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[54] **DETERGENT COMPOSITION HAVING
SOFTENING PROPERTIES**
19 Claims, No Drawings

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ABSTRACT: Simultaneous cleansing and softening of fabrics is achieved by use of an aqueous solution of a mixture of synthetic organic noncationic detergent and an alkali metal salt of isostearic acid as the fabric wash water.

DETERGENT COMPOSITION HAVING SOFTENING PROPERTIES

BACKGROUND OF THE INVENTION

Field Of The Invention

Synthetic organic detergents have found widespread use as cleaning materials for fabrics of all fibers. Numerous of these materials, including the most popular so-called "heavy duty" detergents, which typically consist of an alkyl benzene sulfonate and a water soluble inorganic builder salt such as sodium tripolyphosphate, in aqueous wash solutions lend to fabrics a roughness or lack of "hand" which is commercially disadvantageous.

It has been proposed to add after washing, with the final rinse, a softening agent such as 1-methyl-1-alkylamidoethyl-2-alkylimidazolinium methosulfate. Since few automatic washing machines provide for automated introduction of this material, the housewife must stand by her "automatic" washer to add this softener product at the onset of the final rinse cycle. Toleration of this inconvenience merely illustrates the concern shown by consumers today for softness in washed fabrics.

SUMMARY OF THE INVENTION

It is a major objective of the present invention to obviate critical sequential addition of laundry products with their attendant time waste and possible improper execution. In addition, it is an object to provide a single package laundry product which both washes and softens, in the same wash water, by a single addition. It is a further object to provide a softening product packageable with synthetic organic detergent and substantive to fabric through a detergent washing operation.

It has now been discovered that softening characteristics may be imparted to synthetic organic detergents by intimately mixing therewith a C_{18} saturated fatty acid or a water soluble salt thereof having a methyl substituted tertiary atom. The intimate mixing may be accomplished by a codissolving the detergent and acid or salt in water and removing the water, e.g. in a conventional detergent spray drying apparatus.

There results from this preparation a detergent and fabric softening composition which consists essentially of a mixture of noncationic synthetic organic detergent and the aforescribed fatty acid or salt. Commercially available C_{18} acids may be employed including those in which there may be present up to 60 weight percent acids or salts other than methyl branched C_{18} e.g. C_{14} to C_{22} saturated fatty acids or their salts. For example, a commercial saturated fatty acid of the formula $C_{17}H_{35}COOH$ comprising a complex mixture of isomers, primarily of the methyl branched series that are mutually soluble and only difficultly separable may be used. The term C_{18} acid (or salt) is used herein to include such mixtures. Anionic detergents are preferred herein, particularly alkyl sulfate and alkyl sulfonate anionic detergents such as alkali metal tallow alcohol sulfates and dodecyl benzene sulfonates e.g. sodium salts of the corresponding acids, and mixtures of these detergents. Proportions are not particularly critical with weight ratios of detergent to acid in the range of 10:1 to 0.5:1 being suitable. Additives conventional in detergent formulation including, by way of illustration, builder salts, perfumes, optical brighteners, binders, et cetera, may also be employed.

The invention thus provides a method of softening fabrics during washing thereof with an aqueous washing solution of a synthetic organic detergent which includes introducing in the washing solution a C_{18} saturated fatty acid or water-soluble salt thereof having a methyl substituted tertiary carbon atom.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The essential components of the present inventive compositions are the synthetic organic detergent and the methyl branched C_{18} fatty acid or salt.

With respect to the sythetic organic detergent, useful materials are the nonionic, amphoteric or anionic i.e. noncationic detergents.

