

[54] **TERNARY FOAM CONTROL COMPOSITION AND BUILT ANIONIC DETERGENT COMPOSITION CONTAINING SAME**

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### [56] References Cited

#### UNITED STATES PATENTS

2,443,825 6/1948 Johnson.....252/321 X  
2,954,347 9/1960 St. John et al.....252/358 X

3,325,414 6/1967 Inamorato.....252/137

### FOREIGN PATENTS OR APPLICATIONS

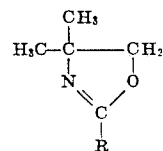
800,291 8/1958 Great Britain  
1,066,025 4/1967 Great Britain

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### [57] ABSTRACT

A built anionic detergent composition having an inverse foam to temperature relationship is disclosed, as well as a ternary composition for accomplishing this relationship when added to a detergent system. The inverse foam to temperature relationship is provided by a synergistic mixture of a C<sub>8</sub>–C<sub>30</sub> fatty acid, a polyethoxylated mono higher fatty alkyl quaternary ammonium halide, nitrate or sulfate containing about 10 to 50 mols of ethylene oxide and an oxazoline having the formula:



where R is C<sub>15</sub> to C<sub>21</sub> alkyl.

**24 Claims, No Drawings**

# TERNARY FOAM CONTROL COMPOSITION AND BUILT ANIONIC DETERGENT COMPOSITION CONTAINING SAME

This application is a continuation-in-part of copending application, Ser. No. 41,359 filed May 28, 1970.

This invention relates to detergent compositions. More particularly, this invention relates to detergent compositions which have an inverse foam-to-temperature relationship and to means for accomplishing this relationship.

The use of synthetic detergents for washing clothes has assumed worldwide importance, due to the efficiency and cheapness of such products. These detergents are compounded with various additives to provide compositions having improved and desirable characteristics. Among these characteristics is that of maintaining a proper level of foam for suds.

Foaming, or sudsing of detergents is an extremely important factor to consider when formulating a detergent composition. It is known, for example, that a detergent which over-foams does not do an efficient job of cleaning in a washing machine. On the other hand, in hand washing there is a desire on the part of most consumers for a substantial amount of foam produced by a detergent. It is therefore necessary to provide a detergent composition which produces enough foam to reassure the consumer but yet not so much foam as to inhibit the detergent action of the composition. This need has been satisfactorily achieved in many ways.

There is, however, another situation which requires a totally different approach to foam control in a detergent system. There are geographical areas where hot water is not readily available for one reason or another. In such areas, as well as others washing machines are designed with internal water eating systems which begin their cycle with cold water and gradually heat the same to the desired operating temperature which is usually the "boil." Such washing machines are used extensively, for instance, in many European countries. It is well known, however, that a detergent system which provides an adequate level of foam when used with hot water will not foam at all in cold water. Conversely, a detergent system which is compounded so that a sufficient level of foam is produced in cold water will over-foam to the extent of overflowing the washing machine when used with hot water. Of course, a detergent system which over-foams can have a foam suppressor included therein. The problem then, naturally, is that such a system will produce no foam when used with cold water. In other words, most detergent systems have essentially a direct relationship between temperature and foam, wherein as the temperature increases the amount of foam increases.

The invention disclosed and claimed in the aforementioned co-pending application, Ser. No. 41,359 (Docket No. 2346), provided the necessary inverse foam-to-temperature relationship through a synergistic binary system of a fatty acid and a polyethoxylated quaternary ammonium salt. It has been found, however, that when extremely high temperatures, i.e., about 200°F., are encountered, over-foaming occurs. The present invention solves this problem by utilizing a ternary system of a fatty acid, a polyethoxylated quaternary ammonium salt and a particular type of oxazoline.

Accordingly, it is a primary object of the present invention to provide a detergent system free of the aforementioned and other such disadvantages.

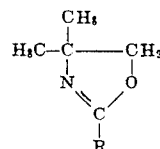
It is another object of the present invention to provide a detergent having an inverse foam-to-temperature relationship.

It is still another object of the present invention to provide a detergent system which can be used in an environment wherein it will be subject to cold water as well as hot water and still provide a satisfactory foam level.

