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(54) Titre : HYDROXYESTERS COMME AGENTS DE COUPLAGE POUR LES FORMULATIONS DE SURFACTANT

(54) Title: HYDROXYESTERS AS COUPLING AGENTS FOR SURFACTANT FORMULATIONS

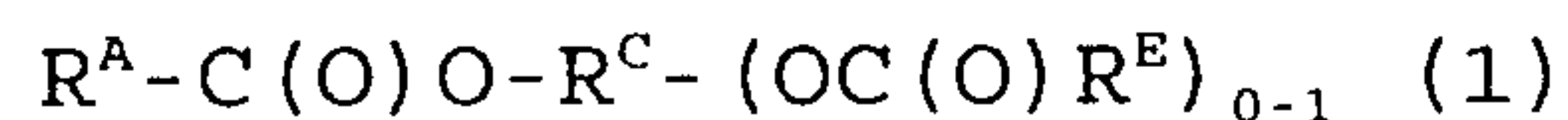
(57) **Abrégé/Abstract:**

Disclosed are stable monophasic liquid compositions comprising water, one or more cationic, anionic, amphoteric and/or nonionic surfactants, exhibiting partial solubility in water or in concentrated formulations, and one or more coupling agents of the formula (1) $R^A-C(O)O-R^C-(OC(O)R^E)_{0-1}$ (1) wherein R^A is C_1-C_{15} alkyl with 0-3 hydroxyl substituents, R^C is C_1-C_{10} alkyl with 0-3 hydroxyl substituents, and R^E is C_1-C_{15} alkyl with 0-1 hydroxyl substituents, wherein the compounds of formula (1) contain 7 to 16 carbon atoms and a total of 1-3 hydroxyl substituents.



ABSTRACT OF THE DISCLOSURE

1 Disclosed are stable monophasic liquid
compositions comprising water, one or more cationic,
anionic, amphoteric and/or nonionic surfactants,
exhibiting partial solubility in water or in
5 concentrated formulations, and one or more coupling
agents of the formula (1)



10 wherein R^A is C_1-C_{15} alkyl with 0-3 hydroxyl
substituents, R^C is C_1-C_{10} alkyl with 0-3 hydroxyl
substituents, and R^E is C_1-C_{15} alkyl with 0-1 hydroxyl
substituents, wherein the compounds of formula (1)
contain 7 to 16 carbon atoms and a total of 1-3
15 hydroxyl substituents.

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HYDROXYESTERS AS COUPLING
AGENTS FOR SURFACTANT FORMULATIONS

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The present invention relates to aqueous compositions containing solubilized or dispersed therein one or more useful surfactants which exhibit
5 low solubility (or no solubility at all) in water, especially in the presence of electrolytes and/or pH agents. For purposes of this application, a substance is considered to be "solubilized" in water if the material is dissolved in the water or if it is
10 uniformly dispersed or distributed therein, or emulsified therein, so as to exhibit the physical appearance and physical properties of a single-phase system (whether as an emulsion, an organic-based formula, or a water-based formula).

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As is well known, surfactants can be used to perform a wide variety of useful purposes, ranging from cleaning and surface protection through deposition of coatings, fabric softening, foam stabilization, oil recovery, asphalt emulsification,
20 achieving or enhancing rewetting effectiveness and penetrating power, and a large variety of other capabilities set forth hereinbelow. However, in many cases the ability to take advantage of such surfactants' useful properties is limited by the low
25 solubility and/or dispersibility of many surfactants and surfactant blends in water.

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There is also need in the marketplace for products with higher levels of concentration of surfactants or active ingredients, thus minimizing the amounts of water in the products. As the amount of

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water in the formulations is reduced, and as
1 formulations add more (and more complex) ingredients,
the fluidity and stability often become more difficult
to maintain. Often the surfactants become insoluble
gels when diluted in water, or become hazy or even
5 split into different phases. Surfactants often become
insoluble in formulations where the concentration of
inorganic salts is very high. In other surfactant
formulations, maintaining the fluidity and
dispersibility of the surfactant in water are serious
10 problems which limit their use and application. Many
surfactants are difficult to even disperse in water,
requiring both hot water and long periods of mixing
for dissolution into solution.

Hydrotropes or, more generally, coupling
15 agents are added to surfactant formulations to
increase the amount of the relatively water-insoluble
surfactants that can be solubilized into the system.
In most cases, they do not act as surfactants to lower
surface tension but they often allow surfactants in
20 the presence of salts or electrolytes to be added and
subsequently dispersed into water at higher
concentrations or at lower viscosities of the
formulation than is otherwise achieved using only
surfactant and water. These coupling agents assist
25 surfactants by increasing the surfactant's solubility
in water and its stability in the formulation,
especially in the presence of salts, electrolytes
and/or pH agents.

Hydrotropes or coupling agents generally
30 contain short chained (C_2 - C_6) hydrophobes with more

1 bulky hydrophilic group(s) such as hydroxyl and/or
sulfonates making them completely water-soluble. They
are normally added to stabilize formulations of
surfactants, salts and water and to hold them in
single-phase systems.