In general, suitable nonionic detergents include water-soluble nonionic polyalkylene oxide detergents such as are produced by the introduction of alkylene oxide group into an organic hydrophobic compound or group having an aliphatic or aromatic structure. The hydrophobic organic group generally contains at least eight carbon atoms and up to about 30 carbon atoms. Condensed with the hydrophobic group are at least five and preferably up to about 50 alkylene oxide groups. It is preferred to use the polyoxyethylene condensates derived from ethylene oxide. Among the nonionic detergents, it is preferred to use the polyalkylene oxide condensates of alkyl phenol, such as the polyoxyethylene ethers of alkyl phenols having a alkyl group of at least about six, and usually about eight to 12 carbons, and an ethylene oxide ratio (No. of moles per phenol) of about 7.5, 8.5, 11.5 and 20, through the number of ethylene oxide groups will be usually from about eight to 18. The alkyl substituent on the aromatic nucleus may be diisobutylene, diamyl, polymerized propylene, dimerized C_6-C_7 olefin, and the like.

Further suitable detergents are the polyoxyalkylene esters of organic acids, such as the higher fatty acids, rosin acids, tall oil acids, or acids from the oxidation of petroleum, et cetera. These polyglycol esters will contain usually from about 12 to about 30 moles of ethylene oxide or its equivalent and about eight to 22 carbons in the acyl group. Suitable products are refined tall oil condensed with 16 or 20 ethylene oxide groups, or similar polyglycol esters of lauric, stearic, oleic acids, etc.

Additional nonionic agents are the polyalkylene oxide condensates with higher fatty acid amides, such as the higher fatty acid primary amides, mono- and di-ethanolamides. Suitable agents are coconut fatty acid amide condensed with about 10 to 50 moles of ethylene oxide. The fatty acyl group will have similarly about eight to 22 carbons, and usually about 10 to 18 carbon atoms, in such products. The corresponding sulfonamides may be used also if desired.

Other suitable polyether nonionic detergents are the polyalkylene oxide ethers of higher aliphatic alcohols. Suitable fatty alcohols having a hydrophobic character, preferably eight to 22 carbons, are lauryl, myristyl, cetyl, stearyl and oleyl alcohols which may be condensed with an appropriate amount of ethylene oxide, such as at least about 6, and preferably about 10 to 30 moles. A typical product is oleyl alcohol condensed with about 12, 15 or 20 moles of ethylene oxide. The corresponding higher alkyl mercaptans or thioalcohols condensed with ethylene oxide are suitable in the present invention also. The water-soluble polyoxyethylene condensates with hydrophobic polyoxypropylene glycols may be employed also.

Further suitable nonionic detergents are the higher fatty acid alkanolamides, such as the monoethanolamides, diethanolamides and isopropanolamides wherein the acyl radical has about 10 to 14 carbon atoms and amine oxides. Examples are coconut (or equivalent lauric), capric and myristic diethanolamide, monoethanolamide and isopropanolamide, dodecyl dimethyl amine oxide and dimethyl acetoxalkylamine oxide where alkyl is $C_{11}-C_{14}$.

Other suitable synthetic detergents are the anionic aromatic detergents, e.g. water-soluble higher alkyl aryl sulfonate detergents particularly those having from eight to about 18 carbon atoms in the alkyl group. It is preferred to use the higher alkyl benzene sulfonate detergent for optimum effects, though other similar detergents having a mononuclear aryl nucleus, such as toluene, xylene, or phenol, may be used also. The higher alkyl substituent on the aromatic nucleus may be branched or straight-chained in structure, examples of such group being nonyl, dodecyl and pentadecyl groups derived from polymers of lower mono-olefins, decyl, keryl, and the like.

Illustrative of suitable aliphatic anionic detergents are the normal and secondary higher alkyl sulfate detergents, particu-

larly those having about eight to 18 carbons in the fatty alcohol residue, such as lauryl (or coconut fatty alcohol) sulfate and tallow alcohol sulfate. Other suitable detergents are the sulfuric acid esters of polyhydric alcohols incompletely esterified with higher fatty acids, e.g. oleic acid ester of isothionic acid; the higher fatty acid (e.g. coconut ethanolamide sulfate, the higher fatty acid amide of amino alkyl sulfonic acids, e.g. lauric acid amide of taurine; and the like.

