Patented Oct. 19, 1954

2,692,235

UNITED STATES PATENT OFFICE

2,692,235

DETERGENT COMPOSITION

Arthur Ira Gebhart, Union, N. J., and Irving Joseph Krems, Bronx, N. Y., assignors to Colgate-Palmolive Company, Jersey City, N. J., a corporation of Delaware

No Drawing. Application March 28, 1950, Serial No. 152,521

22 Claims. (Cl. 252—137)

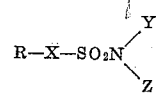
1

The present invention relates to new synthetic detergent compositions, and, more particularly, to compositions of the type of the anionic sulfated and sulfonated detergents having improved properties, and to a process of preparing same.

There has been a considerable amount of research to discover substances or additives which aid the efficiency of detergent compositions. The problem is exceedingly complex, however, in view of the various physico-chemical mechanisms or properties and the like involved in the action of a detergent composition including suspension, colloid adsorption, interfacial tension, micellar structure, dispersion, foam stability, etc., and the general difficulty usually in determining the particular mechanism which is being altered by modifications in the formulation of the detergent composition. In view of the varied nature of many synthetic detergents, moreover, additives in general exhibit a certain degree of specificity of action.

It has now been discovered that the incorporation of minor proportions of certain higher alkyl mononuclear aryl sulfonamide compounds in anionic sulfated and sulfonated detergents are effective to achieve a significant and synergistic enhancement in detergency, in addition to maintenance of a high level of foaming properties. These improvements are unique since the aromatic sulfonamide additives described herein by themselves have neither foaming nor deterging properties, and thus are valueless as cleansing agents per se.

The enhancing additives of the present invention are characterized by their essentially weakly polar nature, general limited water solubility and by the presence, of a higher alkyl substituted mononuclear aryl structure, and a sulfonamide function. More particularly, these additives may be represented by the formula:



where R is a higher alkyl group, having generally at least about 10 and preferably about 10 to 22 carbon atoms, X is a mononuclear aromatic radical, and Y and Z individually are selected from the group consisting of hydrogen and lower alkyl having from about 1 to about 5 carbon atoms.

The higher alkyl substituent on the aromatic nucleus may be branched or straight-chain in structure; it comprises moreover such groups

2

as decyl, dodecyl, keryl, pentadecyl, hexadecyl, mixed long-chain alkyls derived from long-chain fatty materials, cracked paraffin wax olefins, polymers of lower mono-olefins, etc. It is preferred that the alkyl substituent average about 12 to about 18 carbon atoms. For example, propylene may be polymerized to the tetramer and condensed with benzene in the presence of a Friedel-Crafts catalyst to yield essentially the dodecyl benzene derivative which is suitable for preparation of the desired sulfonamide type compounds. The aromatic nucleus may be derived from benzene, toluene, xylene, phenol, cresols etc.

Included within the ambit of the invention is the following preferred class of compounds suitable as additives and which may be represented by the structural formula:

$$R—X—SO_2—NH_2$$

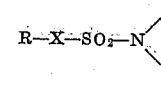
wherein R and X have the significance set forth above. Suitable examples of such compounds are decyl benzene sulfonamide, dodecyl benzene sulfonamide, keryl benzene sulfonamide, dodecyl toluene sulfonamide, dodecyl phenol sulfonamide, dodecyl benzene sulfonamide wherein the dodecyl group is derived from a propylene tetramer, pentadecyl benzene sulfonamide wherein the pentadecyl group is derived from a propylene pentamer, etc.

Other suitable additives are:

a. $R—X—SO_2NH—Y$

wherein R and X have the significance set forth above and Y is a lower alkyl group, preferably containing from about 1 to about 5 carbon atoms. Examples of suitable compounds are dodecyl benzene N-methyl sulfonamide, keryl benzene N-methyl sulfonamide, dodecyl benzene N-ethyl sulfonamide, dodecyl toluene N-methyl sulfonamide, dodecyl benzene N-butyl sulfonamide, dodecyl phenol N-ethyl sulfonamide, dodecyl benzene N-propyl sulfonamide, etc.

b.



wherein R and X are as described above, and Y and Z may be the same or different, each being selected from the group consisting of lower alkyl, preferably up to about 5 carbon atoms. As exemplary of this sub-class are dodecyl benzene N-dimethyl sulfonamide, dodecyl benzene N-diethyl sulfonamide, keryl benzene N-diethyl sulfonamide, dodecyl benzene N-diisopropyl sul-

fonamide, dodecyl benzene N-dipropyl sulfonamide, etc.

