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LIQUID DETERGENT

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This invention relates to liquid detergents and more particularly to substantially clear, homogeneous aqueous compositions of high concentration for home laundering and general cleaning use.

The essential active ingredients in these aqueous detergents are surfactants and salts of aminocarboxylic acids.

The liquid detergent composition of this invention offers several advantages over the granular detergent compositions, such as, to name a few, freedom from dust, ease of measuring the proper amount for optimum performance, pre-treating of heavily soiled items by spotting them with the undiluted product before placing these items in the washing machine and a soft feel imparted to laundered cotton goods.

Prior art liquid detergents utilized large quantities of inorganic phosphate builders. The preparation of such products was relatively difficult; sometimes large quantities of hydrotropes were required to produce stable compositions and the amount and type of surfactant was often dictated by limited compatibility of surfactant and phosphate builder.

It is an object of this invention to provide an effective liquid detergent utilizing organic builders or sequestrants in relatively smaller amounts. The detergent compositions of this invention are stable products at room temperature, exhibiting high detergency with moderate to little sudsing in automatic washing machines. Most of the components making up this invention are supplied in liquid form facilitating the manufacture of the end product by requiring only conventional mixing equipment.

The detergents of this invention generally comprise aqueous compositions containing by weight:

A. 4–15% of an alkali metal salt of an aminocarboxylic acid or a mixture of two salts of such acids.

B. 5–15% of a nonionic surfactant of the type of an alkyl aryl polyether alcohol.

C. 1–10% of a phosphate ester modified by the addition of alkylene oxides.

D. 2–8% of a fatty acid-alkanolamine condensate.

The remainder of the composition is water which may include such optional constituents as optical brighteners, dyes, and perfumes and the like as is known in the art.

In compositions wherein the concentration of active ingredients exceeds about 20% by weight, it is necessary to include as a solubilizing agent from 1 to 10% by weight of an alkali metal salt of a short chain alkyl aryl sulfonic acid to yield homogeneous, stable compositions.

The compositions as prepared have a pH of about 8 and it is desirable to add alkali to adjust the pH in range of 10 to 11.

Suitable materials utilizable as component A include the alkali metal salts of ethylenediamine tetra acetic acid such as trisodium ethylenediamine tetraacetate, trisodium hydroxyethyl ethylenediamine triacetate, penta sodium diethylenetriamine pentaacetate and the like. Suitable materials also are the alkali metal salts of nitrilotriacetic acid such as the mono, di or trisodium or potassium salts. Mixtures of two or more aminocarboxylates may be used. The materials may be utilized in the form of powders or, more conveniently, as aqueous solutions.

As component B one may use the nonionic alkyl aryl polyether alcohols such as tertiary octyl phenoxy polyethoxy ethanol containing 6–20 ethylene oxide units per mole, or nonylphenoxy polyethoxy ethanol containing

from 6–20 ethylene oxide units per molecule. These materials are supplied as essentially 100% active liquids.

Suitable materials useable as component C include p-nonylphenol condensed with 5–20 moles ethylene oxide which is then esterified with orthophosphoric acid. Additional phosphate esters include those based on tridecyl alcohol condensed with 5–20 moles of ethylene oxide, as well as those based on C_8 to C_{20} alkylphenols condensed with ethylene oxide. They may be used in the form of the free acid or as the alkali metal salt. These materials are supplied as essentially 100% active liquids.

Component D is a so called Kritchevsky condensate of a C_{12} to C_{16} fatty acid with ethanolamine, propanolamine, diethanolamine and the like. They are mixtures of alkanolamides with alkanolamine soaps of fatty acids and are substantially 100% active liquids.

For more concentrated compositions requiring the use of a solubilizing agent or hydrotrope, the sodium or potassium salts of xylene sulfonic acid, toluene sulfonic acid or benzene sulfonic acid may be used.

The alkali for adjusting the pH may be potassium hydroxide, sodium hydroxide, ammonia or amines. Usually about 0.5% by weight is required.

Suitable optical brighteners which may be optionally included are the well known stilbene derivatives, such as 4,4'-dibenzoyl diamino stilbene - 2,2' - disulfonic acid. They are usually employed in the range of 0.1 to 0.5% by weight.

A preferred procedure for mixing the ingredients is as follows:

To the required amount of water is added the optical brightener, if any, and dispersed with agitation. Then about one-fourth of component A is added with agitation following in succession by the solubilizing agent, if any, and components B, C, and D. Then the remaining three-fourths of component A are added and the composition neutralized and the pH adjusted to pH 10–11 by the addition of alkali. The end product may be dyed and perfumed as desired. The resulting product is a clear liquid, stable at room temperature, only moderately viscous and highly concentrated. The product is economical to use; two to three liquid ounces are a sufficient amount for a top loading automatic washing machine of 12–14 gallons water capacity.