5 Materials that have been proposed for use as
coupling agents include hexylene glycol, propylene
glycol, dipropylene glycol, diethylene glycol,
propylene carbonate, any of various lower alkoxy-
10 capped glycols or polyglycols, particularly where the
glycol is ethylene glycol or propylene glycol, such as
ethylene glycol monobutyl ether, alcohols such as
isopropanol and ethanol, and certain aryl sulfonates
such as sodium naphthalene sulfonate and sodium xylene
sulfonate, as well as some phosphate esters. However,
15 despite the abilities of these water-soluble products
as coupling agents that have been suggested for these
materials, there remains a need and an interest in
identifying coupling agents and systems containing
such coupling agents which not only exhibit superior
20 stability and superior ability to solubilize
relatively water-insoluble agents but also improve
formulation fluidity, dispersibility and product
performance.

In addition, coupling agents that have
25 improved permissible-exposure limits, higher flash
points (over, for instance, isopropanol and ethanol),
and lower odor (compared to, for example, butyl
cellosolve or isopropanol) would have substantial
importance to formulations and consumers. Other
30 coupling agents such as sodium xylene sulfonate

1 containing aromatic rings have come under
environmental scrutiny in recent times.

5 The composition disclosed in U.S. Patent No.
4,692,277 represents an attempt to incorporate certain
diol solvents into hard surface cleaning formulations.
The disclosure, however, is limited to liquid hard
surface detergents/cleaners which contain at most 10%
of a surfactant, and which must contain 1% to 30% of a
detergency builder salt. The necessity of these
components in the indicated amounts attests to the
10 specific, limited nature of the teachings of this
patent. More fundamentally, the disclosure of this
patent was concerned solely with the solvent power of
 C_6-C_{16} diols as to their effect on soap scum removal
when combined with both surfactants and salt builders,
15 and completely fails to suggest or appreciate that it
is possible, through selection of components according
to the present invention, to employ certain diols
and/or alkoxylates thereof so as to attain the
solubilization of much higher amounts of less soluble
20 surfactant(s) while retaining the desired monophasic
state of the resulting composition. Thus, in turn,
this patent thereby also fails to suggest any of the
many end-use (especially monophasic) formulations that
can be prepared embodying the compositions afforded by
25 the present invention in combination with other
hydrophobic surfactants, be they active ingredients or
otherwise.

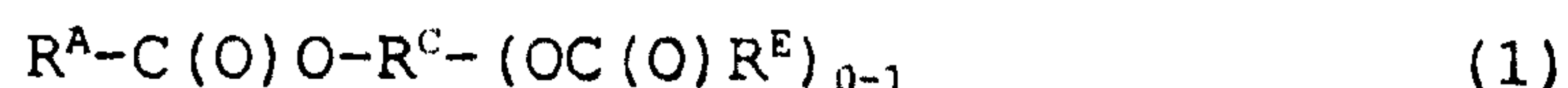
One aspect of the present invention resides
in a stable monophasic liquid composition
30 characterized by the ability to solubilize increased

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amounts of surfactant into said composition while retaining an essentially monophasic state, which composition is useful as a dispersant of hydrophobic material and comprising water;

one or more cationic surfactants, said surfactant present in a concentration of from more than 10 wt% to 50 wt%; and

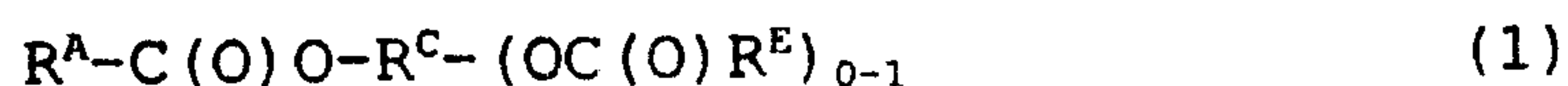
at least 0.1 to 50% by weight of a coupling agent having the structural formula (1)



10 wherein R^A is straight, cyclic or branched alkyl containing 1-14 carbon atoms or a straight, cyclic or branched alkyl containing 1-14 carbon atoms substituted with 1 to 3 hydroxyl groups; R^C is straight, cyclic or branched alkyl containing 1 to 14 carbon atoms or straight, cyclic or branched alkyl containing 1 to 14 carbon atoms substituted with 1 to 3 hydroxyl groups, and R^E is straight, cyclic or branched alkyl containing 1 to 14 carbon atoms or straight, cyclic or branched alkyl containing 1 to 14 carbon atoms substituted with a hydroxyl group. The coupling agent contains 7 to 16 carbon
20 atoms, and includes 1 to 3 hydroxyl groups.

In accordance with another embodiment of the invention there is provided a process for solubilizing into water one or more surfactants selected from the group consisting of anionic surfactants, amphoteric surfactants, cationic surfactants, nonionic surfactants, and mixtures thereof comprising combining into one monophasic composition water, the one or more surfactant, and one or more coupling agents selected from the group consisting of compounds of formula (1)

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and mixtures thereof, wherein R^A is straight, cyclic or branched alkyl containing 1-14 carbon atoms, and R^A is optionally substituted with 1 to 3 hydroxyl groups; and wherein

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10 R^C is straight, cyclic or branched alkyl containing 1 to 10 carbon atoms which is optionally substituted with up to 3 hydroxyl groups, and R^C can optionally be substituted with a group of the structure -OC(O)-R^E wherein R^E is straight, cyclic or branched alkyl containing 1 to 14 carbon atoms which is optionally substituted with a hydroxyl group, wherein the compounds of formula (1) contain 7 to 16 carbon atoms and are substituted with a total of 1 to 3 hydroxyl groups, in an amount of the coupling agent effective to increase the amount of the one or more surfactants that can be solubilized in the composition.

