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3,794,589

CHEMICAL COMPOSITIONS FOR GENERAL CLEANING

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No Drawing. Continuation-in-part of abandoned application Ser. No. 153,101, June 14, 1971. This application Jan. 19, 1973, Ser. No. 325,153

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8 Claims

ABSTRACT OF THE DISCLOSURE

Soaped-based cleaning compositions for use in hard or soft water, sea water and brine are prepared by incorporation into or blending with soap minor quantities of other materials which render the natural hardness found in water harmless or even beneficial to laundering and dishwashing processes. The ratio of soap to synthetic detergent of the compositions is high to permit the cleaning effectiveness in hard or soft water, biodegradability, health hazard and non-polluting character of these compositions to be substantially that of soap when soap is used in soft water. In one embodiment of the invention the composition contains 90 to 95 percent of soap and about 5 to 10 percent of an alkyl sulfate-free higher alcohol mixture in which the free higher alcohol content of the mixture is from about 5 to 15 percent. Another embodiment provides a composition containing 76-94 parts soap, 5 to 10 parts alkyl sulfate-free higher alcohol mixture, 2 to 4 parts of another synthetic detergent surfactant, 2 to 8 parts of a sodium polyphosphate, and 2 to 12 parts of an inorganic salt.

This application is a continuation-in-part of application No. 153,101, filed June 14, 1971, now abandoned.

This invention relates to the preparation of low-cost compositions that are highly effective in laundering, dishwashing and hard surface cleaning. The compositions are readily biodegradable and pose no waste disposal problem in comparison with the presently available commercial preparations.

Current home laundry processes make use of compositions which may consist of detergents, alkalis, organic and inorganic sequestering agents mainly phosphates, silicates, carboxymethylcellulose, bleaches, enzymes, optical brighteners and sodium sulfate for cleaning ability. Perfumes, odorants, dyes and dust control agents may also be present to increase acceptance to the user. Though the cleaning compositions comprised of the above named ingredients are very attractive, these compositions have numerous disadvantages. The phosphates, which may comprise 10 to 40 weight percent of the composition, are a major source of water pollution by causing eutrophication of water courses, lakes and other water bodies by fertilization of algae and other undesirable plant life. Excessive algae and undesirable water plant growth leads to choking of waterways, malodors and decrease in dissolved oxygen in the water with consequent depletion of game and edible fish. The water may become unfit for human drinking, bathing, cooking, manufacturing and recreation purposes.

Sodium sulfate and other inorganic salts in the wash effluent lead to increased dissolved matter in the watercourse. The optical brighteners and carboxymethylcellulose are substantive to the fabrics of the wash load, build

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up with successive washes and contribute to graying and yellowing. These off-colors are most noticeable in white cottons and nylon fabrics. Finely powdered enzymes such as proteases, lipases and amylases may pose health hazards to persons engaged in their manufacture by breathing of air containing these enzyme dusts.

The presently used compositions are used in excessive amounts of 0.5 percent by weight in water in accordance with the manufacturer's label recommendation to use one to one and a half eight ounce cups per wash load (usually 12 to 18 gallons of water). Even at these use concentrations soiled synthetic-fibred materials are not cleaned well. The cuff and neck areas of men's white shirts are also poorly cleaned.

The present day compositions in use are soluble in hard water without any visible evidence of lime soap formation such as curds or scum due to the relative calcium and magnesium insensitivity of the organic detergents and the water softening ability of the phosphates.

Prior to the use of these phosphate built organic detergent compositions soap was widely used for laundering. The use of soap required soft water or lime soaps rings, curds or scum would adhere tenaciously to the walls of the wash-containing vessel as well as on the fabrics of the wash load.

Housewives welcomed the soapless composition, consisting of mainly synthetic detergents, sequestering phosphates and sodium sulfate, as an answer to the problems created by the use of soap in hard water.

In soft water soap is a highly effective cleaner of all types of natural and synthetic fabrics. Many communities are reluctant to invest the capital required to soften natural water which may contain 100 parts per million (p.p.m.) calcium and magnesium hardness expressed as equivalent calcium carbonate to 0 to 50 p.p.m. hardness (considered to be softwater).

It would be advantageous to be able to use hard water and soap-based compositions, if it were possible to render harmless or even beneficial to the wash process the effects of the lime soaps formed during the process.

This is made possible in accordance with the first embodiment of this invention by providing a composition consisting of a soap, an alkyl sulfate and a higher alcohol. When dissolved in 120° F. water of from 0 to 300 p.p.m. hardness at a concentration of from 0.1 to 0.3 percent by weight the composition according to my invention meets the requirements for furnishing a composition for highly effective laundering in hard water using soap-based compositions.

The composition of this embodiment of the invention consists essentially of about 90 to 95 weight percent of soap and about 5 to 10 weight percent of an alkyl sulfate-free higher alcohol mixture in which the free higher alcohol content of the alkyl sulfate-free higher alcohol mixture is from about 5 to 15 weight percent. The soaps suitable for this composition are sodium salts of fatty acids which are essentially in the range of from 8 to 18 carbon atoms, that is, the usual soap-making range. It will be understood that small amounts of soaps of fatty acids outside this range may be present depending upon the source of the fatty acids. The alkyl sulfate is a sodium alkyl sulfate in which the alkyl portion consists essentially of alkyl of 8 to 18 carbon atoms. The free alcohols are monohydric alcohols essentially in the 8 to 18 carbon atom range. The soap, alkyl sulfate and free alcohol may be derived from naturally occurring fats and oils or from synthetic processes practiced on petrochemicals including

paraffin oxidation, caustic fusion, oxo processes and olefin chain growth.

