpentaessigsäure. Ethylendiamindibernsteinsäure, Dipicollnsäure und Hydroxyethyldiphosphonosäure und den Salzen dieser Komplexbildner.

12. Zusammensetzung nach Anspruch 4, welche zusätzlich 0,001 bis 5 Gew.-% der Zusammensetzung Enzymprills enthält, wobei diese Prills eine Größe im Bereich von etwa 100 bis 1000 µm (microns) aurwelsen, und wobei das Enzym aus Proteasen, Amylasen, Cellulasen und Lipasen gewählt ist.

13. Zusammensetzung nach Anspruch 4, welche zusätzlich enthält

(A) 0,1 bis 4 Gew.-% der Zusammensetzung eines Verdickungs-, Viskositätskontroll- und/oder Dispergiermittels, gewählt aus Polymeren auf Acrylsäurebasis mit einem Molekulargewichts im Bereich von 2000 bis 10000; und/oder
(B) 0,0001 bis 2 Gew.-% eines kompatiblen Aufhellers, Schaumunterdrückers, Silikonöls. Bleichkatalysators, Farbstoffs und/oder Parfüms.

14. Nichtwäßrige, flüssige, Universalwaschmittelzusammensetzung in Form einer Suspension eines festen, im wesentlichen unlöslichen, teilchenförmigen Persauerstoff-Bleichmittelmaterials, dispergiert in einer strukturierten, tensidhaltigen, flüssigen Phase mit einer Viskosität von 300 bis 5000 mPa·s (cps), wobei die Zusammensetzung weiterhin **dadurch gekennzeichnet ist, daß** sie umfaßt:

(A) 15 bis 60 Gew.-% der Zusammensetzung eines linearen Alkalimetall-C_{11}-C_{14}-Alkylbenzolsulfonat-Tensids;
(B) 15 bis 70 Gew.-% der Zusammensetzung eines nichtwäßrigen flüssigen Verdünnungsmittels, welches umfaßt:

1) eine Alkoholethoxylatkomponente, umfassend C_{10}-C_{14}-Alkohole mit 3 bis 10 Molen Ethylenoxid; und
ii) ein nichtwäßriges organisches Lösungsmittel, gewählt aus Diethylenglykolmonobutylether, Dipropylenglykolmonobutylether und Hexylenglykol;

in einem Gewichtsverhältnis von Alkoholethoxylat zu organischem Lösungsmittel von 3:1 bis 1:3; und
(C) 1 bis 20 Gew.-% der Zusammensetzung an Teilchen aus einem Persauerstoff-Bleichmittel, gewählt aus Natrium- und Kaliumperboraten und -percarbonaten. wobei die Teilchen eine Größe im Bereich von 5 bis 200 µm (microns) aufweisen.

15. Zusammensetzung nach Anspruch 14, wobei die Zusammensetzung weiterhin 1 bis 10 Gew.-% der Zusammen-

setzung an Teilchen aus einem Bleichaktivator umfaßt, welche mit dem Persauerstoff-Bleichmittel reagieren können, um eine Peroxysäure zu bilden.

16. Zusammensetzung nach Anspruch 15, welche zusätzlich 4 bis 10 Gew.-% der Zusammensetzung eines organischen Detergensbuilders enthält, gewählt aus Alkalimetallcitraten, Succinaten, Malonaten, Carboxymethylsuccinaten, Carboxylaten, Polycarboxylaten, Polyacetylcarboxylaten und Fettsäureseifen.

17. Zusammensetzung nach Anspruch 16, welche zusätzlich 2 bis 15 Gew.-% einer Alkalinitätsquelle enthält, gewählt aus wasserlöslichen Alkalimetallcarbonaten, -bicarbonaten, -boraten, -silicaten und -metasilicaten.

18. Nichtwäßrige, bleichmittelhaltige, flüssige Universalwaschmittelzusammensetzung, welche umfaßt:

(A) 20 bis 40 Gew.-% der Zusammensetzung eines anionischen linearen Natrium-C_{11}-C_{14}-Alkylbenzolsulfonat-Tensids;
(B) etwa 5 bis 25 Gew.-% der Zusammensetzung eines C_{10}-C_{14}, 1-3EO-Alkoholethoxylats;
(C) 10 bis 30 Gew.-% der Zusammensetzung Hexylenglykol oder Dipropylenglykolmonobutylether;
(D) 1 bis 20 Gew.-% der Zusammensetzung an Teilchen aus einem Persauerstoff-Bleichmittel, gewählt aus Natrium- und Kaliumperboraten, und -percarbonaten;
(E) 1 bis 10 Gew.-% der Zusammensetzung an Teilchen aus einem Bleichaktivator, gewählt aus Nonanoyloxybenzolsulfonat, (6-C_8-C_{10}-Alkamidocaproyl)oxybenzolsulfonat und Tetraacetylethylendiamin; und
(F) 2 bis 15 Gew.-% der Zusammensetzung an Teilchen aus Alkalimetallcarbonat; und

wobei die Zusammensetzung in Form einer Suspension aus teilchenförmigem Material vorliegt, umfassend besagte Teilchen, dispergiert in einer flüssigen Waschmittelzusammensetzung, wobei das teilchenförmige Material eine Größe im Bereich von 0,1 bis 1500 μm (microns) aufweist.