The sulfonamide type additives of the present invention may be prepared in any suitable manner, with a few preferred modes of synthesis described below. The appropriate higher alkyl aryl compounds or their sulfonic acid derivatives may be used as suitable starting materials. Using the alkyl aryl compounds as initial reactants, the suitable sulfonic acid derivatives may be formed by any convenient sulfonation procedure, e. g. reaction with oleum or chlorosulfonic acid.

The alkyl aryl sulfonamide type compounds may be prepared by condensation in a non-acidic medium of the appropriate alkyl aryl sulfonic acid derivatives, e. g. sulfonyl chloride, with ammonia or a suitable amino compound generally. Thus, the sulfonyl chloride may be condensed under Schotten-Baumann reaction conditions with ammonia to yield the unsubstituted sulfonamides, with amines such as methyl amine, ethyl amine, etc., to produce the corresponding N-methyl, N-ethyl, etc. sulfonamides respectively, etc.

The novel compositions of the present invention contain as the active ingredient the anionic sulfated and sulfonated detergent, including suitable mixtures thereof. Included therein are the aliphatic sulfated or sulfonated agents, such as the aliphatic acyl-containing compounds wherein the aliphatic acyl radical has about 8 to about 22 carbon atoms and, more particularly, the aliphatic carboxylic ester type having such an aliphatic acyl radical and containing at least about 10 and preferably about 12 to about 26 carbon atoms to the molecule. Among the aliphatic detersive compounds, it is preferred to use the sulfated aliphatic compounds having about 12 to about 22 carbon atoms. As suitable examples of aliphatic detergents may be found the sulfuric acid esters of polyhydric alcohols incompletely esterified with higher fatty acids, e. g. coconut oil monoglyceride monosulfate, tallow diglyceride monosulfate; the long chain pure or mixed higher alkyl sulfates, e. g. lauryl sulfate, cetyl sulfate, higher fatty alcohol sulfates derived from coconut oil; the hydroxy sulfonated higher fatty acid esters, e. g. higher fatty acid esters of 2,3 di-hydroxy propane sulfonic acid; the higher fatty acid esters of low molecular weight alkylol sulfonic acids, e. g. oleic acid ester of isethionic acid; the higher fatty acid ethanolamide sulfates; the higher fatty acid amides of amino alkyl sulfonic acids, e. g. lauric amide of taurine, and the like.

It is a particular feature of this invention that the effects are particularly enhanced with the alkyl aryl sulfonate detergents. These aromatic sulfonate detergents are also known in the art. They may be mononuclear or polynuclear in structure. More particularly the aromatic nucleus may be derived from benzene, toluene, xylene, phenol, cresols, naphthalene, derivatives of phenanthrene nuclei, etc. The alkyl substituent on the aromatic nucleus may vary widely, as long as the desired detergent power of the active ingredient is preserved. While the number of sulfonic acid groups present on the nucleus may vary it is usual to have one such group present in order to preserve as much as possible a balance between the hydrophilic and hydrophobic portions of the molecule.

More specific examples of suitable alkyl aromatic sulfonate detergents are the propylated naphthalene sulfonates, the mixed butyl naphthalene sulfonates, terahydronaphthalene sulfonates, the various butylated di-phenyl sulfonates, and phenyl-phenol sulfonates. It is preferred, however, to use the higher alkyl aromatic sulfonates rather than the lower alkyl substituted detergents. Typical examples of this preferred class are the higher alkyl mononuclear aryl sulfonates wherein the alkyl group is about 10 to about 22, and preferably about 12 to 18 carbon atoms. Both the structure of the higher alkyl substituent and the monocyclic nucleus may vary in the manner described above for such groups in the sulfonamide additives. More particularly, it is preferred to use the higher alkyl benzene sulfonates wherein the higher alkyl group is about 12 to 16 carbon atoms.