It is yet another object of the present invention to provide a composition which will impart an inverse foam-to-temperature relationship to a detergent system.

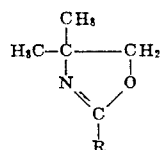
Other objects and advantages of the present invention will become apparent from the following detailed description thereof.

According to the present invention, a composition is provided for regulating the foam profile of a detergent system, comprising a ternary synergistic mixture of a fatty acid, a polyethoxylated quaternary ammonium salt, and a member of the group of oxazolines of the general formula



wherein R represents an alkyl group having from about 15 to about 21 carbon atoms.

In another aspect of the present invention, a detergent composition is provided having an inverse foam-to-temperature relationship which comprises an anionic detergent, inorganic builders, and a synergistic mixture of a fatty acid, a polyethoxylated quaternary ammonium salt, and a member of the group of oxazolines having the general formula



wherein R represents an alkyl group having from about 15 to about 21 carbon atoms.

The detergent composition could have other additives such as brighteners, germicides, soil suspending agents, antioxidants, bleaches, coloring materials, and perfume. It is quite unexpected to find that the mixture of a fatty acid, polyethoxylated quaternary ammonium salt, and an oxazoline provides the inverse foam-to-temperature relationship, since each of the ingredients, when used alone, do not exhibit any such properties.

The useful fatty acids which may be employed in the present invention include those saturated linear acids containing between about eight and 30 carbon atoms in their alkyl chain. These include:

- capric acid
- lauric acid
- myristic acid
- palmitic acid
- stearic acid

arachidic acid  
 behenic acid  
 lignoceric acid  
 cerotic acid  
 melissic acid  
 oleic acid  
 linoleic acid

as well as various natural and synthetic mixtures thereof.

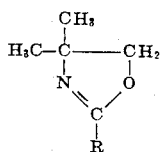
The preferred fatty acids, however, are those having alkyl chains of from about 14 to 22 carbon atoms. One such preferred fatty acid is stearic acid. Another preferred acid composition is available commercially under the name "Hyfac 431." Hyfac 431 is a hydrogenated fish fatty acid having the following approximate composition:

8 percent myristic acid  
 29 percent palmitic acid  
 18 percent stearic acid  
 26 percent arachidic acid  
 17 behenic acid  
 2 percent oleic acid

Other commercially available mixtures of fatty acids are those which are available under the name "Hystrene." For instance, Hystrene 7022 comprises about 70% C<sub>20</sub> to C<sub>22</sub> fatty acids. Hystrene 9022 comprises about 90% C<sub>20</sub> to C<sub>22</sub> fatty acids. Another such commercial product is "Neofat 18-58," which is a hydrogenated tallow acid. The fatty acid, used in combination with the polyethoxylated quaternary ammonium salt and the oxazoline, should be present in the final detergent composition in an amount from about 1 to about 6 by weight of the total detergent composition.

The polyethoxylated quaternary ammonium salt component of the synergistic mixture can be any such salt, although a polyethoxylated mono fatty alkyl methyl ammonium salt is preferred. For instance, a polyethoxylated (40 moles of ethylene oxide) dicoco methyl ammonium methyl sulfate has been used. Still more preferred, however, are the polyethoxylated (15 moles of EO) mono fatty alkyl methyl ammonium chlorides, which are commercially available under the name "Ethoquad." Specifically, the most preferred such salt is Ethoquad 18/25, which is polyethoxylated (15 moles) stearyl methyl ammonium chloride. Other suitable quaternary salts having about 10 to 50 moles ethylene oxide can be used. Any suitable anion can be used including other halides (e.g. bromide), nitrates and sulfates.

The oxazolines to be used as part of the synergistic ternary foam suppressing system has the following general formula:



wherein R represents an alkyl group having from about 15 to about 21 carbon atoms.

The preferred such oxazoline is one in which R represents a linear alkyl group having 17 carbon atoms. This compound is 2-heptadecyl-4-dimethyl-2-oxazoline.

