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3,513,099

LAS DETERGENTS CONTAINING PRIMARY AND SECONDARY ALKOXY ALKANOL AMMONIUM SULFATES

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7 Claims

ABSTRACT OF THE DISCLOSURE

Use of a mixture of primary and secondary alkoxy alkanol ammonium sulfates, e.g. primary and secondary ammonium linear tridecoxy diethoxy ethanol sulfate in weight ratios of 2:1 to 1:2 in combination with LAS detergent such as sodium linear dodecylbenzene sulfonate in a weight ratio of 0.2 to 1 sulfate to sulfonate rather than either of the sulfates alone in an aqueous vehicle affords lowered cloud point, improved viscosity characteristic and adequate deterative strength at lower cost through elimination of superadded alcoholic solvent.

This invention is concerned with improved liquid detergent compositions, specifically of the type employing a primary detergent selected from the ammonium and alkali metal salts of an alkyl benzene sulfonate and as secondary detergent an alkoxy alkanol ammonium sulfate.

Deterative materials vary in their ability to clean in different hardnesses of water. Accordingly two detergents are often employed in a single product to provide a broader tolerance for varying water hardness conditions. One such mixture is that employing the ammonium or alkali metal salts of alkyl benzene sulfonates and an alkoxy alkanol ammonium sulfate.

Two types of alkoxy alkanol ammonium sulfates are available. One, herein termed "primary" is characterized by etherification at a primary carbon atom. Such sulfates are characterized by inhomogeneity, i.e. cloud point at or below ordinarily encountered storage temperatures, in aqueous alcohol solution. Moreover primary alkoxy alkanol ammonium sulfates mixed with a primary detergent comprising an alkyl benzene sulfonate salt provides a viscosity in the product obtained that is too great for commercial acceptability and which must be overcome at further expense by the addition of a compatible liquid such as ethanol.

Secondary alkoxy alkanol ammonium sulfates are also available. While these products are generally inferior in deterative strength, they offer considerably lower cloud point in aqueous alcohol solutions. Mixtures of the secondary alcohol sulfates and alkyl benzene sulfonate salt in the proportions typically employed in detergent formulation are higher in cloud point than the sulfate alone and provide a final product which is so low in viscosity as to appear watery and runny to the consumer.

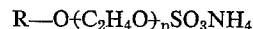
It is an object of the invention to provide a detergent formulation effective in a wide range of water hardness conditions and improved in cloud point and viscosity characteristics and which is lower in cost as well.

Surprisingly, it has been found that although the primary alcohol sulfate alone is inferior in its cloud point behavior, the addition of a primary alkoxy alkanol ammonium sulfate to a detergent composition including a secondary alkoxy alkanol ammonium sulfate improves the cloud point characteristic of the final product. Moreover, the resulting formulation has viscosity characteristics which are optimum for a consumer product without

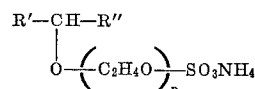
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the need for dilution with expensive solvents, such as ethanol.

Accordingly, the invention contemplates a liquid detergent composition consisting essentially of a detergent selected from the ammonium and alkali metal salts of alkyl benzene sulfonates, in which the alkyl group is essentially linear and contains from 8 to 20 carbon atoms; and, per part of the sulfonate, from 0.2 to 1 part of a mixture of a primary alkoxy alkanol ammonium sulfate having a structural formula



wherein R is a higher alkyl group and n is an integer of at least 2; and a secondary alkoxy alkanol ammonium sulfate having the structural formula



wherein R' and R'' are each alkyl groups which together contain at least 9 carbon atoms and p is an integer of at least 2; the ratio of said primary to said secondary alkoxy alkanol ammonium sulfate being in the range of 2:1 to 1:2 by weight, in an aqueous vehicle.

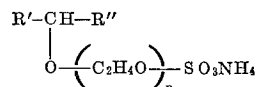
The primary detergent in the present invention is a member of the well-known class consisting of ammonium and alkali metal salts of alkyl benzene sulfonates, e.g. the sodium, potassium and lithium salts of alkyl benzene sulfonate. The alkyl group is essentially linear, i.e. no more than one branch methyl groups, to render the detergent biodegradable and contains from 8 to 20 carbon atoms and may specifically be a caprylyl, pelargonyl, capryl, undecanyl, lauryl, tridecanyl, myristyl, pentadecanyl, palmityl, margaryl, stearyl, nonadecanyl or eicosyl group.

The primary alkoxy alkanol ammonium sulfate herein has the structural formula



wherein R is a higher alkyl group, e.g. containing from 10 to 18 carbon atoms such as a capryl, undecanyl, lauryl, tridecanyl, myristyl, pentadecanyl, palmityl, margaryl, or stearyl group and n is an integer from 2 to 6 inclusive.

The secondary alkoxy alkanol ammonium sulfate herein has the structural formula



wherein R' and R'' are each essentially linear alkyl groups and together contain, e.g. from 9 to 17 carbon atoms such as methyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, caprylyl and pelargonyl, capryl, undecanyl, lauryl, tridecanyl, myristyl, pentadecanyl and palmityl groups and p is an integer from 2 to 6 inclusive.