These various anionic detergents are commonly used in the form of their water soluble salts. Of these, the alkali metal (e. g. sodium, potassium, lithium) and ammonium salts are preferred though other salts such as the amine, alkylolamine and alkaline earth metal (e. g. calcium, magnesium) salts may be used if desired. Their concentration in the detergent compositions of the present invention is generally at least about 10% by weight of the composition. Compositions with very high concentrations of these active ingredients are prepared for specialized uses generally. With built compositions, however, it is preferred to use an active ingredient content of about 15 to 50% concentration. In liquid detergent compositions, any suitable concentration of active ingredient may be employed, e. g. 90% of total solids content or 20–60% of the weight of the total liquid detergent composition.

The amount of sulfonamide additives in the detergent composition is less than the weight of the active ingredient and is generally minor in proportion to the weight of the active ingredient and effective in producing the desired improvements in detersive capacity. Generally, the proportion of sulfonamide additives should be from about 5 to about 50% of the weight of the active ingredient and will preferably be from about 1 to about 15% by weight of the detergent composition. Particularly effective results have been achieved wherein the additives are present in amounts of the order of about 5 to 10% of the total composition.

The additives may be incorporated with the active ingredient at any point during the manufacturing process at which subsequent operations will not adversely modify the properties of the detergent compositions. A variety of procedures which have proved to be convenient, economical, and productive of best results are: the additives may be added to a hot aqueous slurry of about 40 to 50% concentration of the active ingredient with vigorous stirring to form a smooth, uniform and homogeneous paste, the additives may be dissolved in a suitable solvent and added to the slurry of the active ingredient, or a mixture or emulsion of the additives in water with a minor proportion of the active ingredient may be incorporated into the slurry.

Thereafter, these compositions may be prepared in the form of solutions, pastes or as dry or partially hydrated solid products, preferably in a finely divided condition. It is preferred to prepare the products in particulate form. Accordingly, the slurry of the detergent composition may be subjected to any suitable drying operations and converted to particle form. The mixture may thus be subjected to conventional spray-drying, roll drying or drum drying operations utilizing

temperatures above about 212° F. to obtain the desired detergent particles.

It is common to employ various adjuvant materials in synthetic detergent compositions. The detergent compositions of the present invention may include any of these substances employed by the art in admixture with such detergent compositions generally, provided the use of any such materials does not completely neutralize or remove the effect of the sulfonamide type additives in the relationship set forth. These adjuvant builders or additives may be inorganic or organic in structure and may be mixed with the active ingredient in any suitable manner. Such convenient inorganic builders or additives as the various alkali metal phosphates (e. g. tri-polyphosphate, hexametaphosphate, tetrapyrophosphate) the alkali metal silicates, sulfates, carbonates, etc. may be employed in these compositions. Suitable organic materials such as sodium carboxymethylcellulose may also be employed herein. It is preferred that the detersive compositions in particulate form contain major amounts of alkaline builders, particularly the inorganic water soluble phosphates. The total amount of phosphate compounds should be a minimum of at least about 10%, and preferably from about 10 to about 60% by the weight of the detergent composition for best results. An amount of active ingredient of about 15 to 50% with the requisite minor proportion of sulfonamide type additives and about 20 to about 60% total phosphate compounds exhibits particularly desirable properties for a detergent composition. For use as liquid detergents, the active ingredient should be in the form of a highly water soluble salt, e. g. ammonium, mono-, di- and tri-ethanol ammonium salts, and the detergent composition may be prepared in dilute or concentrated aqueous solution with or without the presence of a lower molecular weight aliphatic alcohol such as ethyl alcohol, propylene glycol, etc. An amount of active ingredient of about 20 to 60%, and preferably about 40 to 60%, by weight of the total liquid detergent composition and an effective minor proportion of the sulfonamide type additive, the remainder of the composition consisting essentially of a diluent, exhibits also highly improved results.

The effect on detergency of compositions of the present invention may be indicated by a standard soil removal test. This testing procedure involves the uniform soiling, washing with particular detergent compositions at 110° F.±2° F., and drying of a large number of cotton swatches. The whiteness of the various test swatches are measured by a Hunter reflectometer. The units of soil removed may be calculated by subtracting the average reflectivity of unwashed control samples from the washed swatches.