19. Zusammensetzung nach Anspruch 18, bei der 50 bis 95 Gew.-% der Zusammensetzung eine flüssige Phase sind und 5 bis 50 Gew.-% der Zusammensetzung eine feste, teilchenförmige Phase sind.

20. Zusammensetzung nach Anspruch 19, welche eine Viskosität von 500 bis 3000 mPa·s (cps) aufweist.

Revendications

1. Composition détergente liquide, non aqueuse, pour gros lavage, sous forme d'une suspension d'un matériau particulaire solide sensiblement insoluble, dispersé dans une phase liquide structurée, contenant un tensioactif, ladite composition étant en outre **caractérisée en ce qu'**elle comprend :

(A) 35% à 99% en poids de la composition d'une phase liquide non aqueuse qui comprend :

i) 30% à 65%, en poids de ladite phase liquide non aqueuse, d'un tensioactif anionique dissous choisi parmi des sels de métaux alcalins d'acide alkylbenzènesulfonique en C_{10}-C_{16} ; et
ii) 35% à 70%, en poids de ladite phase liquide non aqueuse, d'un diluant liquide non aqueux qui comprend :

a) des alcools alcoxylés de formule $R^1(OC_mH_{2m})_nOH$ où R^1 est un groupe alkyle en C_8-C_{16}, m vaut 2 à 4 et n vaut 2 à 12 ; et
b) un solvant organique non aqueux qui est choisi parmi :

i) des éthers monoalkyliques en C_2-C_6 de mono, di, tri, tétra-alkylèneglycols en C_2-C_3 ; et
ii) des alkylèneglycols non vicinaux contenant 4 à 8 atomes de carbone ;

dans un rapport en poids de l'alcool alcoxylé au solvant organique de 50 : 1 à 1 : 50 ; et

(B) 1% à 65%, en poids de la composition, d'un matériau particulaire qui est dans la plage de taille de 0,1 à 1500 μm (microns), qui est sensiblement insoluble dans ladite phase liquide non aqueuse et qui est choisi parmi des agents de blanchiment peroxygénés, les activateurs de blanchiment, les tensioactifs auxiliaires anioniques, les adjuvants de détergence organiques, des sources d'alcalinité minérales et les combinaisons

desdits types de matériau particulaire.

2. Composition selon la revendication 1, dans laquelle

(A) le groupe alkyle dudit acide alkylbenzènesulfonique est linéaire et contient 11 à 14 atomes de carbone ;
(B) ledit composant alcool alcoxylé comprend des matériaux éthoxylés contenant 8 à 15 atomes de carbone dans le groupe alkyle et ayant 3 à 10 groupements oxyde d'éthylène par molécule ; et
(C) ledit matériau particulaire comprend des agents de blanchiment peroxygénés choisis parmi les acides percarboxyliques et leurs sels et des perborates et des percarbonates de métaux alcalins.

3. Composition selon la revendication 2, dans laquelle

(A) ledit tensioactif anionique alkylbenzènesulfonique constitue 15% à 60% en poids de la composition ;
(B) ledit diluant liquide non aqueux constitue 15% à 70% en poids de la composition et présente un rapport de l'alcool éthoxylé au solvant organique de 3 : 1 à 1 : 3 ; et
(C) ledit matériau particulaire constitue 5% à 50% en poids de la composition.

4. Composition selon la revendication 3, dans laquelle

(A) ledit agent de blanchiment peroxygéné est choisi parmi les perborates et les percarbonates de métaux alcalins et constitue 1% à 30% en poids de la composition ; et
(B) ledit matériau particulaire comprend également 0,5% à 20%, en poids de la composition, de particules d'un activateur de blanchiment qui peut réagir avec ledit agent de blanchiment peroxygéné pour former un peroxyacide.

5. Composition selon la revendication 4 qui contient également 1% à 20%, en poids de la composition, d'un tensioactif non ionique additionnel comprenant des polymères séquencés oxyde d'éthylène-oxyde de propylène.

6. Composition selon la revendication 4, dans laquelle ledit matériau particulaire comprend également 2% à 20%, en poids de la composition, d'un adjuvant de détergence organique choisi parmi des citrates, des succinates, des malonates, des carboxyméthylsuccinates, des carboxylates, des polycarboxylates, des polyacétylcarboxylates et des savons d'acides gras de métaux alcalins.

7. Composition selon la revendication 6, dans laquelle ledit adjuvant de détergence organique est le citrate de sodium.

8. Composition selon la revendication 4, dans laquelle ledit matériau particulaire comprend également 1% à 25%, en poids de la composition; d'une source d'alcalinité choisie parmi les carbonates, bicarbonates, borates, silicates et métasilicates de métaux alcalins hydrosolubles.

9. Composition selon la revendication 8, dans laquelle ladite source d'alcalinité est le carbonate de sodium.

10. Composition selon la revendication 4 qui comprend en outre 0,1% à 4%, en poids de la composition, d'un agent chélatant choisi parmi les amino-carboxylates, les phosphonates, les amino-phosphonates, les agents chélatants aromatiques polyfonctionnels substitués et les combinaisons de ces agents chélatants.