The soap used contributes excellent detergency of soiled cotton and synthetic fabrics. The sodium alkyl sulfate assists the soap in dispersing and emulsifying the lime soap curds formed by the action of the calcium and magnesium ions present in hard water on part of the soap. The high alcohol in combination with the soap and alkyl sulfate promotes the formation of a stable colloidal dispersion of the lime soaps in the washing medium. This stable state is maintained in even 300 p.p.m. hard water and the stable dispersed or emulsified state persists even during later rinsing operations without formation of lime soap curds, scum or films on the surface of the washing machine or on the fabrics being washed.

A further unforeseen advantage of this composition is the ability to maintain a high foam level during the wash or sudsing operation and to permit an immediate cessation of foaming during the rinse operation. The composition is very easily rinsed from the wash with moderate to low quantities of water as compared to the quantity of water required to rinse out the presently widely used commercial laundry preparations.

The quantity of soap-based composition to be used will vary with the water hardness increasing from a minimum of 0.1 percent by weight for 0 p.p.m. hard water to a maximum usage of 0.30 percent by weight for 300 p.p.m. hard water.

This level of use of the composition of this invention represents from about $\frac{1}{3}$ to $\frac{1}{2}$ the quantities recommended by manufacturers of commercially available compositions.

Among the advantages of the compositions of this invention is their superior cleaning ability. White fabrics after washing have higher visual whiteness, soil removal as observed by removal of gray on nylon and cotton and removal of soil on men's white shirts in the neck and cuffs of sleeves areas is highly effective. Stains such as dried blood, chocolate, milk, tea and coffee stains are more completely removed than by the largest selling commercial laundry detergents. The washed load after drying is odor free, softer and virtually free of lint.

Soap, alkyl sulfate and higher alcohols are among the most easily biodegraded of organic washing material. They are among the least irritating to eyes and skin and are among the least toxic if accidentally ingested of known cleaning agents. No alkaline builders, phosphates or other cleaning adjuvants are required.

Should the water used be extremely soft a small quantity of hardness may be introduced to the process water in the wash cycle by adding sufficient anhydrous calcium chloride to yield about 20 p.p.m. hardness. This hardness in conjunction with the use of the composition of this invention promotes free rinsing and rapid removal of persistent or sticky foam in the rinse cycles.

In accordance with a second embodiment of this invention there is provided another composition, mainly soap-based and containing lesser quantities of lime soap dispersing, stabilizing and free rinse promoting ingredients. The use of a soap-based composition containing lesser quantities of synthetic detergent, inorganic sequestrants and inorganic salts has been found to be a highly effective laundering composition in hard or soft water.

The preferred composition of the second embodiment of the invention consists essentially of about 76 to 94 weight percent of a sodium soap derived from fatty acids essentially containing from 8 to 18 carbon atoms, about 2 to 4 weight percent of an anionic, non-ionic or amphoteric detergent selected from the group consisting of alkyl sulfates, linear alkyl aryl sulfonates, alkyl sulfonates, alkyl aryl polyether sulfates and sulfonates, alkyl polyether alcohols alkyl aryl polyether alcohols, sorbitol, glycol and glyceryl ester of higher acids and amine fatty acid condensate amphoteric, 2 to 8 weight percent of a sodium salt of phosphoric acid, said sodium salt having sequester-

ing properties and being selected from the group consisting of sodium tripolyphosphate, sodium hexametaphosphate and sodium pyrophosphate, and 2.0 to 12 weight percent of an inorganic salt selected from the group consisting of sodium chloride and sodium sulfate.

The similarity of the two embodiments lie in their mode of action, application and interchangeability. The two embodiments give the formulator a broader selection of ingredients and raw material costs and serve effectively as laundry detergents in automatic laundry machines of differing designs.

Both compositions possess the high cleaning ability of soaps. The synthetic detergent present does not exceed about 10 percent by weight of the combined weight of soap and synthetic detergent present. Thus the unique soil suspending property of soap is not impaired by an excessive quantity of synthetic detergent.

During actual washing operation, using home laundry machines, there is a sequence of cycles. In the sudsing cycle the washing composition is dissolved in water into which the wash load has been placed. The washing composition is dissolved and agitated so as to contact the soiled wash load thereby loosening soil from the wash load.

At the conclusion of this sudsing cycle the sudsy water is drained from the wash load by gravity, pumping action and centripetal force due to the spinning of the basket containing the wash load. Depending on the texture of the fabrics more or less sudsy solution will be retained by the wash load. Thus heavy cotton beach towels will retain more sudsy solution than dacron shirts.

After draining, a rinsing cycle ensues in which clear water is sprayed on the wash load and said water diluting the sudsy fabric-retained water is then eliminated through pores in the wash basket by centripetal force. Then clear water fills the wash basket and is agitated contacting the wash load to remove the remaining suds from the wash load. These diluted suds are then removed by draining. A sequence of sprays and spins and finally spins to eliminate excessive water from the wash load terminates the laundry machine washing operation.

