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54 **Built liquid detergents.**

57 Heavy duty liquid detergent compositions comprising a mixture of citrate and succinate builders provide excellent detergency performance without undue fabric build-up of precipitated salts.

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BUILT LIQUID DETERGENTS

Technical Field

The subject matter of this invention relates to liquid laundry detergent compositions which contain alkyl-or alkenyl-succinates, in combination with citrates, as detergency builder ingredients.

Background

The patent literature describes the use of alkyl- and alkenyl-succinates as surfactants: US 2.283.214; detergency boosters UK 1.293.753; in various liquid cleaners UK 1.528.171, US 4.277.378; builders US 2.462.758 and the like. See also US 3.784.486.

UK 1.293.753 describes solid laundry detergent compositions preferably comprising 20 % to 40 % of such succinates as builders.

A variety of substituted succinates and "sulfur-succinates" are described for various similar uses; US 3.912.663, US 4.152.515 and US 3.725.286.

The use of various succinates in combination with certain detergency ingredients is also known; see EPO 79191 and EPO 70190, as well as German 32 05 791 and German 33 17 337.

Indeed, the use of carboxylate materials of various types in solid and liquid cleaners is well-known; see UK 1.514.276 for amine soap mixtures; UK 1.429.143 for zeolite/polycarboxylate mixtures; US 2.264.103 for citrate and other carboxylate plus soap mixtures; US 3.634.392 for polysaccharidic carboxylate detergency builders; US 3.898.187 for various sulfur-succinates in dishwashing detergents; and UK 1.400.898 for use with clay softeners.

It has now been discovered that the formulation of homogeneous liquid detergents containing alkyl- or alkenyl-succinates is fraught with difficulty. Formulations containing above about 17.5 % of the succinate are unstable, or can only be stabilized by decreasing the level of deterative surfactant. Too low a surfactant level, or surfactants of the wrong kind, can give problems with the formulations' greasy stain removal performance. Moreover, too much of the succinate in such formulations can result in excessive deposition of the succinate builder onto fabric surfaces.

It is a major object and advantage of the present invention that superior overall product performance is achieved from a liquid detergent product by the proper, and heretofore unrecognized, combination of various known alkyl-and alkenyl

succinate builders with citrate builders and surfactants, all properly balanced to achieve the desired cleaning function without excessive fabric build-up.

SUMMARY OF THE INVENTION

The present invention relates to homogeneous detergent compositions designed especially for laundering fabrics. Said compositions are commonly referred to as "heavy-duty liquids" or "HDL's", since they are designed to remove even the "heaviest" soil loads from fabrics when used in a conventional laundering operation.

The compositions herein comprise fluid carrier medium, a deterative surfactant or mixtures of deterative surfactants, and optionally, deterative enzymes and other conventional deterative ingredients, characterized in that said compositions contain:

a) from 6 % to 12 % by weight of an anionic deterative surfactant;

b) from 2 % to 6% by weight of a citrate detergency builder; and

c) from 8% to 13 % by weight of an alkyl or alkenyl succinate detergency builder selected from the C₁₀-C₁₆ alkyl or alkenyl succinates. Preferred compositions are those wherein the citrate builder and the succinate builder, together, comprise no more than 16 % by weight of the composition. The compositions are formulated at a pH range of 7.0 - 9.0, preferably 7.3 -8.6.

In a method aspect, the invention comprises a method for laundering fabrics by agitating said fabrics in a aqueous laundering liquor, said liquor containing at least 0.05 % by weight of a composition of the foregoing type.

All percentages, ratios or proportions of ingredients disclosed herein are by weight, unless otherwise specified.

DETAILED DESCRIPTION OF THE INVENTION

The essential components of the present compositions are the alkyl-or alkenyl-succinate, the citrate builder, and the deterative surfactant. The optional deterative adjunct ingredients, as well as the fluid carrier medium, etc., are all well-known to workers in this field.

Succinate Builder : The preferred builders herein are of the general formula R-CH(COOH)CH₂-(COOH), i.e., derivatives of succinic acid, wherein R is C₁₀-C₁₆ alkyl or alkenyl, preferably C₁₂-C₁₆.

These succinate builders are preferably used in the form of their water-soluble salts, including the sodium, potassium, ammonium and alkanolammonium salts (e.g., mono-, di-, or tri-ethanolammonium).