11. Composition selon la revendication 10, dans laquelle ledit agent chélatant est choisi parmi l'acide diéthylènetriaminepentaacétique, l'acide éthylènediaminedisuccinique, l'acide dipicolinique et l'acide hydroxyéthyldiphosphonique et les sels de ces agents chélatants.

12. Composition selon la revendication 4 qui comprend en outre 0,001% à 5%, en poids de la composition, de pépites d'enzyme dans laquelle lesdites pépites ont une taille dans la plage d'environ 100 à 1000 μm (microns) et dans laquelle ladite enzyme est choisie parmi les protéases, les amylases, les cellulases, et les lipases.

13. Composition selon la revendication 4 qui contient en outre

(A) 0,1% à 4%, en poids de la composition, d'un agent épaississant, de réglage de la viscosité et/ou de dispersion choisi parmi les polymères à base d'acide acrylique ayant une masse moléculaire dans la plage de 2000 à 10 000 ; et/ou

(B) 0,0001% à 2%, en poids d'un azurant compatible, d'un suppresseur de mousse, d'une huile de silicone, d'un catalyseur de blanchiment, d'un colorant et/ou d'un parfum.

14. Composition détergente liquide non aqueuse pour gros lavage sous forme d'une suspension d'un matériau d'agent de blanchiment peroxygéné particulaire sensiblement insoluble, solide, dispersé dans une phase liquide structurée contenant un tensioactif ayant une viscosité de 300 à 5000 mPa.s (cP) , ladite composition étant en outre **caractérisée en ce qu'**elle comprend :

(A) 15% à 60%, en poids de la composition, d'un tensioactif alkylbenzènesulfonate linéaire en C_{11}-C_{14} de métal alcalin;
(B) 15% à 70%, en poids de la composition, d'un diluant liquide non aqueux qui comprend :

i) un composant alcool éthoxylé comprenant des alcools en C_{10}-C_{14} contenant 3 à 10 moles d'oxyde d'éthylène ; et
ii) un solvant organique non aqueux choisi parmi l'éther monobutylique de diéthylèneglycol, l'éther monobutylique de dipropylèneglycol et l'hexylèneglycol ;

dans un rapport en poids de l'alcool éthoxylé au solvant organique de 3 : 1 à 1 : 3 ; et
(C) 1% à 20%, en poids de la composition, de particules d'un agent de blanchiment peroxygéné choisi parmi les perborates et les percarbonates de sodium et de potassium, lesdites particules ayant une taille dans la plage de 5 à 200 μm (microns).

15. Composition selon la revendication 14, dans laquelle ladite composition comprend en outre 1% à 10%, en poids de la composition, de particules d'un activateur de blanchiment qui peut réagir avec ledit agent de blanchiment peroxygéné pour former un peroxyacide.

16. Composition selon la revendication 15 qui contient en outre 4% à 10% en poids de la composition d'un adjuvant de détergence organique choisi parmi les citrates, les succinates, les malonates, les carboxyméthylsuccinates, les carboxylates, les polycarboxylates, les polyacétylcarboxylates et les savons d'acide gras de métaux alcalins.

17. Composition selon la revendication 16 qui contient en outre 2% à 15% en poids d'une source d'alcalinité choisie parmi les carbonates, les bicarbonates, les borates, les silicates et les métasilicates de métaux alcalins hydrosolubles.

18. Composition détergente liquide non aqueuse, contenant un agent de blanchiment, pour gros lavage qui comprend :

(A) 20% à 40%, en poids de la composition, d'un tensioactif anionique alkylbenzènesulfonate linéaire en C_{11-14} de sodium ;
(B) environ 5% à 25%, en poids de la composition, d'un alcool éthoxylé à 1-3 OE en C_{10}-C_{14};
(C) 10% à 30%, en poids de la composition, d'hexylèneglycol ou d'éther monobutylique de dipropylèneglycol ;
(D) 1% à 20%, en poids de la composition, de particules d'un agent de blanchiment peroxygéné choisi parmi les perborates et les percarbonates de sodium et de potassium ;
(E) 1% à 10%, en poids de la composition, de particules d'un activateur de blanchiment choisi parmi le nonanoyloxybenzènesulfonate, le (6-alcamido en C_8-C_{10} caproyl)oxybenzène-sulfonate et la tétraacétyléthylènediamine ; et
(F) 2% à 15%, en poids de la composition, de particules de carbonate de métal alcalin ; et

dans laquelle ladite composition est sous forme d'une suspension d'un matériau particulaire comprenant lesdites particules, dispersées dans ladite composition détergente liquide, avec ledit matériau particulaire dans une plage de taille de 0,1 à 1500 μm (microns) .

19. Composition selon la revendication 18 qui a 50% à 95%, en poids de la composition, d'une phase liquide et 5% à 50%, en poids de la composition, d'une phase particulaire solide.

20. Composition selon la revendication 19 qui présente une viscosité de 500 à 3000 mPa.s (cP).