The present discovery has particular utility with surfactants that are either insoluble in water, or exhibit partial solubility in water such as up to 10 grams per 100 milliliters of water (in the absence of surfactants, coupling agents, or other solubility-

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enhancing additives). However, the present discovery
1 also is useful with surfactants which exhibit even
complete solubilities in water but which are difficult
to disperse or to produce fluid, low viscosity
formulations in water, and/or highly concentrated
5 surfactant blends with or without electrolytes,
builders and/or pH agents or other active agents.

Satisfactory surfactants useful herein can
readily be identified in well-known sources such as
McCutcheon's Detergents & Emulsifiers, and the CTFA
10 Cosmetic Ingredient Dictionary.

Anionic surfactants include in particular
organosulfonates and organosulfates, which can be
characterized by the formula X^1-A^1 wherein A^1 denotes
sulfonate or sulfate, attached anywhere to X^1 and most
15 often at one end of X^1 , and X^1 denotes:

alkyl containing 6 to 40 carbon atoms,
optionally substituted with 1 to 10 hydroxyl groups,
and optionally substituted with aryl (particularly
phenyl) which is optionally substituted with one or
20 more alkyl or alkylene groups containing 1 to 20
carbon atoms and up to 3 carbon-carbon double bonds;

alkylene containing 6 to 40 carbon atoms and
1 to 6 carbon-carbon bonds, and optionally substituted
with 1 to 10 hydroxyl groups, and optionally
25 substituted with aryl (particularly phenyl) which is
optionally substituted with one or more alkyl or
alkylene groups containing 1 to 20 carbon atoms and up
to 3 carbon-carbon double bonds;

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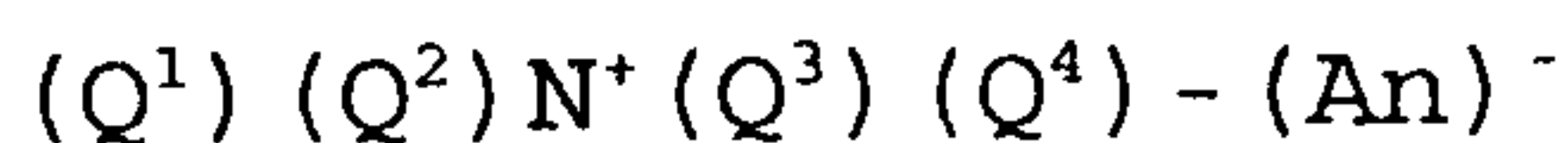
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amides and esters containing a total of 6 to
 1 50 carbon atoms and optionally containing 1 to 6
 carbon-carbon double bonds;

polyalkoxy segments, particularly
 homopolymers, random copolymers, and block copolymers,
 5 of ethylene oxide and/or propylene oxide, containing 2
 to 200 alkoxy units, per se or terminated with alkyl
 or alkylene containing 2 to 40 carbon atoms, which may
 optionally be substituted with 1-10 hydroxyl groups,
 or terminated with aryl (particularly phenyl) which
 10 may optionally be substituted with one or more alkyl
 or alkylene groups containing 1 to 20 carbon atoms and
 up to 3 carbon-carbon double bonds.

The anionic component is counterbalanced by
 a cation X which is preferably an alkali metal (e.g.
 15 sodium, potassium or lithium).

Cationic surfactants include quaternary
 ammonium compounds, particularly those of the formula



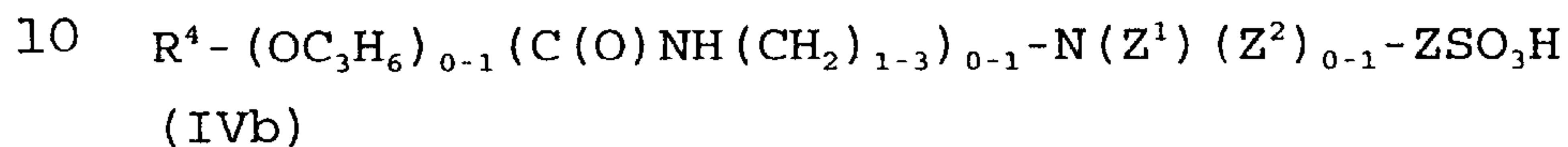
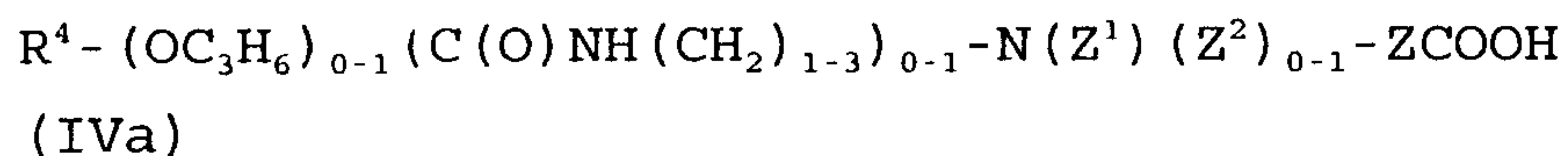
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wherein $(An)^-$ is an anion such as halide (especially
 bromide or chloride), methylsulfate, or ethylsulfate,
 and Q^1 , Q^2 , Q^3 and Q^4 are selected such that 2 or 3
 thereof are C_{1-4} alkyl (optionally one of which is
 25 benzyl) and 1 or 2 thereof are alkyl or alkylene
 containing 8 to 24 carbon atoms and optionally up to 3
 carbon-carbon double bonds, or Q^1 and Q^2 are acyl
 oxyethyl wherein the acyl moiety contains 8 to 22
 carbon atoms and 0 to 3 carbon-carbon double bonds, or
 30 poly(alkoxy) wherein each alkoxy unit is ethoxy or

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propoxy, containing up to 200 alkoxy units. Also
 1 included are polymeric quaternary ammonium salts
 including those known generically as polyquaternium -
 1, -2, -4, -5, -6, -7, -8, -9, -10, -11, -12, -13, and
 -14.

