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SCOURING PAD

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7 Claims

ABSTRACT OF THE DISCLOSURE

An article of manufacture comprising a scouring pad containing a cleansing composition wherein the said cleansing composition contains soap, hard-water-sensitive or soap-sensitive detergent and an alpha sulfo fatty acid or its mono- or di-salts.

This invention relates to a non-defoaming scouring pad. More specifically, the invention concerns scouring pads comprising plastic or metal wool or mesh impregnated with a cleaning composition and which are capable of general use in water of any degree of hardness.

The utility of scouring pads in the cleaning of pots and pans or other cooking utensils having dried-on or baked-on, hard-to-remove solid materials or grease is well known. Usually, these pads are utilized in the dishpan to clean the pots, pans, and heavily soiled utensils after the lightly soiled plates and dishes have been washed and removed from the dishpan. In using the soap impregnated pad to clean the greasy pots and pans, the antagonistic effect of the soap and the detergent causes greatly reduced foam height and the formation of a greasy scum on top of the water which in turn forms a film on the pots and pans which is difficult to rinse or remove. In addition the defoaming effect of the calcium soap formed by the reaction of the hard water salts generally present in domestic water supplies with the scouring soap also acts to defoam the suds remaining in the dishpan, revealing the aesthetically undesirable dirty dishwater to the eyes of the housewife. This conveys to the housewife the general sense of uncleanness which she does not have if the dishpan is covered with a nice white layer of suds. In addition to this, it is mentioned that the dissipation of the suds is indicative in thought, if not in fact, of a lack of adequate cleaning ability on the part of the detergent used to initially wash the dishes, the soap pad used, or both.

Detergents by themselves do not greatly defoam suds or cause curd formation in the presence of hard water. However a 100% active detergent formulation in the scouring pad is technologically difficult and economically inappropriate. Since detergents, in general, are so expensive to manufacture, a premium price must be obtained when they are sold alone or as the sole active component. Hence, most commercial scouring pads comprise inexpensive soaps either alone or in combination with a small amount of detergent. Where soft water is available, scouring pads containing large amounts of soap may be used with comparatively little defoaming or curd formation. However, in regions where only hard water is available, at least a portion of the soap in the pad is converted into a calcium soap which precipitates in the form of sticky curds. These curds not only have no cleansing properties, but constitute impurities that must be dispersed by a part of the unconverted soap which is then not available for cleansing.

Several attempts to alleviate the above-mentioned problems have not met with success. The use of alcohol sulfates, alkyl aryl sulfonates, various lime soap dispersants and other synthetic materials have failed to prevent defoaming or curd formation. In situations where it has

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been proposed to overcome the disadvantages of soaps by mixing them with certain synthetic detergents or dispersing agents which are hard-water resistant, it has been shown that these proposals are not entirely satisfactory.

It is, therefore, an object of this invention to provide a scouring pad capable of functioning adequately in water having any degree of hardness.

Another object of the present invention is the production of a scouring pad which does not substantially defoam detergent suds.

Additional objects, if not specifically set forth herein, will be readily apparent to those skilled in the art from a reading of the detailed description of the invention which follows.

It has now been discovered that the incorporation of certain alpha sulfo fatty acids or their mono- or di-salts into a soap, a hard-water-sensitive detergent, or soap-detergent formulations results in a composition which, in combination with the scouring material, i.e., metal or plastic wool or mesh, or sponges or sponge wool combinations, successfully alleviates the aforementioned difficulties. The alpha sulfo fatty acids or their salts were found to be superior in that it is believed that after micelle formation the substance is essentially water insoluble. On the other hand, other sulfo derivatives, such as esters of alpha sulfo fatty acids, are unsuitable for several reasons, one of which is that they are extremely soluble and leach out of the scouring pad. An added feature of the alpha sulfo fatty acids is that they are biodegradable and possess no irritating qualities. Such compositions may readily be treated with certain bacteria to the extent that their detergent or surface active properties can be destroyed and hence they do not produce foaming problems in sewage or other disposal systems.

More specifically, it has been discovered in accordance with the present invention that by mixing an ordinary soap, soap-sensitive detergent or a hard-water-sensitive detergent, or a combination of these, with an alkali metal, alkaline earth metal, or ammonium, mono- or di-salt of the alpha sulfo fatty acid or the free acid, an efficient composition is obtained which when dispersed throughout a metal or plastic scouring pad, results in a superior cleansing pad quite suitable for use in hard water. It should be pointed out that the alpha sulfo composition may be an essentially pure compound or a mixture thereof, such as a mixture of the mono- and di-salt or mixtures of various metal acids, i.e., sodium and potassium salts, etc.