The wash load is then dried in a drier; in which operation heated air flowing through the wash load eliminates the moisture retained by the wash load.

Using soap alone as the washing composition various difficulties are encountered. While the cleaning during the suds cycle is highly effective, the profuse and dense suds generated by soap may require a longer drainage time to be eliminated during the draining period due to the sticky character of the soap suds. The suds are also voluminous due to much entrapped air.

During the rinsing fill with clear hardness-containing water the small amount of soap suds remaining in the wash load are converted to highly tenacious and sticky lime soap curds. These lime soap curds formed are due to the reaction of the soap and the hardness (usually calcium and magnesium salts) of the rinse water. The lime soap curds so formed adhere to the wash load and sides of the wash basket.

The built synthetic detergents in general use also have numerous disadvantages. The synthetic detergent used being a poor cleaner in comparison to soap must be built or reinforced with corrosion inhibitors such as metasilicates, soil suspending agents such as phosphates, anti-redeposition agents such as carboxymethylcellulose and excessive quantities of sodium sulfate as a bead forming adjuvant and diluent. Some of these formulations are also highly alkaline thus posing a potential human health hazard to children.

These built compositions tend to clean poorly as compared to soap and white fabrics tend to become gray after successive washings. The addition of optical brighteners may be required to mask this graying tendency. The wash load after drying is generally of a stiffer texture than when washed with soap due to a felting action of the built compositions acting on the fabrics of the wash load.

The presence of 10 to 40 percent by weight of phosphates and their disposal also lead to fertilizing algae and consequent eutrophication of water courses. The various substitutes, such as NTA and EDTA, proposed to replace phosphates may also pose a pollution or health hazard. Tartrates and citrates are usually expensive and do not exhibit the desirable threshold effect of phosphates to be able to peptize soils when phosphate is present in very small quantities such as 10-20 parts per million by weight in water.

The compositions of this invention have the high cleaning ability and soil suspending action of soap. While lime soaps are formed they are not sticky tenacious curds but are formed in an emulsifiable or dispersed state in which state they can readily be rinsed completely from the wash load and sides of the wash basket.

The soap of the compositions of this invention furnishes the high cleaning of the wash load and the other materials acting in concert modify the lime soap formed from a bulky, and tenacious curd or scum to a freely rinsable form as well as to improve sudsy water drainage and to promote free rinsing.

In the first embodiment of this invention it was found that the addition of sodium alkyl sulfate and free higher alcohol to soap furnished a composition which when used as a laundry composition yielded highly effective cleaning in hard water. However the proportions used of soap, alcohol and alkyl sulfate are critical.

Preston in U.S. Pat. 2,527,075 also teaches the use of soap, alkyl sulfate and free higher alcohol.

However Preston's compositions contain excessive quantities of alkyl sulfate and free higher alcohols as compared to the present invention. Preston advocates at least 2 percent by weight free higher alcohol and preferably 5 percent compared to a maximum of 1.5 percent and preferably 0.8 percent in the present invention.

Preston also advocates a 6:1 ratio of soap to synthetic detergent as compared to 9:1 in the present invention.

Preston's higher synthetic detergent, lower soap and greater free higher alcohol content lead to inferior cleaning, poorer rinsing and a residual higher alcohol odor as compared to the results yielded by the composition of the present invention when both compositions are compared in use as laundry detergents.

In the second embodiment of this invention the soap serves as the major cleaning ingredient and the lesser quantities of synthetic detergent, phosphate and salt acting in concert serve to tailor the lime soap formed into an easily rinsable emulsion or dispersion.

The relative proportions of soap, synthetic detergent, phosphate and salt were found to operate most efficiently within certain limits to optimize high cleaning, good drainage of suds and free rinsing of lime soaps.

Having established the limits for the first and second embodiments of this invention it was found that optimal performing compositions could be obtained by blending compositions of the first two embodiments of the present invention to give a third embodiment of this invention.

By adding the non-soap ingredients of the first embodiment to the non-soap ingredients of the second embodiment and then adding the combined non-soap ingredients to a sodium soap there results a third embodiment according to the present invention.

The composition of this third embodiment consist essentially of about 5 to 10 parts by weight of an alkyl sulfate free higher alcohol mixture, about 2 to 4 parts by weight of another synthetic detergent, about 2 to 8 parts by weight of a sodium salt of phosphoric acid, about 2 to 12 parts by weight of an inorganic salt and about 76 to 94 parts by weight of soap.

The preferred compositions of the three embodiments are those in which soap is present at a level of at least 90 weight percent of the combined soap, alkyl sulfate and synthetic detergent content.

The use of the soap-based compositions have numerous other advantages. New technology has made available

many new synthetic soaps, detergents and higher alcohols in large volume and at low cost. Many of these materials are from new processes and possess unique properties and applications. Soaps may be derived from naturally occurring fats and oils of a vegetable, marine or animal origin. Soaps may be derived from hydrogenated fats and oils. Soaps may be derived from the caustic fusion process as described in U.S. Pat. No. 3,503,896 from natural or synthetic alcohols produced by the oxo, and ethylene chain growth processes. Soaps may be derived from paraffin oxidation processes as practiced in the U.S.S.R. and elsewhere. The titre of the acids sprung from the soaps by acidifying the soaps and extracting the resulting acids, may be as high as 50° C., the higher titred acids coming from soaps operating at optimum detergency at higher wash temperatures. Soaps used may be made from mixed fatty acids having essentially 8 to 18 membered carbon chain lengths, with at least about 90% being in the 8 to 18 carbon atom range, of alpha branched or unbranched configuration, possessing saturation or unsaturation, of odd or even-membered chain lengths and in all combinations of these properties.