5 Amphoteric surfactants particularly include
 those of the formula (IVa) and (IVb)



salts thereof with an alkali metal X or ammonium
 cation and mixtures of any said compounds and salts,
 15 wherein X is as defined above, R^4 is straight or
 branched alkyl or alkylene, or cyclic or heterocyclic
 aromatic which is optionally substituted with alkyl,
 and contains 4 to 40 carbon atoms and 0-3 carbon-
 carbon double bonds, Z^1 and Z^2 are independently of
 20 each other H, C_fH_{2f+1} or $C_fH_{2f}OH$ wherein f is 1 to 6 and
 preferably 1, Z or 3 or, in formula (IVa), one of Z^1
 and Z^2 can be $-ZCOOH$ or $-ZCOOX$, and Z is $(CH_2)_f$,
 $CH_2CH_2OCH_2$, or $CH_2CHOHCH_2$;

Formulas (IVa) and (IVb) embrace betaines,
 25 sulfobetaines (sultaines), glycines and propionates,
 which are commercially available and/or can readily be
 synthesized. Examples of preferred amphoteric
 surfactants include fatty betaines such as lauryl
 dimethyl betaine (e.g. REWOTERIC® AM-DML-35) (this and
 30 all other REWOTERIC®-branded compounds are marketed by

1 Witco Corp.) and N-lauryl-beta-iminopropionic acid,
mono-sodium salt (e.g. REWOTERIC® AM-LP); glycinate
such as N-cocoylamidoethyl-N-(2-hydroxyethyl)-N-
carboxymethyl glycine, sodium salt (e.g. REWOTERIC®
5 AM-2C-W) and as lauryl hydroxy sultaine (e.g.
REWOTERIC®-AM-B-15); propionates such as sodium
cocoamphopropionate (e.g. REWOTERIC® AM-KSF-40); and
sulfobetaines such as lauryl hydroxy sultaine (e.g.
REWOTERIC AM-CAS).

10 Preferred R⁴ groups include alkyl and
alkylene radicals derived from fatty acids. Other
preferred R⁴ groups include benzyl and alkyl-
substituted benzyl.

15 Nonionic surfactants include any nonionic
compounds having surface active capability. Examples
include

-esters, amides, and alkanolamides,
containing a total of 6 to 40 carbon atoms, optionally
zero to 3 carbon-carbon double bonds and optionally
substituted with 1 to 20 hydroxyl groups (as e.g.
20 polyglycol) esters;

-homopolymers, random copolymers and block
copolymers of ethylene oxide and/or propylene oxide
and/or ethylene glycol and/or propylene glycol,
containing 2 to 200 repeating units;

25 -any of the foregoing homopolymers, random
copolymers and/or block copolymers, but especially
poly(ethylene oxide), substituted with alkyl or
alkylene containing 1 to 40 carbon atoms and
optionally up to 6 carbon-carbon double bonds, and
30 optionally 1 to 20 hydroxyl groups, or with an ester,

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amide, amine, alkanolamide or with an aryl group
1 (especially phenyl) or an aryl-alkyl group, itself
optionally substituted with alkyl or alkylene
containing up to 40 carbon atoms and optionally
containing 6 carbon-carbon double bonds; and
5 -sorbitol derivatives, including those known
guerically as polysorbate -20, -32, -40, -60, -61,
-65, -80, -81, and -85.

The particular selection of the type of
emulsifier, and the particular compound selected, for
10 any given application can readily be made by those of
ordinary skill in this art with reference to the
identity or identities of the intended application and
the surface properties needed, with due consideration
to the amount thereof and to the properties desired of
15 the final product. In particular, the HLB
(hydrophilic-lipophilic balance) which needs to be
exhibited by the surfactant chosen can likewise be
determined quite readily for any particular end-use
application.

20 The critical feature of the discovery
represented by the presently claimed invention is the
discovery of a carefully chosen class of coupling
agents which, in the overall water-based systems
disclosed herein, exhibit remarkable and unforeseen
25 properties rendering the resulting compositions
superior in many respects to those previously
available.

The coupling agents of the aforementioned
formula (1), sometimes referred to herein as hydroxy
30 esters, contribute essentially to the advantageous

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properties of the compositions of the present
1 invention.

The R^A group in formula (1) represents a
saturated, straight-chain, branched-chain, or cyclic
alkyl moiety containing 1 to 14 carbon atoms.
5 Preferably, R^A contains 3 to 14 carbon atoms, or 1 to
10 or even 1 to 6 carbon atoms. The R^A group can be
unsubstituted, or can be substituted with a hydroxyl
group or two or three hydroxyl groups.