Generally speaking, the amount of alpha sulfo compound will be present in an amount of about 2 to about 25 percent by weight of the total cleansing composition. Preferred results were obtained using 10 to 15 percent by weight of the alpha sulfo component; however, even amounts above 25 percent were useful, but the additional cost did not warrant their presence in such high quantities. Various binders such as wax, as well as rust inhibitors, coloring agents, mold or fungicidal inhibitors, and/or fillers may be incorporated into the cleansing composition prior to impregnation of the steel wool or like-metal scouring pad.

Generally speaking, the proportions of the soap or the hard-water-sensitive detergent and the alpha sulfo fatty acid or salt used in the cleansing composition may vary in the manner previously described; the preferred proportions to be employed being dependent largely upon the hardness of the water in which the scouring pad is to be used. By mixing as little as about 2 parts by weight of the sulfo fatty acid or its salt with about 98 parts by weight of a soap, a composition is produced which can be used in moderately hard water without the production of curds. However, in order to produce a composition which is noticeably superior in its ability to not affect the foam nor

produce curds, it is preferred to use at least about 5 parts by weight of the sulfo component for each 95 parts by weight of soap or hard-water-sensitive detergent.

Even in extreme conditions, it has been found that it is unnecessary to use a greater proportion of sulfo component than corresponding to equal parts by weight of sulfo component and soap. For washing in water of moderate hardness, i.e., water of hardness corresponding to about 200 p.p.m. of CaCO_3 or below, a composition containing 10 parts by weight of one or more of the sulfo components and about 90 parts by weight of soap is generally satisfactory. When exceedingly hard waters are to be encountered, the amount of sulfo component is preferably increased correspondingly. For example, for general scouring purposes in water of 400 p.p.m. hardness compositions containing 20 parts by weight of one or more of the sulfo components for each 80 parts by weight of soap are ordinarily satisfactory. In some cases, however, it is advantageous to use in water of this hardness a composition in which the alpha sulfo component or components are present in the proportions of about 30 parts by weight for each 70 parts by weight of soap.

In the present invention, alpha sulfo acids are considered to be acids normally formed by the reaction of a saturated fatty acid with sulfur trioxide in such a manner as to introduce an SO_3 group in the alpha position on the hydrocarbon portion of the fatty chain. Without attempting to expand on the production of alpha sulfo fatty acids which is well covered both in patent and technical literature, it will suffice to describe the production of said sulfo acids only in general terms.

In those instances where it is preferred to eliminate coloring and sludge problems involved from sulfonating the unsaturated components present in commercial fatty acids, substantially pure stearic acid may be used. Sulfur trioxide is reacted with the acid while it is either in a fused state or in a solvent suspended state.

According to another prior art process, less expensive, commercially acceptable alpha sulfo fatty acids can be formed from a stearic acid composition known as rubber grade stearic acids. This composition, in addition to containing between about 45 to 65 percent stearic acid, also contains lower fatty acids as well as about 5 to 10 percent unsaturated acids. This prior art process consists of dissolving the fatty acid composition in a special class of solvents, introducing sulfur trioxide, preferably in combination with a diluent, for example, nitrogen or air, at a maximum temperature of 35°C ., preferably less than 30°C ., and subsequently heating the resulting reaction product at a temperature less than about 100°C .

According to this prior art procedure, the initial product of the reaction between sulfur trioxide and the fatty acids is believed to be an acid sulfate or an acyl sulfuric acid of the fatty acid and sulfuric trioxide. When this intermediate reaction product is subsequently heated at a temperature above 35°C ., the alpha sulfo fatty acid is formed. The rate of formation of the sulfonated fatty acid depends upon the temperature of the second heating step, the higher the temperature the faster the formation. The initial heat treatment of less than 35°C . is required to reduce the tendency for the hydrocarbon solvents to undergo sulfonation.

After formation, the sulfonated fatty acids may be separated from the solvent, either by filtration or as a residue from distillation. The sulfonated acid is then dissolved in water and neutralized to a desired pH by the addition of an alkali, such as sodium hydroxide solution. This results in the production of a mono-alkali salt, for example, the mono-sodium salt of alpha sulfo stearic acid. Thus, normally only the SO_3H group is neutralized. The alkali salt suspension may then be heated to redissolve the salt and subsequently cooled to recrystallize and obtain a substantially pure mono-alkali salt of alpha sulfo fatty acid. A clear product, if the resultant product has a slightly tan appearance, may be obtained by using active charcoal and

adding a bleaching agent, such as sodium hypochloride or hydrogen peroxide, to the hot solution of the acid salt in the above process before recrystallization.