The useful detergents which may be used in conjunction with the foam profile regulating composition of the

present invention include anionic detergents such as alkyl-benzene-sulfonic acid and its salts, and compounds of the formula alkyl-phenyl-SO<sub>3</sub>-M, wherein alkyl is an alkyl radical of a fatty acid and M is hydrogen or an alkali metal, which compounds comprise a well-known class of anionic detergents and include sodium dodecyl-benzene sulfonate, potassium dodecylbenzenesulfonate, sodium laurylbenzenesulfonate, sodium cetylbenzenesulfonate. Others are the alkali metal dialkyl sulfosuccinates, e.g., sodium dioctylsulfosuccinate, and sodium dihexylsulfosuccinate, sodium sulfoethylphthalate, sodium lauryl-p-anisidinesulfonate; sodium tetradecanesulfonate; sodium diisopropylnaphthalenesulfonate; sodium octylphenoxyethoxyethylsulfonate, etc.; and the alkali metal alkyl sulfates, e.g., sodium lauryl sulfate.

Among the above noted alkylbenzene-sulfonic acid and salts thereof, the preferred compounds included those which are biodegradable and which are particularly characterized by a linear alkyl substituent of from C<sub>8</sub> to C<sub>22</sub> and preferably from C<sub>10</sub> to C<sub>15</sub>. It is, of course, understood that the carbon chain length represents, in general, an average chain length since the method for producing such products usually employs alkylating reagents of mixed chain length. It is clear, however, that substantially pure olefins as well as alkylating compounds used in other techniques can and do give alkylated benzene sulfonates wherein the alkyl moiety is substantially (i.e., at least 99 percent) of one chain length; i.e., C<sub>12</sub>, C<sub>13</sub>, C<sub>14</sub>, or C<sub>15</sub>. The linear alkyl benzene sulfonates are further characterized by the position of the benzene ring in the linear alkyl chain, with any of the position isomers (i.e., alpha to omega) being operable and contemplated.

The linear alkyl benzene sulfonates are generally and conveniently prepared by sulfonating the corresponding alkyl benzene hydrocarbons which in turn may be prepared by alkylating benzene with a linear alkyl halide, a 1-alkene or a linear primary or secondary alcohol. Pure isomers (of the 1-phenyl isomer) are prepared by reduction of the acylated benzene (alkyl phenyl ketone) using a modification of the Wolff-Keshner reaction. The 2-phenyl isomer is obtained from n-undecyl phenyl ketone and methyl magnesium bromide to form the tertiary alcohol which is dehydrated to the alkene and then hydrogenated. The 5-phenyl isomer is obtained similarly from a n-heptyl phenyl ketone and n-butyl magnesium bromide. The other isomers are obtained in a similar manner from the appropriate n-alkyl phenyl ketone and n-alkyl magnesium bromide.

In addition to the benzene sulfonates, one may also employ the lower alkyl (C<sub>1</sub> to C<sub>4</sub>) analogs of benzene such as toluene, xylene, the trimethyl benzenes, ethyl benzene, isopropyl benzene, and the like. The sulfonates are generally employed in the water soluble salt form which include as the cation the alkali metals, ammonium, and lower amine and alkanolamine.

Examples of suitable linear alkyl benzene sulfonates are:

sodium n-decyl benzene sulfonate  
 sodium n-dodecyl benzene sulfonate  
 sodium n-tetradecyl benzene sulfonate  
 sodium n-pentadecyl benzene sulfonate  
 sodium n-hexadecyl benzene sulfonate  
 and the lower corresponding lower alkyl substituted

homologues of benzene, as well as the salts of the cations previously referred to. Mixtures of these sulfonates may, of course, also be used with mixtures which may include compounds wherein the linear alkyl chain is smaller or larger than indicated herein, provided that the average chain length in the mixture conforms to the specific requirements of  $C_{10}$  to  $C_{22}$ .

Other anionic detergents are the olefin sulfonates, including long chain alkene sulfonates, long chain hydroxyalkane sulfonates or mixtures of alkenesulfonates and hydroxylalkanesulfonates. These olefin sulfonate detergents may be prepared, in known manner, by the reaction of  $SO_3$  with long chains olefins (of 8–25, preferably 12–21, carbon atoms) of the formula  $RCH=CHR_1$ , where R is alkyl and  $R_1$  is alkyl or hydrogen, to produce a mixture of sultones and alkenesulfonic acids, which mixture is then treated to convert the sultones to sulfonates.