The residue R^C in formula (1) represents a
10 saturated, straight-chain, branched-chain, or cyclic
alkyl moiety containing 1 to 10 carbon atoms. It is
preferred that R^C is branched; the term "branched" is
intended to encompass structures having one side alkyl
chain, more than one side alkyl chain, or one or more
15 side alkyl chains one or more of which is itself
branched. Branched structures include cyclic
structures substituted with one or more alkyl groups
which can be straight or branched. The R^C group is
optionally, but preferably, substituted with at least
20 one hydroxyl group and preferably with 2 or 3 hydroxyl
groups. Examples of preferred R^C groups include
butyl (straight or branched); n-propyl, especially
2,3-dihydroxy -n-propyl (i.e. glyceryl derivatives);
and ethyl, especially 1,2-dihydroxy ethyl (i.e. glycol
25 derivatives).

Optionally, the R^C group can be substituted
with a group of the formula $-OC(O)-R^E$ wherein R^E is
straight, branched or cyclic alkyl containing 1 to 14
carbon atoms and preferably 1 to 4 carbon atoms. R^E

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1 itself can optionally be substituted with a hydroxyl group.

Compounds of the formula (1) defined above are in many instances commercially available. Compounds of formula (1) can be prepared in
5 straightforward manner familiar to those of ordinary skill in this art by obtaining or preparing the corresponding precursor polyol of the formula $R^C-(OH)_i$, wherein i is at least 1, or up to 5; and then esterifying one or two of the hydroxyl groups of the
10 polyol precursor with a stoichiometrically appropriate number of moles of the desired corresponding carboxylic acid. In those cases where it is desired to esterify only one of the hydroxyl groups on the precursor polyol, in some embodiments the
15 esterification will preferentially occur at only one of the hydroxyl groups, particularly where one of them is a primary hydroxyl and the other is a secondary hydroxyl. However, in those cases where both hydroxyl groups on the precursor diol might tend to esterify
20 but esterification at only one of the hydroxyl groups is desired, the hydroxyl group at which esterification is desired not to occur can be protected by preliminarily reacting it with a suitable protecting group such as a lower alkyl moiety. Thereafter,
25 following the esterification the protecting group is removed in a known manner. Mixtures of compounds of formula (1), such as where the polyol $R^C-(OH)_i$ is monoesterified but not all at the same hydroxyl group, are also within scope of this invention.

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Preferred examples of compounds of the foregoing formula (1) include any one, or mixtures, of compounds obtained by esterification between a C₂-C₁₆ carboxylic acid and: glycerine; ethylene glycol; 2,2-dimethyl -1,3-propanediol; 2,2,4-trimethyl-1,3-pentane diol (referred to herein as "TMPD"); 2-ethylhexane-1,3-diol; and 2-butyl-2-ethyl -1,3 propane diol.

Particularly preferred examples of compounds of formula (1) include 2,2,4-trimethyl -1,3-pentenediol monoisobutyrate (commercially available as "Texanol"); hydroxypivalyl hydroxypivalate (e.g. in formula (1), R^A is 1,1-dimethyl-2-hydroxyethyl and R^C is 2,2-dimethyl -3-hydroxypropyl, commercially available from Eastman as "HPHP") (also termed "HPHP Glycol" herein); the 1:1 (molar) ester of 2,2,4-trimethyl-1,3-pentane diol with hydroxypivalic acid; the 1:1 (molar) esters of glycerine, or of ethylene glycol, with hydroxypivalic acid; and the 1:1 (molar) ester of glycerine with a C₂ to C₈ alkanolic acid, preferably a C₄ alkanolic acid.

Compositions in accordance with this invention can also contain one or more compounds of the formula R^T-(OH)₂ and/or one or more alkoxyates thereof wherein R^T is straight, branched or cyclic alkyl containing 4 to 12 carbon atoms. Preferred compounds R^T-(OH)₂ include TMPD (defined above) and 2-ethylhexane-1,3-diol. The alkoxyates of R^T-(OH)₂ can be substituted with one or two terminal poly(alkoxy) chains, each in place of one of the -OH substituents. Each alkoxy unit can be ethoxy, propoxy, or butoxy. Mixtures of types of alkoxy groups, or block

1 copolymers composed of a chain of one type of
repeating alkoxy unit attached to a chain of a
different type of repeating alkoxy unit, are
especially contemplated.

5 In the alkoxyated diols, the number of
repeating units in each poly(alkoxy) chain can be up
to 40 but the total of alkoxy units in both chains
taken together is up to 40. It is preferred that each
chain contains 1 to 10 repeating alkoxy units or more
preferably 1 to 5 alkoxy units. The preferred alkoxy
10 chains are poly(ethoxy), or are composed of 1 to 2
ethoxy units capped with a chain of 1 to 5 propoxy
units.

Compositions in accordance with the present
invention exhibit superior stability, by which is
15 meant that they do not separate into more than one
phase even upon standing, without agitation, for
prolonged periods of time on the order of a year or
longer. They generally form more fluid formulations,
require lower levels of the ester of formula (1) than
20 of other coupling agents to function, and are
nonflammable with high exposure limits. They also
give very easy-to-disperse formulations even when the
formulations are highly concentrated, and thus
function better in each application. They generally
25 give added fluidity to even difficult to handle
surfactants and enable those same surfactants to be
dispersed in much colder water and maintain fluidity
even at cold temperatures, compared to the performance
obtained with other coupling agents.

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The compositions of the present invention
1 are particularly useful in applications that take
advantage of their ability to disperse hydrophobic
material, to stabilize foam, and to enhance the
penetration and wetting exhibited by the compositions.
5 Examples of such applications include:

Oil dispersants and oil slick dispersants,
wherein one applies onto oil (for instance, onto a
film of oil) a sufficient amount of a composition
according to the present invention, containing a
10 sufficient concentration of surfactant, such that the
composition disperses the oil.