According to one reference, a special class of reaction solvents have been found to be quite effective for use in the sulfonation of the fatty acids. These special solvents are normally straight chain, saturated hydrocarbons exemplified by hexane, heptane, octane, and even the lower fraction such as propane of butane when used under pressure. As is well known, almost all the solvents normally used are susceptible in varying degrees to attack by the sulfur trioxide. Hence, the fatty acid is normally suspended or completely dissolved in the solvent prior to reaction with the sulfur trioxide.

The alpha sulfonic acid derivatives of saturated fatty acids utilized in this invention are those containing about 12 to 24 carbon atoms and include saturated fatty acids which contain substituents which do not affect adversely the detergent and dispersing properties of the acid or its salts. While it is preferred to have the fatty acid in essentially saturated form, i.e., very little unsaturation, it should be noted that in some instances commercial mixtures are quite adequate. Therefore, when suitable fatty acids are specified throughout the specification, it should be understood that mixtures of saturated fatty acids as well as mixtures of saturated and unsaturated fatty acids are contemplated. Examples of suitable fatty acids are stearic acid, palmitic acid, myristic acid, lauric, arachidic acid, and behenic acid. Of course, odd-numbered fatty acids, such as pentadecanoic acid, heptadecanoic acid, and nonadecanoic acid, may be utilized. The utilization of fatty acids derived from halogenated tallow and fatty acids derived from tallow stearin are of particularly practical value from an economic standpoint.

The salts of the alpha sulfo fatty acids may be alkali metal, alkaline earth metal, ammonium or lower mono- or di-alkyl amine salts wherein the alkyl group of the amine contains 1-4 carbons and may contain OH groups. Salts may be formed by the neutralization of the free acid. Particularly suitable salts are the mono- or di-salts wherein the cation is sodium, potassium, ammonium, magnesium, calcium, barium, lithium, etc. The salts may be formed by the simple replacement, i.e., metal above hydrogen on the free acid, a metal plus salt reaction, or the commonly employed double decomposition reaction. When using one equivalent of metal per alpha sulfo carboxylic acid, generally only the SO_3H group is neutralized. Accordingly, when the mono-salt is mentioned throughout the specification it is understood that the mono-salt is that salt neutralized only at the SO_3H group. Of course, in the di-salt, both the sulfo group and the carboxyl group are neutralized. Specific examples of sulfo fatty acid salts suitable for use in the cleansing compositions of this invention are as follows: monosodium alpha sulfo stearic acid, monopotassium alpha sulfo stearic acid, monolithium alpha sulfo stearic acid, monosodium alpha sulfo myristic acid, monopotassium alpha sulfo palmitic acid, monolithium alpha sulfo arachidic acid, monosodium alpha sulfo behenic acid, disodium alpha sulfo stearic acid, dipotassium alpha sulfo stearic acid, dilithium alpha sulfo stearic acid, as well as identical salts substituting calcium, magnesium, barium, ammonium, etc., for the above mentioned specific cations.

As discussed above, the ordinary soap, hard-water-sensitive detergent or soap-sensitive detergent comprises the major amount of the cleansing composition. Since the production of soap is well known, a detailed analysis of the definition of said soaps will not be set forth here. However, a general description of the soaps contemplated for use in this invention will be illustrated. Soluble soaps, by definition, are the sodium and potassium salts of the saturated fatty acids having from about 8 to about 24 carbon atoms. Those soaps containing the sodium ion are considered hard soaps while those with the potassium are called soft as they are more water-soluble than the former.

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While soaps of other metals (copper, lead, mercury, zinc, and aluminum) have special uses, generally these soaps are not suitable for washing or cleansing purposes and are not considered to be included by the term "soluble soaps" utilized throughout this specification. Since a high percentage of saturated acids are desirable, beef and mutton tallow, palm oil, cocoanut oil, lard, hydrogenated vegetable or whale oils are utilized in the saponification process. The soap molecule has a long hydrocarbon chain and a polar carboxyl group. The hydrocarbon part has a fat-dissolving property while the carboxyl group is attracted and held by the water.