Table I indicates the per cent change in soil removal on cotton swatches using a standard detergent composition consisting essentially of 35% sodium salts of dodecyl benzene sulfonate (the dodecyl group being derived from a propylene tetramer), 40% sodium tri-polyphosphate, and 25% sodium sulfate, with and without the dodecyl benzene sulfonamide additive, at 0.75% total concentration in distilled water. The percentages listed in the table for the additive at 2%, 5% and 10% addition by weight to the standard detergent composition represent the percent change in soil removal using as a standard the above detergent composition without organic additive.

The + value indicates improved soil removal in comparison to the standard.

TABLE I

Amount of Additive	Percent Change in Soil Removal on Cotton Soil
2%	+13
5%	+30
10%	+27

The marked improvement in soil removal due to the presence of the higher alkyl aryl sulfonamide additives of the present invention is evident from the data.

It is apparent that these additives give consistent improvement in soil removal using varying amounts of the addition agents. For each specific sulfonamide type additive there is an optimum proportion or concentration which may be determined by routine tests. Referring to Table I, the sulfonamide additive appears to exert its optimum effect in the relationship set forth at about 5% concentration.

The sulfonamide additives of the present invention achieve an even more remarkable and significant improvement in soil removal on woolen fabrics, in comparison to the desirable effects achieved on cotton soil as disclosed supra. Using substantially the same testing conditions with the identical detergent compositions, the percent change in soil removal on wool soil is set forth in Table II:

TABLE II

Amount of Additive	Percent Change in Soil Removal on Wool Soil
2%	+61
5%	+103
10%	+101

The synergistic improvements resulting from the use of the organic additive are graphically evident from the data.

Another important feature is that the sulfonamide type additives referred to herein have been observed to have in general relatively little or no deleterious action on the initial volume or stability of foam of alkyl aryl sulfonate washing compositions. Such results are particularly important since it is desirable that the detergent compositions exhibit excellent foaming properties, particularly for consumer appeal and certain home and industrial uses. Many of the hitherto known organic additives have a pronounced adverse effect on foaming properties, particularly foam stability, whereas the novel compositions of the present invention exhibit marked foam stability.

Improved results may also be obtained with detergent compositions containing the aliphatic active ingredients, as set forth in Table III. This table sets forth in similar manner the results obtained on similar wool soil tests using the standard composition indicated above with the substitution of sodium lauryl sulfate and sodium coconut monoglyceride monosulfates respectively

as the active ingredients with and without dodecyl benzene sulfonamide as the organic additive:

TABLE III

Active Ingredient	Amount of Additive, Percent	Percent Change in Soil Removal
1. Sodium lauryl sulfate	2	+37
	5	+71
	10	+70
2. Sodium coconut monoglyceride sulfate	2	+12
	5	+52
	10	+98

The synergistic increase in soil removal using the combination of the sulfonamide additives and the aliphatic active ingredients is patently indicated above.

Another feature of the present invention is that the improved results may be exhibited both in hard and in soft water, and over a wide range of washing concentrations. While additives may in general exert widely variable effects in hard water from those achieved in soft water the novel compositions of the present invention are usually remarkably effective in both types, thereby enlarging their field of application to a great degree. The wide range of suitable washing conditions under which the improved results are obtained is significant also since it permits economy of use and allows a wide latitude to the consumer and the like as to suitable quantities to be employed.

Tables IV and V set forth the percent improvement in soil removal at 0.25%, 0.4%, and 0.75% concentrations of the detergent composition in soft water (50 p. p. m.) and in hard water (300 p. p. m.) employing the standard composition with the higher alkyl aryl sulfonate as the active ingredient and 2% dodecyl benzene sulfonamide additive being substituted for an equivalent amount of active ingredient:

TABLE IV

Soil removal in soft water with varying detergent concentrations

	0.25%	0.4%	0.75%
Percent change using 2% additive on cotton soil	+15	+16	+14
Percent change using 2% additive on Wool soil	+29	+34	+53