Oil well stimulation and oil recovery aids,
wherein one injects into an oil well a composition
according to the present invention in order to
15 penetrate into the surface of the borehole and assist
liberation of crude oil from the matrix material into
the hole, from which it can be brought to the surface.

Vehicles for hydrophobic sheeting agents
such as mineral oil and silicone oil. Such oils can
20 readily be dispersed in compositions, according to the
present invention, and the resulting formulations are
highly satisfactory when sprayed or otherwise applied
to a surface (such as freshly washed automobile
surfaces) to impart a lustrous, water-repellent film
25 to the surface.

Formulation of fabric and textile softeners,
wherein components capable of imparting fabric
softening (typically, quaternary ammonium compounds
such as di-(C₁₂₋₂₂-alkyl)-di(C₁-C₄ alkyl) ammonium
30 chloride or methylsulfate, or 1,3-disubstituted

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imidazolinium salts) are incorporated into the
1 composition thereby forming a fluid, monophasic,
typically clear composition.

Paper deinking and ink flotation, wherein
waste inked paper is pulped as a slurry in an aqueous
5 liquid comprising a composition according to the
present invention so that ink is liberated from the
paper, and prevented from redepositing onto the paper;
typically the ink is dispersed or even fully
solubilized in the liquid composition of this
10 invention or when the ink particles are floated from
the fibers.

Paper debonding, wherein paper fibers are
pulped in the headbox of a papermaking machine as a
slurry in an aqueous liquid comprising a composition
15 according to the present invention, just prior to
feeding the slurry onto the dewatering screen, to
improve the debonding of the fibers and the softness
of the paper product formed.

Asphalt emulsions, wherein finely divided
20 asphalt is emulsified (at loadings typically 1-20
wt.%), with or without particulate filler such as
sand, in an aqueous phase which comprises the
composition according to the present invention.

Hair and skin conditioning formulations,
25 wherein effective amounts (e.g. 0.1 wt.% to 10 wt.% or
more) of emollients, humectants, and/or slip and
conditioning agents (e.g. organopolysiloxanes and the
like) are incorporated with the composition of the
present invention to create formulations that are
30 monophasic and can be made to be translucent or even

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1 clear or gel structures. Compounds suitable for use
as emollients, humectants and conditioners in
formulations for skin care or hair care can be found
in the CTFA Cosmetic Ingredient Dictionary, 3d
Edition, and in the CTFA Cosmetic Ingredient Handbook.

5 Corrosion inhibitors, wherein an effective
amount of a hydrophobic corrosion inhibiting material
(such as liquid or waxy-solid fatty ester, paraffinic
hydrocarbon or silicone) is dispersed in a composition
according to the present invention. The resulting
10 formulation is applied to any surface to which one
desires to apply a film that protects against
corrosion.

Rinse aids, such as used in automatic
dishwashers, wherein application of the composition of
15 the present invention disperses residual hydrophobic
matter, including cleaner residues and films.

Suspension concentrates and emulsifiable
concentrates of herbicides, pesticides, miticides,
fungicides, and/or bactericides, wherein one or more
20 liquid or solid, generally hydrophobic, active
ingredients are dispersed in a composition according
to the present invention. The concentrate can be
applied as is on or around desired vegetation; but is
more often mixed (e.g. at the point of use) with water
25 of dilution to form a final formulation having the
desired concentration of active ingredient(s). This
application takes advantage of the noteworthy property
of this invention that addition of the water for
dilution does not disrupt the monophasic state, nor
30 the fluidity, of the formulation.

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1 Generally speaking, the amount of coupling
agent of formula (1) can range from about 0.1 wt.% or
10 wt.% to about 50 wt.%, with the particular amount
readily identified by the formulator. Water may not
necessarily be present, but usually is present in
5 amounts that can be up to about 90-95 wt.%.

The one or more surfactants (which may
exhibit low solubility in water) will generally be
present in amounts on the order of 0.1 wt.% to about
90 wt.%, and similarly the particular amount can
10 readily be ascertained by the formulator. The
invention is particularly utilizable in embodiments
wherein the amount of surfactant(s), in the
aggregate, exceeds 10 wt.%, i.e. 15 wt.% or more.
Indeed, it has quite surprisingly been determined that
15 compositions in accordance with the present invention
can be prepared wherein the amount of surfactant(s) is
at least 20-25 wt.%, or even 30 wt.% or higher,
ranging up to 50 wt.% or higher, yet the composition
remains monophasic and retains its fluidity and its
20 ability to be compounded with other components without
suffering phase separation, turbidity or excessive
viscosity.

The compositions of the present invention
can also optionally contain other components,
25 depending on the additional properties one may wish to
provide in the finished composition. Such additional
components include, but are not limited to, additional
coupling agents and solvents, thickeners, fragrances,
coloring agents, hydrocarbon actives, and so forth.

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The compositions of the present invention
1 have particular usefulness in applications not calling
for the presence of inorganic or organic salts. It is
customary to incorporate quantities of such salts,
known often as "builder" salts or "detergency builder"
5 salts, particularly when cleaning functionality like
hard surface cleaning is desired. However, the
present invention is applicable to a considerable
number of utilities that do not need the presence of
builder salts, since they are not related to cleaning
10 hard surfaces. The ability of the present invention
to be so versatile and functional in applications
without builder salts is one of the many unexpected
and noteworthy aspects of the present invention.

