

[54] **CLEANING COMPOSITION**

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[57] **ABSTRACT**

Cleaning compositions based upon higher fatty alcohol detergents such as sodium lauryl sulfate and having particular utility for removing soil and stains from carpets, upholstery, etc., and for imparting stain resistance to the cleaned surface are improved by the addition of certain anionic surfactants without which the compositions could cause respiratory irritation to an unprotected user, especially in unventilated closed areas.

9 Claims, No Drawings

CLEANING COMPOSITION

BACKGROUND OF THE INVENTION

This invention foaming cleaning compositions based upon higher fatty alcohol detergents.

The term "higher fatty alcohol detergent" is a recognized class of sulfated alcohol detergent compositions which are derived from fatty alcohols that are characterized by having from 10 - 16 carbon atoms.

The use of sulfates of the higher fatty alcohols as detergents in cleaning compositions is well known. Such detergents have been found, when mixed with a suitable anti-redeposition agent in an aqueous solution, to provide a highly effective foaming upholstery and carpet cleaning composition. Although these compositions are extremely effective and quite economical, they have one serious failing. When the cleaning compositions are sprayed, either from a mechanical spraying device or from an aerosol mixture, an intolerable situation is produced, especially in confined unventilated areas. The higher fatty alcohol detergent apparently acts as a respiratory irritant, causing persons in the vicinity of such spraying to cough and/or sneeze uncontrollably. As far as known, prior to the present invention, no solution has been found to alleviate this problem without requiring complete replacement of the higher fatty alcohol detergent by less effective and/or a more expensive detergents.

SUMMARY OF THE INVENTION

The present invention provides a novel foaming, container-stable higher fatty alcohol detergent-based cleaning composition for cleaning carpets, upholstery and the like which will not cause respiratory irritation to a normal individual. The user can spray the cleaning composition upon the surface being cleaned without encountering the irritation that would normally result in similar application of the prior art higher fatty alcohol detergent-based cleaning compositions. Because of the presence of certain anionic surfactants, it is possible to utilize the superior cleaning ability of higher fatty alcohol detergents and also avoid the irritation problem which has heretofore been present.

In accordance with the invention, an aqueous solution of higher fatty alcohol detergent containing an anionic surfactant selected from

- a. oleic acid ester of sodium isethionate,
- b. sodium N-cyclohexyl-N-palmitoyl taurate,
- c. sodium N-coconut acid-N-methyl taurate,
- d. sodium N-methyl-N-oleoyltaurate, and

an anti-redeposition agent such as the ammonium salt of hydrolyzed styrene-maleic anhydride copolymer, provides the improved cleaning composition. The presence of any one of these anionic surfactants (or a mixture of two or more thereof) with the higher fatty alcohol detergent surprisingly eliminates the otherwise irritating nature of the cleaning composition.

As previously mentioned, higher fatty alcohol detergents are sulfated alcohols of $C_{10} - C_{16}$ fatty alcohols. The higher fatty alcohol detergents useful in the invention can be represented by the general formula



wherein RO is the residue of a fatty alcohol which has from 10 to 16 carbon atoms and M is sodium, potassium, lithium or magnesium.

Examples of higher fatty alcohol detergents that are useful in the invention include sodium lauryl sulfate (commercially available under the trade designation "Avirol" 101), potassium lauryl sulfate (commercially available under the trade designation "Culverol" KLS), magnesium lauryl sulfate (commercially available under the trade designation "Culverol" MgLS), sodium myristyl sulfate (commercially available under the trade designation "Maprofix" MSP90), sodium cetyl sulfate (commercially available under the trade designation "Conco" Sulfate A), sodium tridecyl sulfate (commercially available under the trade designation "Sipex" TDS), sodium 7-ethyl-2 methyl-4 undecyl sulfate (commercially available under the trade designation "Tergitol" 4). Of these, sodium lauryl sulfate is the preferred higher fatty alcohol detergent.