The alkyl sulfate may be made by the sulfation and neutralization of alcohols or olefins produced from natural occurring fats and oils, produced from the oxo process or by ethylene chain growth processes. Alcohols suitable for use in the compositions of this invention may have essentially 8 to 18 membered chain lengths, a branched or normal configuration, a single hydroxyl group on the primary or secondary position, possess saturation or unsaturation, odd or even-membered chain lengths and having these properties in all combination. Mixed alcohols essentially in the 8 to 18 carbon atoms range are normally used.

The cation of the soap or alkyl sulfate should confer water solubility to the soap or alkyl sulfate. Sodium is preferred rather than potassium or amine for reasons of low-polluting and low algae-fertilizing effect.

The higher alcohol may derive from the same processes or sources as the alcohol used to prepare the alkyl sulfate. It may arise from alcohol present with the alkyl sulfate due to intentional or unintentional non-reaction of the total alcohol in the sulfation process or it may be added to the fully sulfated alcohol or alkyl sulfate. The free higher alcohol and the alcohol undergoing sulfation may be different in composition.

The organic detergents of the compositions of this invention may be nonionic, anionic or amphoteric. They should be water soluble or water solubilizable by the soap of the composition. They should be easily and quickly biodegraded, of a low order of irritation to skin and eyes and be low cost materials. Some suitable anionic detergents are alkyl sulfates, linear alkyl aryl sulfonates, alkyl sulfonates, alkyl aryl polyether sulfates and sulfonates.

Some suitable nonionics for illustrative purposes are alkyl polyether alcohols, alkyl aryl polyether alcohols, sorbitol, glycol and glyceryl esters of higher acids.

Ethoxy adducts may be replaced by propoxy and butoxy products. Suitable amphoteric may be derived from the condensation of amines and fatty acids.

Some suitable inorganic sequestrants are the water soluble polyphosphates, hexametaphosphates and pyrophosphates. The sodium salts are preferred.

Ethylenediamine tetracetate and nitrilotriacetate also known as EDTA and NTA are not considered entirely suitable because of their present unclarified health hazard status.

Suitable inorganic salts are sodium and potassium chlorides and sulfates. The sodium salts are preferred.

Other additives such as dyes, odorants, anti-redeposition agents, dust control agents, soap antioxidants, corrosion inhibitors, alkalis and spray drying adjuvants may be added for applications well-known in the soap and detergent art to achieve specific effects without departing from the spirit of this invention. These additives are to

be added in the minimal quantity required where needed so as to pose no water pollution problem or human health hazard.

The compositions of this invention also possess advantages in hand dishwashing application. 0.1 to 0.2 percent by weight solutions of the compositions in water are readily soluble from room temperature to 120° F., possess high detergency in soil removal, are mild, function well in hard or soft water are freely rinsed and pose no waste disposal or foaming problems.

Presently used hand dishwashing commercial preparations are profuse and persistent sudsers but only fair soil removers. They also contain amides and amine oxides and are a potential source of nitrogen for algae fertilization. The persistence of their foam has for example been a problem in the Suffolk County Section of Long Island, in New York State. The effluent from dishwashing returns to the house water supply system and provides a source of incoming foaming water.

The compositions of this invention are also highly effective hard surface cleaners, automobile or car washes, glass and mirror cleaners, and are useful in preparing disinfectants and emulsions.

The addition of sufficient sodium hypochlorite solution to yield 10 to 25 parts per million free chlorine in a 0.2% solution of composition in wash water will sanitize or materially reduce the microorganisms present on the soiled load in laundry or dishwashing applications.

The invention will now be illustrated by means of the following non-limitative examples.

EXAMPLE 1

The following four compositions were prepared and compared for their lime soap dispersing properties:

	Parts by weight
Composition A: Sodium tallow soap	100
Composition B:	
Sodium tallow soap	95.000
Sodium alkyl sulfate	4.875
Free alcohol	0.125
	100.000
Composition C:	
Sodium tallow soap	95.000
Sodium alkyl sulfate	4.600
Free alcohol	0.400
	100.000
Composition D:	
Sodium tallow soap	90.000
Sodium alkyl sulfate	8.500
Free alcohol	1.500
	100.000

The titre of the fatty acids of the tallow soap was 42° C. The alkyl group of the sodium alkyl sulfate and the free alcohol were derived from coconut oil. The composition by carbon number distribution of the alcohol and alkyl groups was

	Percent by weight
Saturated:	
C ₈	6
C ₁₀	5
C ₁₂	47
C ₁₄	17
C ₁₆	9
C ₁₈	5
Unsaturated:	
Mono C ₁₈	9
Unsaturated	
di C ₁₈	2
	100

The composition of acids for the tallow soap was

	Percent by weight
Saturated:	
C ₁₂	0.5
C ₁₄	3.0
C ₁₅	0.5
C ₁₆	25.0
C ₁₇	1.0
Unsaturated	
C ₁₈	18.0
C ₁₄	1.0
C ₁₆	3.5
C ₁₈	47.5
	100.0

0.2 percent by weight of Compositions A, B and C were prepared in city water having 100 p.p.m. calcium hardness calculated as CaCO₃.