The various types of detergents utilized in scouring pads is well known and a detailed description is believed not to be warranted here. Generally speaking, however, the teachings of this invention are especially directed to hard-water-sensitive detergents or soap-sensitive detergents, i.e., those detergents that have an antagonistic effect on suds when in the presence of soaps. Hard-water-sensitive detergents are generally of the polyglycol ester type with a substantial free fatty acid content. However, any detergent capable of forming water insoluble calcium salts in hard water can be considered hard-water-sensitive for the purposes of this invention.

The following examples are presented to illustrate the invention. It will be understood that these examples are merely illustrative and should not be taken in any manner as limiting the invention as defined in the appended claims.

EXAMPLE I

Fifty parts by weight of water was poured into a conventional soap-mixing vessel. Thirty-five parts by weight of sodium tallow soap and 5 parts by weight of the disodium salt of alpha sulfo stearic acid were added and dispersed evenly throughout the solution. The mixture was then heated to a temperature of between about 145–155° F. until completely homogeneous. The mixture at this point was cloudy but quite fluid. A steel wool ball was impregnated by dipping in the solution. The excess cleansing material was removed by pressing, and the impregnated pad was then dried in a conventional oven at about 200° F. The resulting scouring pad was found to not essentially affect the foaming of suds present on top of normally used dishwater. Further, there was no evidence of calcium salt curd formation.

EXAMPLE II

Identical to Example I except that 52 parts by weight of water, 3 parts by weight of the dicalcium salt of alpha sulfo stearic acid and 45 parts of sodium tallow soap were utilized.

EXAMPLE III

Seventy percent potassium vegetable oil soap, 10 percent potassium salt of alpha sulfo stearic acid, and 20 percent water were utilized, and the procedure was the same as that described in Example I except that the pad was freeze-dried.

EXAMPLE IV

Forty parts sodium salt of dodecylbenzene sulfonic acid, 8 parts of the sodium salt of alpha sulfo myristic acid, 20 parts of sodium tallow soap, and 52 parts of water were utilized, and the procedure was the same as that described in Example I.

EXAMPLE V

Fifteen parts sodium salt of tetrapropylene sulfonic acid, 30 parts of sodium tallow soap, 15 percent paraffin

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wax, 8 sodium salt of sulfo stearic acid, and 47 percent water were utilized, and the procedure was the same as that described in Example I.

EXAMPLE VI

The cleansing compositions prepared in the above examples were used to impregnate steel wool, copper mesh and plastic mesh scouring pads. In all instances, there was no visible effect on the foam of the synthetic dishwashing detergents when the scouring pads were dipped and utilized in the dishwashing composition. The steel wool utilized is that formed from fibrous steel which is commonly used for scouring purposes.

Coloring agents which give a pleasant color to the scouring pads may be utilized. Filler materials, such as gypsum, lava, silica, clay, nutshells, diatoms, etc., along with scouring or gritty materials may be utilized. Mold inhibitors, such as phenol, formaldehyde, pentachlorophenol, etc., as well as rust inhibitors which are known to be effective for preventing the rusting of iron, may be utilized. Such rust inhibitors include: borax, sodium carbonate, sodium chromate, sodium nitrate, sodium phosphate, etc.

Obviously, many modifications and variations of the invention as set forth herein may be made without departing from the spirit and scope of the invention, and, therefore, only such limitations should be imposed as are indicated in the appended claims.

We claim:

1. As an article of manufacture, an improved scouring pad impregnated with a cleansing composition containing water soluble soap and about 2% to about 25%, by weight, of an alpha sulfo member selected from the group consisting of alpha sulfo fatty acids, mono-salts of alpha sulfo fatty acids, di-salts of alpha sulfo fatty acids, and mixtures thereof, said fatty acids having about 12 to about 24 carbons so that the scouring pad possesses non-defoaming of suds properties.
2. The article of claim 1 wherein the salts of the alpha sulfo fatty acids are alkali metal, alkaline earth, ammonium or lower mono- or dialkyl amine salts.
3. The article of claim 1 wherein the salt of the alpha sulfo fatty acid is an alkali metal or alkaline earth metal salt of an alpha sulfo fatty acid having an average of between about 16 to 18 carbons.
4. The article of claim 3 wherein the salt is a sodium salt of alpha sulfo palmitic acid.
5. The article of claim 3 wherein the salt is a calcium salt of alpha sulfo palmitic acid.
6. The article of claim 3 wherein the salt is a potassium salt of alpha sulfo palmitic acid.
7. The article of claim 3 wherein the soap is a tallow soap.

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