The invention is illustrated by the following three formulations constituted as follows:

Ingredient	Example	Control I	Control II
Sodium linear dodecylbenzene sulfonate	18.0	18.0	18.0
Ammonium linear primary tridecoxy diethoxy ethanol sulfate	6.5-3.5	10.0	-----
Ammonium linear secondary tridecoxy diethoxy ethanol sulfate	3.5-6.5	-----	10.0
Diethanolamide of lauric acid	5.0	5.0	5.0
Sodium xylene sulfonate	4.0	4.0	4.0
Water and other additives	q.s.	q.s.	q.s.
Cloud Point (° F.)	40	35	80

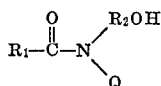
The Control I had a too high viscosity for a consumer product but was satisfactory in terms of soil tolerance and freeze-thaw stability. Control II, on the other hand, had a too low viscosity, poor freeze-thaw stability and a

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reduced tolerance for soil. The example was superior in that it had excellent freeze-thaw stability and ideal commercial product viscosity and a soil tolerance equivalent to that of the Control I. It will be noted that the cloud point of the formulation of the invention (example) is well within the practical range at 40° F., while the Control II cloud point at 80° F. is unsatisfactory. The addition of a primary alkoxy alkanol sulfate to the higher cloud point secondary alkoxy alkanol ammonium sulfate formulation surprisingly actually reduced cloud point temperature, in contrast to the effect of such addition in the absence of an alkyl benzene sulfonate salt.

The detergent formulation of the present invention desirably includes hydrotropes to facilitate homogeneity in the product. Suitable materials for this purpose include the lower alkyl benzene sulfonate salts formed with cations such as ammonium and alkali metals, e.g. sodium, potassium and lithium and ammonium salts of a methyl, ethyl, dimethyl, ethyl methyl or propyl benzene sulfonates. Water miscible alkanols such as methanol, ethanol and propanol are cosolvents and can also be employed as hydrotropes. Other these alkanols will be supplied in the commercial versions of the sulfate materials in that both primary and secondary alkoxy alkanol sulfates are supplied to 50 to 75% aqueous alcohol solution and most generally at a 55 to 65% concentration. The alcohol thus added is nonetheless insufficient to afford proper viscosity to the primary sulfate, sulfonate detergent mixture alone.

In certain highly commercial embodiments of the invention, foam builders are employed including the conventional materials, such as the lower mono- and dialkanolamides of fatty acids, e.g. those acids having from 8 to 20 carbon atoms whose radicals are listed above in describing the primary detergent material and particularly the ethanol and propanol amide derivatives of lauric and myristic acids. These alkanol amides have the general formula



wherein Q is H or R₃OH and R₁ is a higher alkyl group such as above named and containing from 11 to 21 carbon atoms and R₂ and R₃ are lower alkyl groups having from 2 to 3 carbon atoms inclusive. Amine oxides can also be used as foam building agents including those having the general formula



wherein R₄ is an alkyl group having from 8 to 20 carbon atoms such as are named above.

The quantity of foam builder used is that amount sufficient to impart the desired foaming properties to the final formulation. The proportion of hydrotrope is that amount sufficient to render homogeneity to the composition. Both foam builder and hydrotrope are typically employed in quantities of 1 to 10 parts per 100 parts of formulation, by weight.

The composition may also include other conventional additives such as perfumes, colorants, opacifiers and builders such as sodium tripolyphosphate and sodium pyrophosphate.

We claim:

1. Liquid detergent composition consisting essentially of

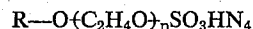
(A) a detergent selected from the ammonium and alkali metal salts of alkyl benzene sulfonates in

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which the alkyl group is essentially linear and contains from 8 to 20 carbon atoms; and per part of (A) from 0.2 to 1 part

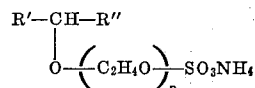
(B) of a mixture of:

(B-1) a primary alkoxy alkanol ammonium sulfate having the structural formula;



wherein R is a higher alkyl group of 10 to 18 carbon atoms and n is an integer from 2 to 6 inclusive; and

(B-2) a secondary alkoxy alkanol ammonium sulfate having the structural formula:



wherein R¹ and R⁴ are each essentially linear alkyl groups and together contain from 9 to 17 carbon atoms and p is an integer from 2 to 6 inclusive, the ratio of (B-1) and (B-2) being in the range of 2:1 to 1:2 by weight, in an aqueous vehicle.

2. Composition according to claim 1 including also an effective amount of a hydrotrope agent selected from the ammonium and alkali metal salts of a lower alkyl benzene sulfonate and water miscible monohydric alcohols.

3. Composition according to claim 1 including also an effective amount of a foam building agent selected from lower alkanolamides of 8 to 20 carbon atom fatty acids, and amine oxides having the formula



wherein R₄ is an alkyl group containing 8 to 20 carbon atoms.

4. Composition according to claim 1 in which said detergent is the sodium salt.

5. Composition according to claim 4 in which (B-1) is ammonium primary tridecoxy diethoxy ethanol sulfate and (B-2) is ammonium secondary tridecoxy diethoxy ethanol sulfate.

6. Composition according to claim 5 including also an effective amount of sodium lower alkyl benzene sulfonate in which said lower alkyl group has from 1 to 3 carbon atoms, as a hydrotrope.

7. Composition according to claim 6 including also an effective amount of lower alkanolamide of an 8 to 20 carbon atom fatty acid as a foam builder.

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MAYER WEINBLATT, Primary Examiner

U.S. Cl. X.R.

252-137, 138, 161; 260-458

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,513,099 Dated May 19, 1970

Inventor(s) Harvey B. Hans & Lyle J. Lofdahl

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, line 7; " HN_4 " should read -- NH_4 --

SIGNED AND
SEALED
NOV 24 1970

(SEAL)

Attest:

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