50 ml. of each of the solutions was diluted with 200 ml. of city water and observed for lime soap formation in glassware.

Composition A yielded a solution having large lime soap curds and the glass could not be rinsed free of lime soap with city water.

Composition B yielded a solution having a slight film of lime soap above the solution and was rinsable using large quantities of city water.

Compositions C and D yielded solutions having no film or evidence of lime soap curds and were homogeneous, stable emulsions. The glass containers were freely rinsable with city water.

The ratio of free alcohol to alkyl sulfate in the optimum performing compositions C and D were 8 to 92 and 15 to 85 respectively as compared to 2.5 to 97.5 in the poorer lime soap dispersing composition B.

EXAMPLE 2

The following compositions were prepared and tested as in Example 1.

	Parts by weight
Composition A: Sodium tallow soap	100
Composition B:	
Sodium tallow soap	88
Sodium alkyl sulfate (containing 2.5% free alcohol)	12
Composition C:	
Sodium tallow soap	88
Sodium tripolyphosphate	12
Composition D:	
Sodium tallow soap	88
Sodium chloride	12
Composition E:	
Sodium tallow soap	88
Sodium alkyl sulfate	5
Sodium chloride	7
Composition F:	
Sodium tallow soap	88
Sodium alkyl sulfate	5
Sodium tripolyphosphate	7
Composition G:	
Sodium tallow soap	88
Sodium alkyl sulfate	2
Sodium tripolyphosphate	4
Sodium chloride	6
Composition H:	
Sodium tallow soap	76
Sodium alkyl sulfate	4
Sodium tripolyphosphate	8
Sodium chloride	12

Composition I:	Parts by weight
Sodium tallow soap -----	94
Sodium alkyl sulfate -----	2
Sodium tripolyphosphate -----	2
Sodium chloride -----	2

0.2 percent by weight of the compositions in 100 p.p.m. hardness city water were prepared and diluted 1 part by volume with 4 parts by volume of 100 p.p.m. city water and observed for lime soap separation and rinsability.

A had a heavy floating lime soap curdlike mass clinging to the side of the glassware. The lime soap could not be rinsed from the glass ware sides.

B had a slight film of lime soap rinsable with much water.

C had a heavy floating lime soap curdlike mass clinging tenaciously to the sides of the glassware and could not be rinsed from the glassware sides.

D ditto

E had a small amount of floating lime soap scum and was rinsable with large quantities of water.

F ditto

G, H and I no film, scum or curds evident. Glassware was freely rinsable with a small quantity of water.

Tests made with sodium sulfate indicated that replacement of sodium chloride by sodium sulfate yielded equivalent results.

EXAMPLE 3

In an automatic home washing machine using composition C of Example 1 in a powdered form, a 0.2 percent by weight solution was prepared in 12 gallons of 120° F. city water of 100 p.p.m. hardness. An 8 pound load of soiled laundry, consisting of cotton, acrylic, polyester and nylon fabrics, was added and washed. Observations were made throughout the wash cycle for ease of solution of the composition, formation of lime soap in the wash water, on the fabrics and on the wall of the washing machine during washing and rinsing cycles. The washed load was dried in an automatic electric clothes dryer and observed for speed of drying, cleanliness, odor and softness of the dried fabrics.

Similar washes were performed with a leading high-foaming anionic commercial preparation and with a leading low-foaming nonionic commercial preparation.

Composition C of Example 1 was readily soluble in the wash water and yielded no lime soap curds or film in the washing or rinsing cycles. Foaming was excellent throughout the sudsing cycle and disappeared completely at the onset of the rinse cycle indicating the free rinsing character of the foam of composition C of Example 1. The dried wash was free of soil, stains and lint, men's white shirts were totally free of soil on the cuff and neck areas, cotton bath towels were soft and all washed fabrics were odor free. This wash using composition C of Example 1 was repeated twenty times over a two month period with the same results and with no evidence of lime soap curds on the walls of the washing machine or on the fabrics.

Both commercial preparations were used at the rate of 8 ounces avoirdupois per 12 U.S. gallons of wash water or at a use level of 0.5% by weight. The anionic-based preparation foamed well initially but lost its foaming ability half way through the sudsing cycle. Visual appearance of the wash indicated incomplete removal of soil on the neck and cuff areas of men's white shirts, much lint clung to the fabrics and the dried fabrics had a harsh feel. White synthetics appeared slightly gray in color. No evidence of lime soaps was noted.

The nonionic-based commercial preparation performed in a similar fashion to the anionic-based commercial preparation except foaming was lower.

The approximative composition of the anionic high foaming preparation was

	Parts by weight
Sodium alkyl aryl sulfonate -----	15
Sodium metasilicate -----	5
Carboxymethylcellulose -----	1
Sodium tripolyphosphate -----	30
Optical brightener -----	0.2
Sodium sulfate -----	Balance to 100

Enzymes were present.