TABLE V

Soil removal in hard water with varying detergent concentrations

	0.25%	0.4%	0.75%
Percent change using 2% additive on cotton soil	+14	+15	+21
Percent change using 2% additive on Wool soil	+36	+36	+66

The following examples are additionally illustrative of the nature of the present invention and it will be understood that the invention is not limited thereto:

EXAMPLE I

A detergent composition is prepared by forming about a 60% solids slurry containing on a solids basis about 35% sodium propylene tetramer benzene sulfonate salt, 40% sodium tri-polyphosphate, 15% sodium sulfate, 5% propylene tetramer benzene sulfonamide, and the remainder minor amounts of sodium chloride, sodium hydroxide, sodium carboxymethylcellulose, etc. This slurry is agitated at about 140° F. in a conventional soap crutcher to form a homogeneous composition. The slurry is submitted to spray-drying with heated air at a temperature of about 350° F. with a resultant moisture loss of about 40%. The resulting composition is recovered in the form of homogeneous beads, and possesses a high degree of detersive properties in both hard and soft water.

EXAMPLE II

The procedure of Example I is repeated with the modifications that the active ingredient consists essentially of the keryl benzene sulfonate salt, the organic additive is the keryl benzene sulfonamide, and the slurry is roll dried at about 50 lbs. steam pressure to flake form. This composition also possesses highly desirable detersive properties.

EXAMPLE III

Using the procedure of Example I an improved detergent composition is prepared from the following components: 40% sodium propylene tetramer benzene sulfonate, 12.5% tri-sodium phosphate, 12.5% sodium silicate, 32% sodium sulfate, and 3% dodecyl benzene N-methyl sulfonamide.

EXAMPLE IV

A liquid detergent is prepared containing about 50% monoethanolamine propylene tetramer benzene sulfonate salt, 10% dodecyl benzene sulfonamide, the remainder of the composition consisting essentially of water.

EXAMPLE V

Another suitable liquid detergent composition is prepared by compounding 40% tri-ethanolamine salt of dodecyl benzene sulfonate, 10% dodecyl benzene N-ethyl sulfonamide, the remainder being a 15% aqueous ethanol solution.

Other formulations productive of desired results are:

EXAMPLE VI

	Per cent
Sodium coconut alcohol sulfates	16
Sodium chloride	1
Sodium tri-polyphosphate	38
Tetrasodiumpyrophosphate	15
Sodium sulfate	25
Keryl benzene sulfonamide	5

EXAMPLE VII

	Per cent
Triethanolamine salt of lauryl sulfate	50
Dodecyl benzene sulfonamide	12
Ethyl alcohol	20
Water	18

EXAMPLE VIII

	Per cent
Sodium dodecylbenzene sulfonate	9
Sodium lauryl sulfate	10
Dodecyl benzene sulfonamide	4
Sodium carboxymethylcellulose	0.5
Sodium carbonate	1.5
Sodium sulfate	20
Sodium tri-polyphosphate	43
Tetrasodium pyrophosphate	12

EXAMPLE IX

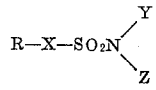
	Per cent
Coconut oil fatty acid amides of taurine	25
Sodium sulfate	28
Sodium tri-polyphosphate	40
Dodecyl benzene sulfonamide	7

The term "consisting essentially of" as used in the definition of the ingredients present in the composition claimed is intended to exclude the presence of other materials in such amounts as to interfere substantially with the properties and characteristics possessed by the composition set forth but to permit the presence of other materials in such amounts as not substantially to affect said properties and characteristics adversely.

Although the present invention has been described with reference to particular embodiments and examples, it will be apparent to those skilled in the art that variations and modifications can be substituted therefor without departing from the principles and true spirit of the invention.

Having described the invention what is desired to be secured by Letters Patent is:

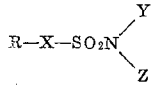
1. A detergent composition consisting essentially of water-soluble detergent selected from the class consisting of the water-soluble anionic organic sulfate and sulfonate detergents, and a sulfonamide compound represented by the formula:



wherein R is a higher alkyl group, X is a mononuclear aromatic nucleus, and Y and Z are each selected from the class consisting of hydrogen and lower alkyl groups, the amount of said sulfonamide compound being less than the weight of said water-soluble detergent and sufficient to improve the soil removal power thereof.