Specific examples of succinate builders include: lauryl succinate, myristyl succinate, palmityl succinate, 2-dodecenyl succinate (preferred), 2-tetradecenyl succinate, and the like.

Citrate Builder : The citrate builder employed in the practice of this invention includes any water-soluble salt of citric acid. Such salts include, for example, sodium, potassium, ammonium or alkanolammonium salts, as in the case of the succinate builders already described. As will be seen hereinafter, the citrate builders are unique in their ability to prevent undue fabric build-up by the succinate builders.

In this regard, a highly preferred HDL composition herein comprises a mixture of 3.7 % citrate - (specified as citric acid) and 10.4 % 2-dodecenyl succinate as the builder, and is formulated at a pH range of 7.3 to 8.6.

Deterative Surfactants -The detergent compositions of this invention will contain organic surface-active agents ("surfactants") to provide the cleaning benefits associated with the use of such materials.

As noted hereinabove, it is difficult to formulate a stable, homogeneous HDL which contains an effective amount of deterative surfactant. Importantly, however, it is highly desirable for the HDL's to contain at least 5 % , preferably 7 % to 12 % of an anionic surfactant to give true "heavy-duty" laundering performance on a wide spectrum of soils and stains.

Anionic deterative surfactants useful herein include the well-known synthetic alkyl benzene sulfonates (which are highly preferred in the present HDL's) alkyl-and alkylether sulfates, paraffin sulfonates, olefin sulfonates, alpha-sulfonates of fatty acids and of fatty acid esters, and the like, which are well-known from the detergency art. In general, such deterative surfactants contain an alkyl group in the C_8 - C_{18} range; the anionic deterative surfactants can be used in the form of their sodium, potassium, ammonium or alkanolammonium salts. Standard texts such as the McCutcheon's Index contain detailed listings of such typical deterative surfactants. While the C_{10} - C_{14} alkyl benzene sulfonates are especially preferred herein, the C_{12} - C_{18} paraffin-sulfonates and C_{11} - C_{18} alkyl sulfates may also be used in HDL compositions of the present type.

Highly preferred HDL compositions comprising anionic deterative surfactants typically contain :

a) from 7 % to 12 % by weight of a C_{10} - C_{14} alkyl benzene sulfonate anionic deterative surfactant;

b) from 2 % to 6 % by weight of a citrate detergency builder; and

c) from 8 % to 13 % by weight of an alkyl or alkenyl succinate detergency builder selected from the salts of C_{10} - C_{18} alkyl or alkenyl succinates, especially 2-dodecenyl succinate, said composition having a pH of 7.3 to 8.6.

In order to enhance the detergency performance of the HDL's of this invention, it is preferred that they also contain a nonionic surfactant of the ethoxylated alcohol type, especially the C_{10} - C_{18} alcohols ethoxylated with 4 to 7 EO groups. Such compositions comprise, besides the mixture of succinate and citrate builders noted, from 7 % to 12 % of the anionic (especially alkyl benzene sulfonate) deterative surfactant and from 10 % to 20 % of the aforesaid ethoxylated alcohol nonionic surfactant. As before, such compositions with mixed anionic/nonionic surfactants are formulated at pH 7.0 -9.0, preferably 7.3 -8.6. Most preferably, the composition contains no more than 16 % of the citrate/succinate builder, as noted above.

Fluid Carrier Medium -The fluid carrier for the present composition can comprise water; mixtures of water-ethanol; water-glycol mixtures, and the like, all well-known to formulators of HDL's. Typically and HDL will comprise 20 % to 40 % fluid carrier, said carrier comprising 80 % water, and 20 % ethanol.

Deterative Adjuncts -The compositions herein can contain other ingredients which aid in their cleaning performance. For example, it is highly preferred that the laundry compositions herein also contain enzymes to enhance their through-the-wash cleaning performance on a variety of soils and stains. Amylase and protease enzymes suitable for use in detergents are well-known in the art and in commercially available liquid detergents. Commercial deterative enzymes (preferably a mixture of amylase and protease) are typically used at levels of 0.001 % to 2 %, and higher, in the present compositions.