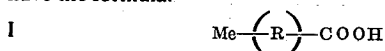
These sulfate and sulfonate detergents are used in the form of their water-soluble salts, such as the alkali metal and nitrogen-containing, e.g. lower alkylolamine, salts. Examples are the sodium, potassium, ammonium, isopropanolamine, mono- and tri-ethanolamine salts of said higher alkyl benzene sulfonate, higher alkyl sulfate and the like. In commercial practice, it is preferred to use the alkali metal salts.

Typical specific examples are:

the sodium salt of a sulfate ester of an alkylphenoxypoly (ethyleneoxy) ethanol, the ammonium salt of this sulfate ester, sodium methyl oleyl taurate, sodium alkyl naphthalene sulfonate, alkyl acyl sodium sulfonate, sodium tetrahydronaphthalene sulfonate, sodium alkyl aryl sulfonate, alkyl amido sulfate, cocomonoglyceride sulfate, dodecylbenzene sodium sulfonate, dodecylbenzene sulfonic acid, tridecylbenzene sodium sulfonate, fatty alcohol sodium sulfate, sodium dodecyl diphenyl oxide disulfonate, sulfonated castor oil, polyethoxyalkyl phenol sulfonate triethanolamine salt, sodium triethanolamine alkyl aryl sulfonate, magnesium lauryl sulfate, potassium lauryl sulfate, sodium lauryl ether sulfate, ammonium lauryl ether sulfate, sodium tallow sulfate, dodecylbenzene sodium sulfonate, oleyl methyl tauride, ammonium lauryl sulfate, amide sulfonate, and the like.

Other noncationic materials such as amphoteric detergent materials can be employed in formulations having a pH above the material's isoelectric point including, illustratively, the sodium salt of N-coco beta amino propionate, N-lauryl beta amine propionic acid and metal salts of substituted quaternary hydroxy cycloimidinic acid metal alcoholates such as disclosed in USP 2,528,378 to Mannheimer.

The softeners herein found to be substantive to fabric through a detergent wash cycle and applicable during such cycle are generally the C₁₈ saturated fatty acids and their water-soluble salts in which there occurs a methyl substituted tertiary carbon atom, in other words C₁₈ fatty acids free of aliphatic unsaturation and having a branch chain. Such acids have the formula:

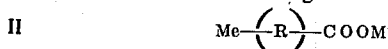


in which R is a divalent organic radical of 17 carbon atoms and Me is a methyl side chain located on any but the terminal carbon atom of R, which substituted carbon atom is thus a tertiary carbon atom.

Branch chain stearic acids having along the chain a methyl group side chain often termed "isostearic acids" in the trade. The methyl group position generally will vary with the acid source, particularly if a natural product e.g. degreas or sheep wool fat. Typical values for commercially available isostearic acids are:

Molecular weight	284
Viscosity cps at 25°C.	48
Acid Value	>175
Titer °C.	<10
Iodine value	<10

The water-soluble salts of these acids may be used in addition to or in place of all or part of the acid. In general, suitable salts are the alkali metal salts e.g. of the formula:



in which M is an alkali metal and Me and R are as in formula I above. Suitable alkali metals include Li, K, Na and Cs metals. Ammonium morpholine and water-soluble amine and hydroxylamine salts of these acids may also be used including salts

derived from alkyl amines and alkanolamines e.g. from primary, secondary and tertiary alkyl amines such as mono-, di-, or tri-methyl, ethyl, propyl or butyl amines or primary, secondary and tertiary alkanol amines such as mono-, di-, or tri-methanol, ethanol, propanol and isopropanol amines.