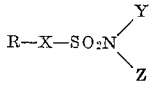
2. A detergent composition in accordance with claim 1 which contains about 10 to about 60% by weight of water-soluble inorganic phosphates.

3. A detergent composition consisting essentially of water-soluble detergent selected from the class consisting of the water-soluble anionic organic sulfate and sulfonate detergents, and a sulfonamide compound represented by the formula:



wherein R is a higher alkyl group, X is a benzene nucleus, and Y and Z are each selected from the class consisting of hydrogen and lower alkyl groups, the amount of said sulfonamide compound being less than the weight of said detergent and sufficient to improve the soil removal power thereof.

4. A detergent composition consisting essentially of water-soluble detergent selected from the class consisting of water-soluble anionic organic sulfate and sulfonate detergents, a minor amount of sulfonamide compound having the formula:



wherein R is a higher alkyl group of 12 to 18 carbon atoms, X is a benzene nucleus, and Y and Z are each selected from the class consisting of hydrogen and lower alkyl, said minor amount being from about 1 to about 15% by weight of the detergent composition.

5. A detergent composition consisting essentially of water-soluble detergent selected from the class consisting of water-soluble anionic organic sulfate and sulfonate detergents, and a sulfonamide compound represented by the formula:

$$R—X—SO_2NH_2$$

wherein R is a higher alkyl group and X is a mononuclear aromatic nucleus, the amount of said sulfonamide being less than the weight of said detergent and sufficient to enhance the soil removal power thereof.

6. A detergent composition consisting essentially of water-soluble detergent selected from the class consisting of water-soluble anionic organic sulfate and sulfonate detergents, and a sulfonamide compound represented by the formula:

$$R—X—SO_2NH_2$$

wherein R is a higher alkyl group of about 12 to 18 carbon atoms and X is a benzene nucleus, the amount of said sulfonamide being less than the weight of said detergent and sufficient to enhance the soil removal power thereof.

7. A detergent composition consisting essentially of water-soluble detergent selected from the class consisting of water-soluble anionic organic sulfate and sulfonate detergents, a minor amount of sulfonamide compound having the formula:

$$R—X—SO_2NH_2$$

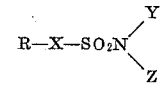
wherein R is a higher alkyl group of 12 to 18 carbon atoms and X is a benzene nucleus, said minor amount being from about 1 to about 15% by weight of the detergent composition.

8. A detergent composition consisting essentially of water-soluble detergent selected from the class consisting of water-soluble anionic organic sulfate and sulfonate detergents, and a sulfonamide compound represented by the formula:

$$R—X—SO_2NH—Y$$

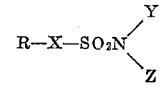
wherein R is a higher alkyl group, X is a mononuclear aromatic nucleus, and Y is a lower alkyl group, the amount of said sulfonamide being less than the weight of said detergent and sufficient to improve the soil removal power thereof.

9. A detergent composition consisting essentially of water-soluble detergent selected from the class consisting of water-soluble anionic organic sulfate and sulfonate detergents, and a sulfonamide compound represented by the formula:



wherein R is a higher alkyl group, X is a mononuclear aromatic nucleus, and Y and Z are lower alkyl groups, the amount of said sulfonamide being less than the weight of said detergent and sufficient to improve the soil removal power thereof.

10. A detergent composition consisting essentially of water-soluble higher alkyl aryl sulfonate detergent, and a sulfonamide compound represented by the formula:



wherein R is a higher alkyl group, X is a mononuclear aromatic nucleus, and Y and Z are each selected from the class consisting of hydrogen and lower alkyl groups, the amount of said sulfonamide compound being less than the weight of said detergent and sufficient to improve the soil removal power thereof.

11. A detergent composition consisting essentially of water-soluble higher alkyl mononuclear aryl sulfonate detergent and a sulfonamide compound represented by the formula:

$$R—X—SO_2NH_2$$

wherein R is a higher alkyl group and X is a mononuclear aromatic nucleus, the amount of said sulfonamide being less than the weight of said detergent and sufficient to enhance the soil removal power thereof.