The approximate composition of the nonionic low-foaming preparation was

	Parts by weight
Alkyl aryl polyether alcohol -----	10
Sodium metasilicate -----	5
Carboxymethylcellulose -----	1
Sodium tripolyphosphate -----	30
Optical brightener -----	0.2
Sodium sulfate -----	Balance to 100

Enzymes were not present.

The washing machine and dryers were 1968 models of the leading selling brands in the United States and Canada.

EXAMPLE 4

Using composition G of Example 2 the same results were obtained as reported for Example 3 (using Composition C of Example 1).

EXAMPLE 5

Washes using the compositions of Example 1 Composition C and Example 2 Composition G were repeated following the procedure of Example 3. However 8 fluid ounces of a 5% sodium hypochlorite solution was added to the wash cycle.

No evidence of any incompatibility of bleaches and compositions were noted. No lime soap curds were observed. The dried washed fabrics were bright, clean, odor free and soft to touch. Stain removal was excellent.

EXAMPLE 6

The procedures of Examples 1 through 5 were repeated replacing the sodium tallow soap of the compositions with an equal weight of a sodium soap made from 80% tallow and 20% coconut fatty acids. The results obtained were similar to those reported in Examples 1 through 5.

EXAMPLE 7

The procedures of Examples 1 through 5 were repeated replacing the sodium tallow soap of the compositions with an equal weight of a sodium soap made with 90% tallow fatty acids and 10% rosin acids. The results obtained were similar to those reported in Examples 1 through 5.

EXAMPLE 8

The procedures of Examples 1 through 7 were repeated in 300 p.p.m. hard water. Sufficient anhydrous calcium chloride was added to 100 p.p.m. hardness city water to increase the water hardness to 300 p.p.m. Composition use level was increased to 0.30 weight percent. Results obtained were similar to those obtained in Examples 1 through 7.

EXAMPLE 9

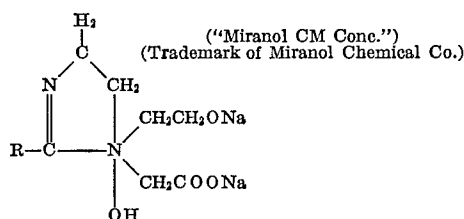
The procedures of Examples 1 through 7 were repeated in a simulated sea water prepared by adding 3.5 weight percent of sodium chloride to city water. Results obtained were similar to those obtained in Examples 1 through 7.

EXAMPLE 10

The sodium alkyl sulfate of Example 2 Composition G was replaced with the same quantity of the following in separate trials: sodium alkyl aryl sulfonate (sodium duodecyl benzene sulfonate), alkyl aryl polyether alcohol

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(isooctyl phenoxy polyethoxy ethanol—the ethoxy being a 10 mol adduct of ethylene oxide) and an amphoteric surfactant. Typical examples of suitable amphoteric are sodium N-coconut- β -aminopropionate and the “Miranols” of commerce, e.g.,



where R represents the coconut- derived alkyl. The procedures of Examples 2 through 9 were repeated and results similar to those reported in Examples 2 through 9 were obtained.

EXAMPLE 11

The coconut derived alkyl sulfate and free alcohol used in the compositions of this invention of Examples 1 through 9 was replaced with a sodium tallow sulfate having a 10% by weight free tallow alcohol content. The procedures of Examples 1 through 9 were repeated and similar results were obtained as reported for the compositions in Examples 1 through 9.

EXAMPLE 12

A comparison of the effectiveness as a laundry detergent was made between a composition as taught by Preston in U.S. Pat. 2,527,075 and a composition representing the upper limits of alkyl sulfate and free higher alcohol of the first embodiment of the present invention.

Composition A (Modified Example 7 of U.S. 2,527,075)	
	Weight percent
Sodium tallow coconut soap (tallow to coconut ratio of 75:25) -----	81.0
Sodium alkyl sulfate (alkyl coconut derived) ----	16.0
Free alcohol (coconut derived) -----	3.0
	100.0

Composition A modified Example 7 of U.S. 2,527,075 by replacing the sodium salt of the sulfuric acid esters of coconut oil monoglyceride by sodium alkyl sulfate. Composition A represents approximately the lower limits of alkyl sulfate and free alcohol claimed by Preston.

The following Composition B represents the upper limits of alkyl sulfate and free alcohol of the present invention.

Composition B	
	Weight percent
Sodium tallow coconut soap -----	90.0
Sodium alkyl sulfate -----	8.5
Free alcohol -----	1.5
	100.0

Compositions A and B were compared for laundering effectiveness following the procedure of Example 3 of this invention.

Composition A was found to foam very profusely in the rinse cycle and did not rinse freely. The excessive foaming produced by Composition A prolonged draining time of the suds produced in the sudsing and rinsing cycles. The odor of free alcohol was present during drying.

Use of Composition B yielded a cleaner wash and rinsed more freely than did Composition A. Draining was more rapid following the suds cycle and in the rinse cycle. No odor of free alcohol was present during drying.

Preston (U.S. 2,527,075) teaches a use of at least 2% free alcohol and preferably about 5% free alcohol and a synthetic detergent content of at least 16% by weight.

Washes performed using only 1.5% free alcohol and a synthetic detergent content of only 8.5% by weight yielded

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higher cleaning, freer rinsing and less residual odor than did the Preston compositions.