Proportions of synthetic organic detergent and C₁₈ particular fatty acid or salt are not narrowly critical with as little as 0.5 part of the detergent per part of the fatty acid/salt or 10 parts of detergent and 1 part of the acid/salt, by weight, being broadly useful in providing varying ranges of cleaning and softening action. In commercial formulations the weight ratio of synthetic organic detergent to fatty acid/salt will generally range between 5:1 and 1:1 with between 4:1 and 2:1 and especially the latter being particularly preferred when the mixture is blended with builder salts, as described below.

Builder salts are materials added to detergent formulations to assist in soil dispersion or suspension, deflocculation and water softening and to increase the alkalinity of the system. While suitable water-soluble inorganic salt may be employed commercially used materials are the alkali metal salts e.g. sodium, potassium, lithium and cesium metal salts of phosphoric, sulfuric, carbonic or silicic acids. Typical materials include trisodium phosphate, tetrasodium phosphate, sodium tripolyphosphate, sodium sulfate, sodium carbonate, sodium silicate, potassium sulfate, phosphates, carbonates and silicates.

Builder salts are employed in conventional amounts, e.g. 4:1 to 1:1 by weight relative to the detergent, with weight ratios of 2:1 to 3:1 being preferred.

In the preparation of a typical formulation; a crutcher is charged with (1) sodium tallow alcohol sulfate, 10-20 percent by weight of the whole; (2) sodium tripolyphosphate, sodium sulfate, sodium silicate, (20-60 percent); (3) carboxymethyl-cellulose; (4) isostearic acid (-10 percent); (5) sodium hydroxide (to neutralize the isostearic acid); optical brighteners and water to form a slurry of 50 percent solids.

The aqueous slurry is heated above 140° F. and crutched until lump-free. The slurry is then deaerated and spray-dried so that the resulting, easily dissolved, detergent beads have 5-10 percent moisture.

In the examples all parts are by weight.

EXAMPLE I

The following were blended and formed into detergent beads as above described:

Tallow Alcohol Sulfate	20 parts
Sodium Tripolyphosphate	40 parts
Sodium Isostearate *	10 parts
Sodium Sulfate	13.5 parts
Carboxymethyl Cellulose	1. parts
Optical Brighteners	0.5 parts
Sodium Silicate	5.0 parts
Water	100.0 parts

*The isostearic acid used was a commercial grade known as Emery 3101-D Isostearic Acid containing a minimum of 40 percent by weight C₁₈ acids.

FABRIC WASHING PROCEDURE

Fabric softening was tested by using terry cloths placed in a home-type automatic washing machine along with a load of naturally soiled fabrics. One cup of the spray-dried composition was added to the 15 gallon washer and set through the normal wash, rinse and spin-dry cycles. The wash load, including the test cloths, was dried in a home-type drier.

CONTROL I

For comparison, an identical load was washed using the leading detergent powder.

The two sets of coded cloths were evaluated by a panel of 10 persons who ranked the cloths according to softness. This procedure was repeated for 10 cycles. Using statistical

methods, it was determined that the cloths washed in detergents with isostearic acid were significantly softer (at the 95 percent confidence level) than the cloths washed in the commercially-available detergent powder. The difference was noted from the first wash cycle through the 10th.

Other illustrative formulations include:

EXAMPLE 2

Sodium Tallow Alcohol Sulfate	20 parts
Sodium tripolyphosphate	40 parts
Sodium Isostearate	8-12 parts
Sodium sulfate	15.5-11.5 parts
Carboxymethyl cellulose	1.0 parts
Optical Brighteners	0.5 parts
Sodium silicate	5.0 parts
Water	10.0 parts
	100.0 parts

EXAMPLE 3

Sodium Tallow Alcohol Sulfate	20 parts
Sodium Tripolyphosphate	40 parts
Potassium Isostearate	2 parts
Sodium Sulfate	21.5 parts
Carboxy methyl cellulose	1. parts
Optical Brighteners	0.5 parts
Sodium Silicate	5.0 parts
Water	10.0 parts
	100.0 parts