The linear paraffin sulfonates are also a well-known group of compounds and include water soluble salts (alkali metal, amine, alkanolamine, and ammonium) of:

- 1-decane sulfonic acid
- 1-dodecane sulfonic acid
- 1-tridecane sulfonic acid
- 1-tetradecane sulfonic acid
- 1-pentadecane sulfonic acid
- 1-hexadecane sulfonic acid

as well as the other position isomers of the sulfonic acid group.

In addition to the paraffin sulfonates illustrated above, others with the general range of  $C_{10}$  to  $C_{22}$  alkyls may be used, with the most preferable range being from  $C_{12}$  to  $C_{20}$ .

The linear alkyl sulfates which are contemplated in this invention comprise the range of  $C_{10}$  to  $C_{20}$ . Specific examples include sodium n-decyl sulfate; sodium m-dodecyl sulfate; sodium n-octadecyl sulfate; and the ethoxylated (1 to 100 moles ethylene oxide) derivatives; and, of course, the other water soluble salt-forming cations mentioned above.

The composition of the present invention may also include in addition to the foam profile regulating compounds and conventional anionic detergent compositions builders, brighteners, hydrotropes, germicides, soil suspending agents, anti-redeposition agents, antioxidants, bleaches, coloring materials (dyes and pigments), perfumes, water soluble alcohols, non-detergent alkali metal benzene sulfonates, fabric softening compounds, enzymes, etc.

The builder is, generally, a water soluble, inorganic salt which may be a neutral salt, e.g., sodium sulfate or an alkaline builder salt such as phosphates, silicates, bicarbonates, carbonates, and borates. The preferred builders are those characterized as condensed phosphates such as polyphosphates and pyrophosphates. Specific examples of alkaline salts are: tetrasodium pyrophosphates, pentasodium tripolyphosphate (either Phase I or Phase II), sodium hexametaphosphate, and the corresponding potassium salts of these compounds, sodium and potassium silicates, e.g., sodium metasilicate and alkaline silicates ( $Na_2O$ ;  $2SiO_2$  and  $Na_2O$ ;  $3SiO_2$ ), sodium carbonate, potassium carbonate and sodium and potassium bicarbonate. Other salts may also be used where the compounds are water soluble. These include the general class of alkali metal, alkaline earth metal, amine, al-

kanolamine, and ammonium salts. Other builders which are salts of organic acids may also be used, and in particular the water soluble (alkali metal, ammonium, substituted ammonium and amine) salts of aminopolycarboxylic acids such as:

- ethylene diamine tetra-acetic acid
- nitrilo triacetic acid
- diethylene triamine penta-acetic acid
- N-(2-hydroxyethyl) - ethylene diamine triacetic acid
- 2-hydroxyethyl-iminodiacetic acid
- 1,2-diaminocyclohexane diacetic acid, and the like.

In addition to the above ingredients, one may as previously delineated, employ hydrotropes in connection with the compositions of the instant invention. The useful hydrotropes include such compounds as sodium xylene sulfonate, potassium xylene sulfonate, sodium and potassium toluene sulfonates, in the position isomers thereof, and ethyl benzene sulfonate.

It has now been found, quite unexpectedly, that when the synergistic mixture of a fatty acid, a polyethoxylated quaternary ammonium salt, and an oxazoline, as disclosed above, is added to a conventional detergent system, or is used in combination with the above detergents and other conventional detergent additives, an inverse foam-to-temperature relationship is exhibited by the resulting system.