The following examples illustrate the practice of the invention, in which all parts are by weight. Compositions were prepared consisting of the following:

	Components on percent active basis by weight							
Examples	I	II	III	IV	V	VI	VII	VIII
t-Octyl phenoxy polyethoxy ethanol (12–13 units)	12	12	12	15	15	7	9	7
Coconut fatty acid-ethanolamine Kritchevsky condensate	7	7	7	4	------	4	8	4
Tridecyl phosphate ester modified with Ethylene oxide (10 moles)	5	5	5	5	7	3	3	3
Sodium xylene sulfonate	5	5	5	5	5	------	4	3
Trisodium hydroxyethyl ethylenediamine triacetate	2.05	------	------	2	------	1	1	------
Tetrasodium ethylenediamine tetraacetate	------	10	------	------	------	------	------	15
Trisodium nitrilotriacetate	7.5	------	10	5	10	3.75	6	------
Optical brightener	0.15	0.2	0.2	0.15	0.15	0.15	------	0.3
Water to percent	100	100	100	100	100	100	100	100

In the above examples, the pH was adjusted to about pH 10.5 with potassium hydroxide. The optical brightener in the examples was 4,4'-dibenzoyl diamino stilbene-2,2'-disulfonic acid.

Compositions I, II, and III are highly concentrated formulations with moderate sudsing. Compositions IV and V are highly concentrated, but little sudsing. Compositions VI, VII, and VIII are more diluted compositions, but excellent detergents.

Example IX

The following composition was prepared:

	Parts
p-Nonyl phenoxy polyethoxy ethanol (14 ethoxy units)	12
Lauric acid-diethanolamine condensate	5
p-Nonyl phenol phosphate-ethylene oxide condensate (10 mols ethylene oxide)	5
Sodium toluene sulfonate	5
Tetrasodium ethylenediamine tetraacetate	2
Trisodium nitrilotriacetate	8
Water to 100.	

The above was a clear, heavy duty, moderately sudsing laundry detergent.

While the invention has been described in terms of certain examples, they are to be considered illustrative rather than limiting, and it is intended to cover all further embodiments and modifications apparent to those skilled in the art that fall within the spirit of the claims.

I claim:

1. A substantially clear, homogeneous liquid detergent consisting of about 1 to 5% by weight of trisodium hydroxyethyl ethylenediamine triacetate, about 1 to 10% by weight of sodium xylene sulfonate, about 5 to 15% by weight of octyl phenol condensed with 12 to 13 moles of ethylene oxide, per mole of phenol about 1 to 10% by weight of the phosphate ester of tridecyl alcohol-ethylene oxide condensate, having 5 to 20 ethoxy groups per mole of alcohol about 2 to 8% by weight of coconut fatty acid-diethanolamine condensate, about 4 to 10% by weight of trisodium nitrilotriacetate and the remainder water.

2. A substantially clear, homogeneous liquid detergent consisting of about 2.05% by weight of trisodium hydroxyethyl ethylenediamine triacetate, about 5% by weight of sodium xylene sulfonate, about 12% by weight of octyl phenol condensed with 12 to 13 moles of ethylene oxide, per mole of phenol about 5% by weight of the phosphate ester of tridecyl alcohol-ethylene oxide condensate, having 5 to 20 ethoxy groups per mole of alcohol about 7% by weight of coconut fatty acid-diethanolamine condensate, about 7.5% by weight of trisodium nitrilotriacetate, and the remainder water.

3. A substantially clear, homogeneous liquid detergent consisting of about 5 to 15% by weight of an alkylphenol-ethylene oxide condensate having 6 to 20 ethoxy groups per mole of phenol and the alkyl group having 8 to 9 carbon atoms nonionic detergent, about 1 to 10% by weight of a long chain alcohol-ethylene oxide condensate having 5 to 20 ethoxy groups per mole of alcohol esterified with phosphoric acid, said long chain alcohol being selected from the group consisting of tridecyl alcohol and alkyl phenols having 8 to 20 carbon atoms in the alkyl group, about 2 to 8% by weight of a fatty acid-alkanolamine condensate, the fatty acid having 12 to 16 carbon atoms and the alkanolamine being selected from the group consisting of ethanolamine, diethanolamine and propanolamine, about 4 to 15% of an alkali metal salt of an aminopolyacetic acid selected from the group consisting of nitrilotriacetic acid, ethylenediamine tetraacetic acid, hydroxyethyl ethyldiamine triacetic acid, and diethylenetriamine pentaacetic acid and the remainder water.

4. A detergent composition set forth in claim 3 including about 1 to 10% by weight of a solubilizing agent selected from the group consisting alkali metal salts of toluene sulfonic acid and alkali metal salts of xylene sulfonic acid.

5. A detergent composition set forth in claim 3 where the nonionic detergent is tert.-octylphenoxy polyethoxy ethanol with from 6 to 20 moles of ethylene oxide per mole of phenol.

6. A detergent composition set forth in claim 3 where the nonionic detergent is nonylphenoxy polyethoxy ethanol with from 6 to 20 moles of ethylene oxide per mole of phenol.

7. A detergent composition set forth in claim 3 where the salt of the aminocarboxylic acid is sodium ethylenediamine tetraacetate.

8. A detergent composition set forth in claim 3 where the salt of the aminocarboxylic acid is sodium nitrilotriacetate.

9. A substantially clear, homogeneous liquid detergent consisting essentially of about 12% by weight p-nonyl phenoxy polyethoxy ethanol having 14 ethoxy units per mole of phenol, about 5% by weight of lauric acid-diethanolamine condensate, about 5% by weight of the phosphate ester of p-nonyl phenol condensed with 10 moles of ethylene oxide per mole of phenol, about 5% by weight of sodium toluene sulfonate, about 2% by weight of tetrasodium ethylene diamine tetraacetate, about 8% by weight of trisodium nitrilotriacetate, and remainder water.

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