In a particularly preferred embodiment of the invention, the weight ratio of the higher fatty alcohol detergent to the anionic surfactant is in the range of 1:1 to 1:3. At less than one part of anionic surfactant per one part higher fatty alcohol detergent, the cleaning composition will cause irritation. At greater than three parts of the anionic surfactant per one part higher fatty alcohol detergent, the product becomes a less effective cleaner, having a tendency to resoil faster and to form a less stable foam.

Anionic surfactants which provide the unexpected improvement in the higher fatty alcohol detergent-based cleaning compositions of the invention include oleic acid ester of sodium isethionate (commercially available under the trade designation "Igepon" AP-78), sodium N-cyclohexyl-N-palmitoyl taurate (commercially available under the trade designation "Igepon" CN-42), sodium N-coconut acid-N-methyl taurate (commercially available under the trade designation "Igepon" TC-42), and sodium N-methyl-N-oleoyltaurate (commercially available under the trade designation "Igepon" T-33), although others may be useful.

The cleaning composition should contain at least 0.3 part by weight of an anti-redeposition agent for each part of higher fatty alcohol detergent/anionic surfactant to prevent resoil. Preferably the ratio of anti-redeposition agent to higher fatty alcohol detergent/anionic surfactant should be about 0.67:1 (2:3). At ratios greater than 1:1 (anti-redeposition agent:sodium lauryl sulfate/anionic surfactant), no additional improvement is noted, and, in fact, the cleaning ability may decrease. Therefore, the anti-redeposition should not exceed 1:1 in the ratio.

A preferred anti-redeposition agent is the ammonium salt of the hydrolyzed copolymer of styrene and maleic anhydride, but other known anti-redeposition agents may be equally useful.

The cleaning composition of the invention can contain other components which increases effectiveness or physical appearance. For example, the cleaning composition can contain from about 1 to about 5 percent of the total (diluted) composition a water-soluble solvent for oily residue, e.g., an alkanol such as ethanol or propanol or a mono-alkyl ether of ethylene glycol such as the butyl ether, e.g., that sold under the trade designation "Butyl Cellosolve." The cleaning composition can also contain a dye to provide a more attractive color, a germicidal compound, or a compound which provides a more pleasant odor, etc.

For use as a cleaning solution, the composition typically has a non-aqueous portion of about 2 to 5 percent. The cleaning composition can, of course, be made and sold as a concentrated solution having a higher non-aqueous concentration, even as high as 50 percent or greater.

In use, the diluted composition is typically sprayed as an aerosol upon the surface to be cleaned. The spraying can be accomplished by conventional mechanical spraying devices or by using the cleaning composition packaged in an aerosol dispensing container with a suitable non-irritating aerosol propellant such as a low boiling chloro-, fluoro-substituted alkane (e.g., "Freon" 12) or low boiling alkanes or mixtures thereof such as a mixture of isobutane and propane.

DESCRIPTION OF PRESENTLY PREFERRED EMBODIMENTS

Understanding of the invention will be further facilitated by referring to the subsequent examples, which indicate, without thereby limiting, ways in which the invention may be practiced.

EXAMPLE 1

A non-irritating foaming higher fatty alcohol detergent-based cleaning composition was prepared by mixing the components set forth below in the order given:

Components	Parts by Weight
Water	84.25
Sodium lauryl sulfate (30% solids aqueous solution)	2
Anti-redeposition agent (ammonium salt of hydrolyzed styrene/maleic anhydride copolymer, 15% solids aqueous solution)	8
Anionic surfactant (sodium N-methyl-N-oleoyl taurate, 32% active, sold as "Igepon" T-33)	3.75
Water-soluble oily residue solvent (Mono-butyl ether of ethylene glycol, sold as "Butyl Cellosolve")	2

The anti-redeposition agent solution was previously prepared by mixing 15 parts by weight styrene/maleic anhydride resin (sold as "SMA 3000A"), with 54 parts water, heating this mixture to 150° F. and then adding 6 parts ammonium hydroxide solution (28% NH₄OH), heating at 165° F. for about 30 minutes, and diluting the composition with additional water to provide a 15 percent solids aqueous solution.