In the composition for regulating the foam profile of a detergent according to the present invention, there is employed from about 20 to 80 percent fatty acid, from about 10 to 60 percent polyethoxylated quaternary ammonium salt, and from about 10 to about 60 percent oxazoline. Preferably, there is employed from about 35 to 60 percent fatty acid, from about 20 to 40 percent polyethoxylated quaternary ammonium salt, and from about 20 to about 40 percent oxazoline. In terms of the total detergent system, there is employed from about 1 to 6 percent fatty acid, from about 1 to 6 percent polyethoxylated quaternary ammonium salt, and from about 1 to about 6 percent oxazoline; and preferably from about 2 to 5 percent fatty acid, from about 1 to 3 percent polyethoxylated quaternary ammonium salt, and from about 1 to about 3 percent oxazoline. All of said percentages are by weight, based on the total amount of the composition being used. In the case of the detergent systems, the percentages are based on an anionic detergent concentration of about 8 to 18 percent by weight. When less anionic detergent is present in the system, a correspondingly lesser amount of each of the fatty acid, the polyethoxylated quaternary ammonium salt, and the oxazoline can be used. Builders when used may range from 10–85 wt %.

The present invention will now be illustrated by the following, more detailed examples thereof. It is noted, however, that the present invention is not deemed as being limited thereto.

The following examples demonstrate the foam profiles of various detergent systems under the conditions of use to be encountered in Europe. The detergent compositions were tested in a Miele automatic washing machine, which is of German manufacture. The machine is a front-loading, tumbler type washing machine equipped with a heater that raises the water temperature from room temperature to the boil. The machine operates on 220 volts, 50 cycle alternating current. In each instance, the machine was set on the white clothes setting, and a five-pound load of clean clothing was used. The water capacity is 11 liters. A de-

tergent concentration of 0.5% was used in each cycle. This detergent concentration was provided by using 56 grams of detergent.

The machine operates on two cycles, a pre-wash cycle and a wash cycle. In the pre-wash cycle, the temperature of the water climbs from 70° to 120°F., and the total cycle is 12 to 14 minutes. The drum rotates for about 10 seconds, rests for 4 seconds, reverses direction, and the operation is repeated. At the end of the cycle, the machine stops, drains, and remains "motionless" until the wash cycle starts.

The wash cycle is divided into two stages, the heating stage and the washing stage. In the heating stage, cold water washes a second charge of detergent into the drum. During this 30-minute stage, the temperature climbs from about 90°F to over 190°F. The drum rotates for 4 to 5 seconds, rests for 10 seconds, reverses direction, and repeats the operation. At the end of the heating period, the machine changes its drum action and goes into the washing stage.

The washing stage lasts 18 minutes. During this time, the drum action is the same as that described for the prewash cycle. The temperature fluctuates between 190° and 200°F during the whole washing stage.

#### Example 1

Detergent compositions were made having the following formulations:

TABLE 1

| Ingredients                    | 1     | 2     | 3     | 4     |
|--------------------------------|-------|-------|-------|-------|
| Water                          | 8.50  | 8.50  | 8.50  | 8.50  |
| Sodium Alkylbenzene*Sulfonate  | 10.00 | 10.00 | 15.00 | 10.00 |
| Sodium Hydroxide               | 0.45  | 0.45  | 0.45  | 0.45  |
| Neo-Fat 18-58                  | 3.00  | —     | 3.00  | —     |
| Ethoquad 18/25                 | 2.00  | 2.00  | —     | —     |
| Sodium Tripolyphosphate        | 35.00 | 35.00 | 35.00 | 35.00 |
| Sodium Silicate                | 7.00  | 7.00  | 7.00  | 7.00  |
| Sodium Carboxymethyl Cellulose | 0.50  | 0.50  | 0.50  | 0.50  |
| Polyvinyl Alcohol              | 0.20  | 0.20  | 0.20  | 0.20  |
| Sodium Sulfate                 | 3.04  | 5.04  | 5.04  | 8.04  |
| Sodium Perborate Tetrahydrate  | 30.00 | 30.00 | 30.00 | 30.00 |
| Balance**                      | 0.31  | 0.31  | 0.11  | 0.36  |

\* tridecylbenzene

\*\*Optical brighteners and antioxidant

These products were evaluated using the Meile washing machine. Formulations 2, 3 and 4 with Ethoquad 18/25, Neo-Fat 18-58, and no foam suppressing system at all, respectively, foamed rapidly and overflowed. Formulation 1, which contained Neo-Fat 18-58 and Ethoquad 18/25, showed some foam control demonstrating a high foam at 80°F and a low foam at 160°F. The foam profile of the system of Formulation 1, while good, still did not match that which could be considered ideal for the conditions of use to be expected by the consumer.