Moreover, the compositions herein can contain, in addition to ingredients already mentioned, various other optional ingredients typically used in commercial products to provide aesthetic or additional product performance benefits. Typical ingredients include pH regulants, perfumes, dyes, optical brighteners, soil suspending agents, hydrotropes and gel-control agents, freeze-thaw stabilizers, bactericides, preservatives, suds control agents, and the like.

In a through-the-wash laundry mode, the compositions are typically used at a concentration of at least 500 ppm, preferably 0.10 % to 2.5 %, in an aqueous laundry bath a pH 7-11 to launder fabrics.

The laundering can be carried out by agitating fabrics with the present compositions over the range from 5°C to the boil, with excellent results.

INDUSTRIAL APPLICATION

The following example is typical of the preferred compositions of this invention, but is not intended to limit the scope of the invention.

EXAMPLE I

A preferred HDL is as follows:

<u>Ingredient</u>	<u>Percent (Wt)</u>
2-Dodecenyl Succinate	10.4
Citric Acid	3.70
Soil Release Polymer *	0.50
Diethylentriamine Penta(methylenephosphonate	0.8
CaCL ₂	0.01
Formate (Na)	0.9
Triethanolamine	6.00
NaOH	5.6
Ethanol	6.0
C ₁₂ Alkyl Benzene Sulfonate	8.0
Coconutalkyl Sulfate	2.5
Ethoxylated C ₁₃₋₁₅ Alcohol (EO5)	17.0
Oleic Acid	3.7
Enzymes	0.15
Water and Minors	to 100
Product pH	7.6 - 7.7

* Prepared by esterifying 1,4 phtalic acid (chloride) with 1,2-propane diol and ethoxylating the polymer with ethylene oxide. The resulting polymer mix is fractionated in cold (15°C) ethanol to provide a cold-ethanol soluble fraction with an average ethoxylation value in the range from 12-43.

Claims

1. A homogeneous liquid detergent composition comprising a fluid carrier medium, a deterative surfactants or mixtures of deterative surfactants, and

optionally, deterative enzymes and other conventional deterative ingredients, characterized in that said composition contains :

- a) from 7 % to 12 % by weight of an anionic deterative surfactant ;
- b) from 2 % to 6 % by weight of a citrate detergency builder; and

c) from 8 % to 13 % by weight of an alkyl or alkenyl succinate detergency builder selected from the C_{10} - C_{18} alkyl or alkenyl succinates.

2. A composition accordig to claim 1 wherein the citrate builder and the succinate builder, together, comprise no more than 16 % by weight of the composition.

3. A composition according to claim 2 wherein the citrate and succinate builders are in the form of their sodium, potassium, ammonium or mono-, di- or tri-ethanolammonium salts, or mixtures thereof.

4. A composition according to claim 3 which is formulated at pH 7.0 -9.0.

5. A composition according to claim 4 which is formulated at pH 7.3 -8.6.

6. A homogeneous liquid detergent composition according to claim 1 comprising :

a) from 7 % to 12 % by weight of a C_{10} - C_{14} alkyl benzene sulfonate anionic deterative surfactant ;

b) from 2 % to 6 % by weight of a citrate detergency builder; and

c) from 8 % to 13 % by weight of an alkyl or alkenyl succinate detergency builder selected from the salts of C_{10} - C_{18} alkyl or alkenyl succinates, said composition having a pH of 7.3 to 8.6.

7. A composition according to claim 6 which contains a mixture of citrate and 2-dodecenyl succinate as the builder

8. A homogeneous liquid detergent composition according to claim 1 characterized in that said composition contains a mixture of deterative surfactants comprising

a) from 7 % to 12 % by weight of an alkyl benzene anionic deterative surfactant ; and

b) from 10 % to 20 % of an ethoxylated alcohol nonionic surfactant which is a C_{10} - C_{15} alcohol ethoxylated with 4 to 7 ethoxyl groups.

9. A composition according to claim 8 wherein the citrate and succinate builders are in the form of their sodium, potassium, ammonium or mono-, di-, or tri-ethanolammonium salts, or mixtures thereof, and, together, comprise no more than 16 % of the composition.

10 A composition according to claim 9 which is formulated at pH 7.3 -8.6.

11 A composition according to claim 10 which comprises a mixture of 3.7 % citrate and 10.4 % 2-dodecenyl succinate as the builder.

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