EXAMPLE 13

Composition A was prepared by adding the non-soap components of Example 1 Composition C and the non-soap components of Example 2 Composition G together and then adding the combined non-soap ingredients to a sodium tallow coconut soap. In addition, several variations were prepared (Compositions B, C and D).

Composition A

	Parts by weight
Sodium alkyl sulfate (alkyl-coconut derived) ----	4.6
Free alcohol (coconut derived) -----	0.4
Sodium alkyl sulfate -----	2.0
Sodium tripolyphosphate -----	4.0
Sodium chloride -----	6.0
Sodium tallow coconut soap (tallow to coconut ratio 80 to 20) -----	83.0
	100.0

Composition B

	Parts by weight
Sodium alkyl sulfate -----	4.6
Free alcohol -----	0.4
Isooctyl phenoxy polyethoxy alcohol (10 mol ethoxylate) ("Triton X-100" trademark of Rohm & Haas) -----	2.0
Sodium tripolyphosphate -----	4.0
Sodium sulfate -----	6.0
Sodium tallow coconut soap -----	83.0
	100.0

Composition C

	Parts by weight
Sodium alkyl sulfate -----	9.2
Free alcohol -----	0.8
Isooctyl phenoxy polyethoxy alcohol (10 mol ethoxylate) -----	2.0
Sodium tripolyphosphate -----	2.0
Sodium sulfate -----	2.0
Sodium tallow coconut soap -----	84.0
	100.0

Composition D

	Parts by weight
Sodium alkyl sulfate -----	4.6
Free alcohol -----	0.4
Isooctyl phenol polyethoxy alcohol (10 mol ethoxylate) -----	4.0
Sodium tripolyphosphate -----	8.0
Sodium sulfate -----	12.0
Sodium tallow coconut soap -----	95.0
	124.0

Compositions A, B, C and D were used in the washing procedure of Example 3. Cleaning results and overall performance were among the best obtained. Composition D was rated highest of the 4 compositions. Suds drainage was rapid and no lime soap curds were evident.

All ingredients of compositions A or B or C or D may be blended together to yield a non-dusting powder or the mixture of the ingredients may be flaked or produced as a spray-dried bead by means well-known to the soap making art.

Tests made by replacing sodium tripolyphosphate by an equal quantity by weight of sodium hexametaphosphate or tetrasodium pyrophosphate in compositions A, B, C and D yielded similar results as above.

EXAMPLE 14

Dishwashing compositions were made by dissolving 0.2 percent by weight of the following compositions in 100 p.p.m. hard water at 120° F.

13 COMPOSITION A

	Parts by weight
Sodium tallow coconut soap (tallow to coconut ratio of 80:20) -----	95.0
Sodium alkyl sulfate (alkyl coconut derived) ----	4.6
Free alcohol (coconut derived) -----	0.4
	100.0

COMPOSITION B

	Parts by weight
Sodium tallow-coconut soap -----	88.00
Sodium alkyl sulfate -----	1.84
Free alcohol -----	.16
Sodium hexametaphosphate -----	4.00
Sodium sulfate -----	6.00
	100.00

Composition C

A large selling commercial liquid dishwashing compound

	Parts by weight
Ammonium laurylthoxysulfate -----	30
Amine oxide or alkanolamide -----	3
Denatured ethyl alcohol -----	10
Water -----	57
	100

All compositions were compared at 0.2% active ingredient level in 120° F. city water containing 100 p.p.m. hardness. Soiled dishes, glasses and silverware were washed by hand by immersing the soiled articles in the dishwashing solution and then removing adherent soil with a dishcloth saturated with the dishwashing solution and allowing the washed articles to air dry in a vertical position on a rack.

Compositions A and B were excellent soil removers. Composition C was only a fair soil remover and required repeated application of the dishcloth for complete soil removal.

Compositions A and B were high foamers. Composition C foamed so profusely that a great deal of rinsing was required to eliminate foam. Compositions A and B were very free rinsing with lesser quantities of rinse water.

A, B and C were all equally mild to skin even after repeated use.

EXAMPLE 15

0.2 percent by weight of Compositions A and B of Example 14 were prepared in city water of 100 p.p.m. hardness. ½ percent by weight of sodium hypochlorite was added to the solutions maintained at 120° F. Heavily stained parts of a coffee stained aluminum and stainless steel percolator were immersed in the hypochlorite containing composition A and B solutions. The parts were removed from the solution using rubber gloves to avoid barehanded contact with the hypochlorite and scrubbed with a nylon bristled bottle brush to remove loosened soil and stains and then rinsed in clear water and allowed to air dry. All coffee stains were easily and completely removed. The dried aluminum and stainless steel coffee parts were completely clean, bright and spot and film-free.

The same compositions with the added hypochlorite were effective in removing soil of scorched oatmeal cheese fondues, bread doughs and baked on carbon deposits from aluminum and stainless steel utensils.

By reducing the bleach content so as to yield composition solutions containing about a 25 p.p.m. chlorine concentration, immersed fabrics or solid dishes, silverware and cups and glasses may be effectively santized or disinfected.

14 EXAMPLE 16

Bar soaps were made from the following compositions.