#### Example 2

Detergent compositions were made having the following formulations:

TABLE 2

| Ingredient                     | 5    | 6    | 7    | 8    |
|--------------------------------|------|------|------|------|
| Water                          | 8.5  | 8.5  | 8.5  | 8.5  |
| Sodium Alkylbenzene*Sulfonate  | 10.0 | 10.0 | 10.0 | 10.0 |
| Sodium Perborate Tetrahydrate  | 30.0 | 30.0 | 30.0 | 30.0 |
| Sodium Tripolyphosphate        | 35.0 | 35.0 | 35.0 | 35.0 |
| Sodium Silicate                | 7.0  | 7.0  | 7.0  | 7.0  |
| Sodium Carboxymethyl Cellulose | 0.5  | 0.5  | 0.5  | 0.5  |
| Polyvinyl Alcohol              | 0.2  | 0.2  | 0.2  | 0.2  |
| Sodium Hydroxide               | 0.45 | 0.45 | 0.45 | 0.45 |
| Neo-Fat 18-58                  | 3.00 | 3.00 | 3.00 | —    |
| Ethoquad 18/25                 | 2.00 | 2.00 | 2.00 | —    |
| Oxazoline type (A)             | 2.00 | x    | x    | 2.00 |
| Oxazoline type (B)             | x    | 2.00 | x    | —    |
| Oxazoline type (C)             | x    | x    | 2.00 | —    |
| Sodium Sulfate                 | 1.04 | 1.04 | 1.04 | 1.04 |
| Balance                        | 0.31 | 0.31 | 0.31 | 0.31 |

(A) 2Heptadecyl-4-dimethyl-2-oxazoline

(B) 2-Heptadecyl-4-dimethylol-2-oxazoline

(C) 4-Ethyl-2-Heptadecyl-4-methylol-2-oxazoline

\* tridecylbenzene

\*\* Optical brighteners and antioxidant

Each of these products was evaluated in the Miele washing machine.

Formulation No. 7 had no effect at all in foam suppression. Formulation 6 acted as a foam stabilizer rather than a foam suppressor at the higher temperature. Formulation 5 produced good foam suppression and a good foam profile. Formulation 8 showed absolutely no foam suppression.

Since the use of the oxazoline with the 4-ethyl, 4-methylol substitution acted as a foam stabilizer and caused overflow of foam and the 4-dimethylol substituted oxazoline also acted as a foam stabilizer, it is hypothesized that substituting methylol groups for methyl groups on the 4 position increases the hydrophilic character of the oxazoline and makes it too soluble and incapable of performing as a suds depressant. It is clear that the 4-dimethyl substituted oxazoline did not perform satisfactorily when used alone, but when used in combination with the fatty acid and the ethoxylated quaternary ammonium salt it provided good suds control.

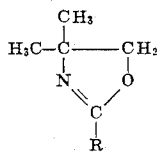
Thus, it has been shown that a synergistic combination of a fatty acid, a polyethoxylated quaternary ammonium salt, and a 4-dimethyl substituted oxazoline provided a means of controlling the foam profile of a detergent system in order to produce an inverse foam-to-temperature relationship. It is to be clearly understood that the ratios of anionic detergent and various of the inorganic builder salts can be varied within suitable detergent limits.

In the description and claims, reference to fatty acids or the like includes the corresponding water-soluble soaps thereof, preferably the alkali metal soaps such as sodium and potassium. In general, the fatty acids per se and soaps thereof may be used interchangeably depending upon economics, method of manufacture of the composition with other ingredients and its use in washing. For example, fatty acids may exist in the product when post-added to a detergent powder; or partly or wholly in the form of soap when added to a slurry or solution during manufacture of detergent products in the presence of alkaline materials or in alkaline washing solutions.

Accordingly, it is clear that the objects of this invention, set forth at the outset of the specification, have been successfully achieved. The invention has been disclosed and described with respect to certain preferred embodiments and various modifications thereof will become obvious to one skilled in the art. It is to be understood that such modifications and variations are to be included within the spirit and scope of the invention which is not limited to the exemplary embodiments, but is defined only by the claims.