The following are but a few examples of more
15 particular formulations embodying the compositions of
the present invention. These examples are provided
for purposed of illustration, and should not be deemed
to limit the scope of the invention.

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EXAMPLES

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Carwash Sheeting Spray

	Component (wt.%)	Typical Amount (wt.%)	Exemplary Amount (wt.%)
5	Dicoco dimethyl ammonium chloride (78% in isopropanol)	10-30	18
	HPHP Glycol	2-10	7
10	Mineral seal oil	20-30	25
	Water	40-60	50

Biodegradable Clear Fabric Softener

	Component (wt.%)	Typical Amount (wt.%)	Exemplary Amount (wt.%)
15	Methyl bis (oleylcarboxyethyl 2-hydroxyethyl ammonium methysulfate (90 wt.% in propylene glycol)	20-60	28
20	HPHP Glycol	20-40	25
25	Fragrance/dye preservative	0.4-2.	1
	Water	5-60	46

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Paper Debonder Concentrate

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	Component (wt.%)	Typical Amount (wt.%)	Exemplary Amount (wt.%)
5	Di(hard tallow) dimethyl ammonium methylsulfate	40-80	60
	HPHP Glycol	20-50.	35
	Water	0-20	5

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Textile Softener Concentrate
(cold water dispersible, nonflammable)

	Component (wt.%)	Typical Amount (wt.%)	Exemplary Amount (wt.%)
15	Methyl-1- tallow amidoethyl -2-tallow imidazolinium methylsulfate	50-75	65
20	HPHP Glycol	10-20	15
	TMPD	10-20	15
	Water	0-20	5

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Oil Field Foam Booster

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<u>Component</u> <u>(wt.%)</u>	<u>Typical Amount (wt.%)</u> <u>(wt.%)</u>	<u>Exemplary</u> <u>Amount</u> <u>(wt.%)</u>
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Blend of anionic
and nonionic
surfactants

30-50

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Alpha-olefin
sulfonate

30-50

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HPHP Glycol

10-40

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Oil Slick Dispersant

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Component
(wt.%)Typical Amount
(wt.%)Exemplary
Amount
(wt.%)Nonyl phenol
ethoxylate

10-30

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Dioctyl
sulfosuccinate

10-20

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HPHP Glycol

5-20

15

Water

50-60

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Low Foaming Automatic Dishwasher Rinse Aid

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	Component	Typical Amount	Exemplary
	<u>(wt.%)</u>	<u>(wt.%)</u>	<u>Amount</u> <u>(wt.%)</u>
5	Poly(ethoxy) - poly(propoxy) block copolymer	15-35	25
	HPHP Glycol	15-40	30
	Water	35-70	45

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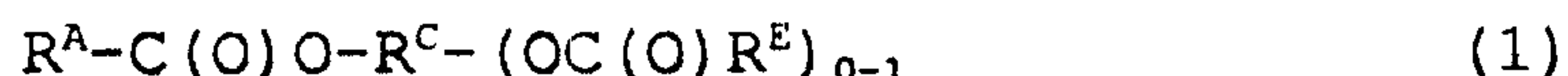
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THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A stable monophasic liquid composition characterized by the ability to solubilize increased amounts of surfactant into said composition while retaining a monophasic state, which composition is useful as a dispersant of hydrophobic material and comprising water; one or more cationic surfactants, said surfactant present in a concentration of from more than 10 wt% to 50 wt%; and at least 0.1 to 50% by weight of a coupling agent having the structural formula (1);



where R^A is straight, cyclic or branched alkyl containing 1-14 carbon atoms or straight or branched alkyl containing 1-14 carbon atoms substituted with 1 to 3 hydroxyl groups; R^C is straight, cyclic or branched alkyl containing 1 to 14 carbon atoms or straight, cyclic or branched alkyl containing 1 to 14 carbon atoms substituted with 1 to 3 hydroxyl groups; and R^E is straight, cyclic or branched alkyl containing 1 to 14 carbon atoms or straight, cyclic or branched alkyl containing 1 to 14 carbon atoms substituted with a hydroxyl group, with the proviso that the coupling agent contains 7 to 16 carbon atoms and includes 1 to 3 hydroxyl groups.

2. A composition in accordance with claim 1, wherein R^A is straight, cyclic or branched alkyl containing 1 to 10 carbon atoms or straight, cyclic or branched alkyl substituted with 1 to 3 hydroxyl groups containing 1 to 10 carbon atoms.

3. A composition in accordance with claim 1 or 2, wherein R^A is straight, cyclic or branched alkyl containing 1 to 6 carbon atoms or straight, cyclic or branched alkyl substituted with 1 to 3 hydroxyl groups containing 1 to 6 carbon atoms.

4. A composition in accordance with any one of claims 1 to 3, wherein R^c is a residue of 2,2,4-trimethyl-1,3-pentane diol, 2-ethylhexane-1,3-diol, 2-butyl-2-ethyl-1,3-propane diol, 2,2-dimethyl-1,3-propane diol, glycerol or ethylene glycol.

5. A composition in accordance with any one of claims 1 to 4, wherein R^c is a residue of 2,2,4-trimethyl-1,3-pentane diol.

6. A composition according to any one of claims 1 to 5 comprising 2,2,4-trimethyl-1,3-pentane diol isobutyrate monoester or diester.

7. A composition in accordance with any one of claims 1 to 5, wherein said coupling agent is hydroxypivalyl hydroxypivalate.

8. A composition according to any one of claims 1 to 5, comprising a glyceryl monoester of hexanoic acid or of butanoic acid.