(A)

	Parts by weight
Sodium tallow soap -----	95.0
Sodium alkyl sulfate -----	4.6
Free higher alcohol -----	0.4
	100.0

(B)

	Parts by weight
Sodium tallow soap -----	90.0
Sodium alkyl sulfate -----	8.5
Free higher alcohol -----	1.5
	100.0

The tallow soap was made from fatty acids of 42° C. titre. The alkyl sulfate and free higher alcohol were derived from coconut oil. To sixty parts of the composition in a stainless steel beaker was added 40 parts of 100 p.p.m. city water. The mixture was heated to 180° F. and hand mixed with a spatula until a uniform and spreadable paste resulted. The fluid paste was spread as a thin layer on a polyethylene sheet and allowed to air dry to a moisture content of 15 weight percent. The dried composition was broken into small flakes and fed to a grinder. The extruded plastic-like ribbons from the grinder were pressed into rectangular molds and allowed to cool and harden.

The soap bars so formed were effective hand cleaners, foamed well in both hard and soft water and the foam produced was easily eliminated by rinsing without evidence of lime soap curd formation.

EXAMPLE 17

A composition comprised of

	Parts by weight
Sodium tallow soap -----	95.0
Sodium alkyl sulfate -----	4.6
Free higher alcohol -----	0.4
	100.0

was dissolved in soft water (zero p.p.m. hardness) to yield a solution of 0.2 weight percent concentration in water. A heavy and persistent foam was generated in the glass container by vigorous shaking of the glass container. The copious adherent foam so produced was eliminated only after the use of much rinse water.

In another trial, sufficient anhydrous calcium chloride was added to the 0.2 weight percent solution in soft water to yield a solution containing 50 p.p.m. hardness. A heavy and persistent foam was generated by shaking. The copious foam so produced was freely eliminated by the use of a much smaller quantity of rinse water.

No lime soap curds were observed in the trials using either soft or 50 p.p.m. hard water. In this example a small amount of hardness is beneficial over no hardness in the cleaning process using a soap-based formulation.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A composition consisting essentially of about 90 to 95 parts by weight of soap and about 5 to 10 parts by weight of an alkyl sulfate-free higher alcohol mixture, the free higher alcohol content of the alkyl sulfate-free higher alcohol mixture being from 5 to 15 weight percent, said soap consisting of a sodium salt of essentially 8 to 18 numbered carbon fatty acid, said alkyl sulfate being a sodium alkyl sulfate in which the alkyl portion consists essentially of 8 to 18 numbered carbon lengths and said

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free alcohols consisting essentially of 8 to 18 numbered carbon monohydric alcohols.

2. A composition consisting essentially of about 76 to 95 parts by weight of a soap consisting of a sodium salt of essentially 8 to 18 numbered carbon fatty acids, about 5 to 10 parts by weight of an alkyl sulfate-free higher alcohol mixture, the free higher alcohol content of the alkyl sulfate-free higher alcohol mixture being from 5 to 15 weight percent, said alkyl sulfate being a sodium alkyl sulfate in which the alkyl portion consists essentially of 8 to 18 numbered carbon lengths and said free alcohols consisting essentially of 8 to 18 numbered carbon monohydric alcohols, about 2 to 4 parts by weight of a synthetic detergent selected from the group consisting of linear alkyl aryl sulfonates, alkyl sulfonates, alkyl aryl polyether sulfates and sulfonates, alkyl polyether alcohols, alkyl aryl polyether alcohols, sorbitol, glycol and glyceryl esters of higher acids and fatty acid-amine condensation amphoteric products, about 2 to 8 parts by weight of a sodium salt of phosphoric acid, said sodium salt having sequestering properties and being selected from the group consisting of sodium tripolyphosphate, sodium hexametaphosphate and sodium pyrophosphate and about 2 to 12 parts by weight of an inorganic salt selected from the group consisting of sodium chloride and sodium sulfate.

3. A composition according to claim 1 consisting essentially of about 90 to 92 parts by weight of a sodium tallow coconut soap, the ratio of tallow to coconut being 80 to 20, and about 8 to 10 parts by weight of a sodium alkyl sulfate-free higher alcohol mixture, the free higher alcohol content of the sodium alkyl sulfate-free higher alcohol mixture being from 5 to 10 weight percent and said alkyl portion of the alkyl sulfate and free higher alcohol being derived from coconut oil.

4. A composition according to claim 2 consisting essentially of about 80 to 95 parts by weight of a sodium tallow coconut soap, the ratio of tallow to coconut being 80 to 20, about 5 parts by weight of a sodium alkyl sulfate-free higher alcohol mixture, the free higher alcohol content of the alkyl sulfate-free higher alcohol mixture being 5 to 10 weight percent, said alkyl portion of the

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alkyl sulfate and free higher alcohol being derived from coconut oil, about 2 to 4 parts by weight of a nonionic detergent said detergent being an isooctyl phenoxy polyethoxy ethanol containing 10 moles of ethylene oxide, about 4 to 8 parts by weight of sodium tripolyphosphate and about 6 to 12 parts by weight of sodium sulfate.

5. A composition according to claim 2 in which the weight ratio between soap and synthetic detergents is at least 9 to 1.

6. A composition according to claim 1 in which at least 10 percent by weight of the soap is rosin soap.

7. A composition according to claim 2 in which at least 10 percent by weight of the soap is rosin soap.

8. A composition according to claim 5 in which at least 10 percent by weight of the soap is rosin soap.

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