What is claimed is:

1. A composition for regulating the foam profile of a detergent system, said composition consisting essentially from about 20 to 80 percent by weight of  $C_8$ - $C_{30}$  fatty acid, from about 10 to 60 percent by weight of polyethoxylated mono higher fatty alkyl quaternary ammonium halide, nitrate or sulfate containing about 10 to 50 moles of ethylene oxide and from about 10 to 60 percent by weight of oxazoline having the formula:



wherein R is  $C_{15}$  to  $C_{21}$  alkyl.

2. A composition according to claim 1 wherein said fatty acid contains from about 14 to 22 carbon atoms.

3. A composition according to claim 1 wherein said fatty acid is hydrogenated fish fatty acid.

4. A composition according to claim 2 wherein said fatty acid is hydrogenated tallow fatty acid.

5. A composition according to claim 1, wherein said fatty acid is present in from about 35 to 60 percent by weight of said composition.

6. A composition according to claim 1, wherein said quaternary ammonium compound is a polyethoxylated (15 mole) mono fatty alkyl methyl ammonium chloride.

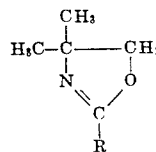
7. A composition according to claim 6, wherein said quaternary ammonium compound is polyethoxylated (15 mole) stearyl methyl ammonium chloride.

8. A composition according to claim 1, wherein said quaternary ammonium compound is present in from about 20 to 40 percent by weight of said composition.

9. A composition according to claim 1, wherein said oxazoline is 2-heptadecyl-4-dimethyl-2-oxazoline.

10. A detergent composition having an inverse foam-to-temperature relationship consisting essentially of from about 8 to 18 percent by weight of built anionic detergent, from about 1 to 6 percent by weight of a  $C_8$ - $C_{30}$  fatty acid, from about 1 to 6 by weight of polyethoxylated mono higher fatty alkyl quaternary

ammonium halide, nitrate or sulfate containing from about 10 to 50 moles of ethylene oxide and from about 1 to 6 by weight of oxazoline having the formula:



wherein R is  $C_{15}$  to  $C_{21}$  alkyl.

11. A composition according to claim 10, wherein said anionic detergent is a linear alkyl benzene sulfonate having about 10 to 22 carbon atoms in the alkyl group.

12. A composition according to claim 11, wherein said alkyl group has about 12 to 15 carbon atoms.

13. A composition according to claim 10, which includes about 10 to 15 percent linear alkyl benzene sulfonate, and said builder salts are selected from the group consisting of alkali metal and ammonium polyphosphates, silicates, borates, sulfates, and combinations thereof.

14. A composition according to claim 10, wherein said fatty acid contains from about 14 to 22 carbon atoms.

15. A composition according to claim 14, wherein said fatty acid is hydrogenated fish fatty acid.

16. A composition according to claim 14, wherein said fatty acid is hydrogenated tallow fatty acid.

17. A composition according to claim 10, wherein said fatty acid is present in from about 2 to 5 percent by weight of said composition.

18. A composition according to claim 10, wherein said quaternary ammonium compound is a polyethoxylated (15 mole) mono fatty alkyl methyl ammonium chloride.

19. A composition according to claim 18, wherein said quaternary ammonium compound is polyethoxylated (15 mole) stearyl methyl ammonium chloride.

20. A composition according to claim 10, wherein said quaternary ammonium compound is present in from about 1 to 3 percent by weight of said composition.

21. A composition according to claim 10, wherein said oxazoline is 2-heptadecyl-4-dimethyl-2-oxazoline.

22. A composition according to claim 10 wherein said detergent is selected from the group consisting of  $C_8$  to  $C_{22}$  linear alkyl benzene sulfonates,  $C_8$ - $C_{25}$  olefin sulfonates,  $C_{10}$ - $C_{22}$  paraffin sulfonates,  $C_{10}$ - $C_{20}$  linear alkyl sulfates and ethoxylated derivatives thereof containing from about 1 to 100 moles ethylene oxide.

23. A composition according to claim 10 wherein said detergent is sodium tridecyl benzene sulfonate.

24. A composition according to claim 13 wherein said builder is sodium tripolyphosphate.

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