9. A composition in accordance with any one of claims 1 to 5, wherein said coupling agent is a hydroxypivalate monoester of 2,2,4-trimethyl-1,3-pentane diol.

10. A composition in accordance with any one of claims 1 to 5, wherein said coupling agent is a hydroxypivalate monoester of glycerol.

11. A composition in accordance with any one of claims 1 to 5, wherein said coupling agent is a hydroxypivalate monoester of ethylene glycol.

12. A composition in accordance with any one of claims 1 to 11, further comprising a compound of the formula (2)

to 11, further comprising a compound of the formula (2)



wherein R^{T} is saturated, straight, branched or cyclic alkylene containing 4 to 12 carbon atoms, and each X is ethylene, straight or branched propylene, or straight or branched butylene;

x is 0 to 40;

each Y is ethylene, straight or branched propylene, or straight or branched butylene;

y is 0 to 40;

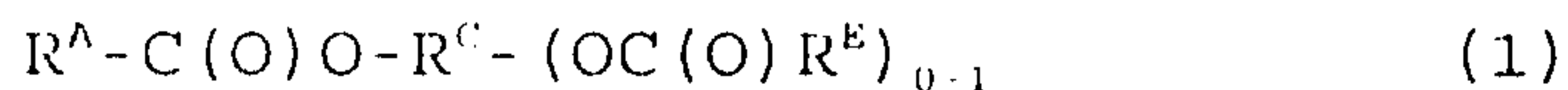
the sum of (x+y) is 0 to 40.

13. A composition in accordance with claim 12 containing at least one compound of formula (2) wherein the sum of (x+y) is 1-10.

14. A composition in accordance with claim 12 containing at least one of 2,2,4-trimethyl-1,3-pentane diol and 2-ethylhexyl-1,3-diol.

15. A composition in accordance with any one of claims 12 to 14, comprising one compound of formula (2) wherein R^{T} is the residue of 2,2,4-trimethyl pentane-1,3-diol, and the sum of (x+y) is 1-10.

16. A process for solubilizing into water one or more surfactants selected from the group consisting of anionic surfactants, amphoteric surfactants, cationic surfactants, nonionic surfactants, and mixtures thereof comprising combining into one monophasic composition water, said one or more surfactant, and one or more coupling agents selected from the group consisting of compounds of formula (1)



and mixtures thereof, wherein R^A is straight, cyclic or branched alkyl containing 1-14 carbon atoms, and R^A is optionally substituted with 1 to 3 hydroxyl groups; and wherein R^C is straight, cyclic or branched alkyl containing 1 to 10 carbon atoms which is optionally substituted with up to 3 hydroxyl groups, and R^C can optionally be substituted with a group of the structure $-OC(O)-R^E$ wherein R^E is straight, cyclic or branched alkyl containing 1 to 14 carbon atoms which is optionally substituted with a hydroxyl group, wherein said compounds of formula (1) contain 7 to 16 carbon atoms and are substituted with a total of 1 to 3 hydroxyl groups, in an amount of said coupling agent effective to increase the amount of said one or more surfactants that can be solubilized in said composition.

17. A process in accordance with claim 16 containing a compound according to formula (1) wherein R^A contains 1 to 10 carbon atoms.

18. A process in accordance with claim 16 or 17 containing a compound according to formula (1) wherein R^A contains 1 to 6 carbon atoms.

19. A process in accordance with any one of claims 16 to 18, wherein R^C is a residue of 2,2,4-trimethyl-1,3-pentane diol, 2-ethylhexane-1,3-diol, 2-butyl-2-ethyl-1,3-propane diol, 2,2-dimethyl-1,3-propane diol, glycerol or ethylene glycol.

20. A process in accordance with any one of claims 16 to 19, wherein R^C is a residue of 2,2,4-trimethyl-1,3-pentane diol.

21. A process according to any one of claims 16 to 20, comprising 2,2,4-trimethyl-1,3-pentane diol isobutyrate monoester or diester.

22. A process according to any one of claims 16 to 20, comprising hydroxypivalyl hydroxypivalate.

23. A process according to any one of claims 16 to 20, comprising a glyceryl monoester of hexanoic acid or of butanoic acid.

24. A process according to any one of claims 16 to 20, comprising a hydroxypivalate monoester of 2,2,4-trimethyl-1,3-pentane diol.

25. A process according to any one of claims 16 to 20, comprising a hydroxypivalate monoester of glycerol.

26. A process according to any one of claims 16 to 20, comprising a hydroxypivalate monoester of ethylene glycol.

27. A process in accordance with any one of claims 16 to 26, further comprising a compound of the formula (2)



wherein R^T is saturated, straight, branched or cyclic alkylene containing 4 to 12 carbon atoms, and each X is ethylene, straight or branched propylene, or straight or branched butylene;

x is 0 to 40;

each Y is ethylene, straight or branched propylene, or straight or branched butylene;

y is 0 to 40;

the sum of (x+y) is 0 to 40.

28. A process in accordance with claim 27 containing at least one compound of formula (2) wherein the sum of (x+y) is 1-10.

29. A process in accordance with claim 27 or 28 containing at least one of 2,2,4-trimethyl-1,3-pentane diol and 2-ethylhexyl-1,3-diol.

30. A process in accordance with any one of claims 27 to 29 containing at least one compound of formula (2) wherein R is the residue of 2,2,4-trimethyl pentane-1,3-diol, and the sum of (x+y) is 1-10.