The cleaning composition (640 g.), packaged in an epoxy-phenolic resin lined tin plated aerosol can with 32 g. of a 90:10 isobutane:propane propellant mixture, was sprayed at a rate of about 3.5 g. per second with a 12-inch diameter spray pattern at a distance of one foot on the surface of a carpet in a closed room, with no irritation to the occupants of the room being noted.

A control cleaning solution lacking the anionic surfactant was prepared by mixing the following components:

Components	Parts by Weight
Water	85.5
Sodium lauryl sulfate (30% solids aqueous solutions)	7.5
Anti-redeposition agent (described above)	5.0
Water-soluble oily residue solvent ("Butyl Cellosolve")	2.0

The control, packaged in an aerosol can as above and sprayed in the closed room described above, caused the irritation to the occupants of the room. The irritation was manifested by coughing, nasal and throat discomfort, and sneezing.

EXAMPLES 2 - 4

Other non-irritating cleaning compositions were prepared by using the following anionic surfactants instead of the sodium N-methyl-N-oleoyl taurate and otherwise duplicating Example 1:

Example	Anionic Surfactant
2	Sodium N-coconut acid-N-methyl taurate ("Igepon" TC-42)
15 3	Oleic acid ester of sodium isethionate ("Igepon" AP-78)
4	Sodium N-cyclohexyl-N-palmitoyl-aurate ("Igepon" CN-42)

TESTING

Each of the examples and the control were subjected to a test to determine their ability to clean a carpet surface.

Synthetic soil is prepared by mixing the following components in a pebble-mill, together with 1½ times the total weight of water, and milling for 18 hours. Thereafter the slurry is removed, dried, and returned to the mill for 6 hours, and finally passed through a 200 mesh screen for use.

Components	Parts by Weight
Humus	35
Cement (white Portland)	15
Silica ("Silica Gel")	15
Clay (Kaolin)	15
Sodium chloride	5
Gelatin	3.5
Carbon black (Furnace Black)	11.5
Iron oxide (Red)	0.25
Stearic acid	1.6
Oleic acid	1.6
Palm oil fatty acid	3.0
Lanolin	1.0
n-Octadecane	1.0
n-Octadecene	1.0
Lauryl alcohol	0.5

A 12 inch by 25 inch sample of beige colored nylon carpet was uniformly soiled by first adhesively attaching its base to the inner surface of a 12 inch long rotatable aluminum soiling capsule having an inner diameter of 9½ inches, suspending a 12 inch long perforate metal soil dispensing trough containing 5 grams of the synthetic soil therein, placing 100-¾ inches long × ¾ inches diameter ceramic cylinders in the capsule on the pile surface, securing end caps on the capsule, and rotating the capsule for 20 minutes to cause uniform dispensing of soil. The soiled carpet was removed from the capsule. vacuumed to remove loose soil, and the degree of soiling noted.

The soiled samples were cleaned by applying approximately 120 grams of cleaning composition thereon, thoroughly working the composition into the carpet pile with a rotary tool having a fibrous non-woven pad thereon, permitting the carpet sample to dry for about 120 minutes, and thoroughly vacuuming the cleaned sample. Results as follows were noted:

Cleaning Composition	Cleaning Result	Irritation During Application
Control	Excellent	Yes
Example 1	Excellent	No
Example 2	Excellent	No

Example 3
Example 4

Excellent
Excellent

No
No

EXAMPLE 5

A foaming, non-irritating cleaning composition was prepared according to Example 1 except magnesium lauryl sulfate (commercially available under the trade designation "Matrofix" MG) was substituted for sodium lauryl sulfate. This cleaning composition had excellent cleaning and resoil prevention properties.

EXAMPLE 6

A foaming, non-irritating cleaning composition was prepared according to Example 1 except the sodium salt of a long chain fatty C₁₆-C₁₈ alcohol (commercially available under the trade designation "Alfol" 1618) sulfate was substituted for the sodium lauryl sulfate. This cleaning composition had excellent cleaning and resoil prevention properties.