EXAMPLE 4

Sodium Tallow Alcohol Sulfate	20 parts
Sodium Tripolyphosphate	40 parts
Sodium Isostearate	20 parts
Sodium Sulfate	3.5 parts
Carboxy methyl cellulose	1. parts
Optical Brighteners	0.5 parts
Sodium Silicate	5.0 parts
Water	10.0 parts
	100.0 parts

EXAMPLE 5

Sodium Dodecylbenzene sulfonate (anionic detergent)	67 parts
Sodium Isostearate	33 parts

EXAMPLE 6

Nonyl phenoxy polyethoxy ethane (non-ionic detergent)	67 parts
Sodium Isostearate	33 parts

CONTROL II

Example 1 is duplicated using normal stearic acid. No statistically significant improvement over the control I is noted.

The foregoing softening additive acids and salts may be blended with amine treated clays to enhance or compliment the fabric softening action.

I claim:

1. Method of preparing compositions for imparting fabric

softening characteristics to water soluble anionic, nonionic and amphoteric synthetic organic detergents which includes intimately mixing the detergent with an alkali metal salt of isostearic acid in a weight ratio of 0.5:1 to 10:1 of detergent to said isostearic acid salt by codissolving the detergent and salt in water and removing the water from the mixture by heating.

2. Method according to claim 1 in which the water is removed by spray drying the solution.

3. Detergent composition having both fabric cleaning and softening characteristics, which consists essentially of a mixture of a detergent selected from the group consisting of water soluble anionic, nonionic and amphoteric synthetic organic detergents and an alkali metal salt of isostearic acid in a weight ratio of 0.5:1 to 10:1 of detergent to said salt.

4. Detergent composition according to claim 3 in which said salt is an alkali metal salt selected from lithium, sodium and selected from the group consisting of potassium salts.

5. Detergent composition according to claim 4 in which said salt is the sodium salt.

6. Detergent composition according to claim 3 including also C₁₄ to C₂₂ saturated fatty acids except C₁₈ fatty acids in up to 60 weight percent of the total of fatty acids present in the composition.

7. Detergent composition according to claim 3 in which said detergent is an anionic detergent.

8. Detergent composition according to claim 7 in which said anionic detergent is an alkyl aryl sulfonate detergent in which the alkyl group contains from eight to 22 carbon atoms.

9. Detergent composition according to claim 8 in which said anionic detergent is alkyl benzene sulfonate.

10. Detergent composition according to claim 7 in which said anionic detergent is an alkyl sulfate in which the alkyl group contains from eight to 22 carbon atoms.

11. Detergent composition according to claim 10 in which said anionic detergent is tallow alcohol sulfate.

12. Detergent composition according to claim 3 in which said detergent is nonionic.

13. Detergent composition according to claim 3 in which said detergent includes both an alkyl sulfate and an alkyl aryl sulfonate detergent in which the alkyl groups each contain from eight to 22 carbon atoms.

14. Detergent composition according to claim 13 in which said alkyl sulfate is tallow alcohol sulfate and said alkyl aryl sulfonate is dodecyl benzene sulfonate.

15. Detergent composition according to claim 3 in which the weight ratio of said detergent to said salt is from 5:1 to 1:1.

16. Detergent composition according to claim 15 in which said detergent is a mixture of alkyl sulfate and alkyl aryl sulfonate detergents in which said alkyl groups each contain from eight to 18 carbon atoms and in proportions of 4:1 to 2:1 by weight.

17. Detergent composition according to claim 3 in which there is additionally present from 20 to 60 percent by weight of a water-soluble inorganic builder salt in the total composition.

18. Method of softening fabrics during washing thereof with an aqueous washing solution of a synthetic organic noncationic detergent which includes introducing into the washing solution an alkali metal salt of isostearic acid in a weight ratio of 0.5:1 to 10:1 of detergent to said salt.

19. Method according to claim 18 in which the weight ratio of detergent to isostearic acid salt in said solution is between 5:1 and 1:1.

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