What is claimed is:

1. A container-stable foaming higher fatty alcohol detergent-based aqueous cleaning composition having particular utility for removing soil and stains from a substrate such as a carpet and imparting soil resistance to said substrate, said composition consisting essentially of

A. from about 2 percent to about 50 percent of a mixture of the following

1. a sulfated fatty alcohol detergent of the formula ROSO_3M wherein R has from 10 to 16 carbons and M is alkali metal", in an amount sufficient to remove soil and stains from a substrate such as a carpet;
2. ammonium salt of hydrolyzed styrene/maleic anhydride copolymer anti-redeposition agent in an amount sufficient to impart soil resistance to said substrate; and
3. an anionic surfactant selected from the group consisting of
 - a. oleic acid ester of sodium isethionate,
 - b. sodium N-cyclohexyl-N-palmitoyl taurate,
 - c. sodium N-coconut acid-N-methyl taurate, and
 - d. sodium N-methyl-N-oleoyl taurate

is an amount sufficient to substantially eliminate the normal tendency of said cleaning composition on being atomized by spraying to cause respiratory irritation to an unprotected user; and

B. correspondingly from about 98 percent to about 50 percent water.

2. A composition in accordance with claim 1 wherein the weight ratio of higher fatty alcohol detergent: anionic surfactant is in the range of 1:1 to 1:3.

3. A composition in accordance with claim 1 wherein the weight ratio of anti-redeposition agent: (higher fatty alcohol detergent plus anionic surfactant) is in the range of 0.3:1 to 1:1.

4. A composition in accordance with claim 1 wherein the higher fatty alcohol detergent is sodium lauryl sulfate.

5. A composition in accordance with claim 1 wherein the composition further comprises a minor amount of a water-soluble solvent for oil residues, said solvent being selected from the group consisting of alkyl ethers of ethylene glycol and alkanols having from 2-3 carbon atoms.

6. The composition of claim 5 wherein the water-soluble solvent is the mono-butyl ether of ethylene glycol.

7. The composition of claim 5 wherein the alkanol is isopropyl alcohol.

8. A container-stable foaming sodium lauryl sulfate based aerosol aqueous cleaning composition having particular utility for removing soil and stains from a substrate such as a carpet and imparting soiling resistance to said substrate, which composition can readily be used in unventilated areas without causing respiratory irritation to an unprotected user, the composition being contained in a pressure-resistant closed vessel fitted with a valve means, said composition consisting essentially of from about 2 percent to about 5 percent non-aqueous components consisting essentially of a mixture of the following ingredients:

1. sodium lauryl sulfate in an amount sufficient to remove soil and stains from a substrate such as a carpet;
2. an anionic surfactant selected from the group consisting of:
 - a. oleic acid ester of sodium isethionate;
 - b. sodium N-cyclohexyl-N-palmitoyl taurate;
 - c. sodium N-coconut acid-N-methyl taurate; and
 - d. sodium N-methyl-N-oleoyl taurate

in an amount sufficient to substantially eliminate the normal tendency of said cleaning composition on being atomized by spraying to cause respiratory irritation to an unprotected user;

3. an ammonium salt of hydrolyzed styrene maleic anhydride copolymer anti-redeposition agent in an amount sufficient to impart soil resistance to said substrate;

4. sufficient low boiling alkane or chloro-, fluoro-substituted alkane non-irritating aerosol propellant to expel the liquid contents of said vessel; and correspondingly from 95 percent to 98 percent water;

the weight ratio of sodium lauryl sulfate to said anionic surfactant being in the range of 1:1 to 1:3 and the weight ratio of said anti-redeposition agent to sodium lauryl sulfate and anionic surfactant being in the range of 0.3:1 to 1:1.

9. The composition of claim 8 wherein the propellant is a mixture is isobutane and propane.

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