12. A detergent composition consisting essentially of water-soluble higher alkyl benzene sulfonate detergent, and a sulfonamide compound represented by the formula:

$$R—X—SO_2NH_2$$

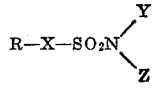
wherein R is a higher alkyl group of about 12 to 18 carbons, and X is a benzene nucleus, the amount of said sulfonamide being less than the weight of said detergent and sufficient to improve the soil removal power thereof.

13. A detergent composition consisting essentially of water-soluble higher alkyl benzene sulfonate detergent, and from about 1 to about 15% by weight of a sulfonamide compound represented by the formula:

$$R—X—SO_2NH_2$$

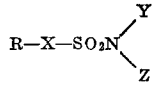
wherein R is a higher alkyl group and X is a benzene nucleus.

14. A detergent composition consisting essentially of water-soluble aliphatic sulfate detergent and a sulfonamide compound represented by the formula:



wherein R is a higher alkyl group, X is a mononuclear aromatic nucleus, and Y and Z are each selected from the class consisting of hydrogen and lower alkyl groups, the amount of said sulfonamide compound being less than the weight of said detergent and sufficient to improve the soil removal power thereof.

15. A detergent composition consisting essentially of water-soluble higher alkyl sulfate detergent, and a sulfonamide compound represented by the formula:



wherein R is a higher alkyl group, X is a mononuclear aromatic nucleus, and Y and Z are each selected from the class consisting of hydrogen and lower alkyl groups, the amount of said sulfonamide being less than the weight of said detergent and sufficient to improve the soil removal power thereof.

16. A detergent composition consisting essentially of water-soluble higher alkyl sulfate detergent and a sulfonamide represented by the formula:

$$R—X—SO_2NH_2$$

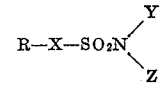
wherein R is a higher alkyl group, and X is a mononuclear aromatic nucleus, the amount of said sulfonamide compound being less than the weight of said detergent and sufficient to improve the soil removal power thereof.

17. A detergent composition consisting essentially of water-soluble higher alkyl sulfate detergent and from about 1 to about 15% by weight of a sulfonamide compound represented by the formula:

$$R—X—SO_2NH_2$$

wherein R is a higher alkyl group and X is a benzene nucleus.

18. A detergent composition consisting essentially of water-soluble detersive salt of sulfuric acid ester of polyhydric alcohol incompletely esterified with higher fatty acid and a sulfonamide compound represented by the formula:



wherein R is a higher alkyl group, X is a mononuclear aromatic nucleus, and Y and Z are each selected from the class consisting of hydrogen and lower alkyl groups, the amount of said sulfonamide being less than the weight of said detergent and sufficient to improve the soil removal power thereof.

19. A detergent composition consisting essentially of water-soluble higher fatty acid monoglyceride monosulfate detergent and a sulfonamide compound represented by the formula:

$$R—X—SO_2NH_2$$

wherein R is a higher alkyl group and X is a mononuclear aromatic nucleus, the amount of said sulfonamide compound being less than the weight of said detergent and sufficient to improve the soil removal power thereof.

20. A detergent composition consisting essentially of water-soluble higher fatty acid monoglyceride monosulfate detergent and from about 1 to about 15% by weight of a sulfonamide compound represented by the formula:

$$R—X—SO_2NH_2$$

wherein R is a higher alkyl group and X is a benzene nucleus.

21. A detergent composition consisting essentially of water-soluble detergent selected from the group consisting of water-soluble anionic organic sulfate and sulfonate detergents, and dodecyl benzene sulfonamide in an amount less than the weight of said detergent and sufficient to improve the soil removal power thereof.

22. A detergent composition consisting essentially of water-soluble higher alkyl benzene sulfonate detergent and about 1 to about 15% by weight of dodecyl benzene sulfonamide.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
2,002,613	Orthner	May 28, 1935
2,071,917	Bren	Feb. 23, 1937
2,093,947	Albrecht	Sept. 21, 1937
2,197,851	Dietrich	Apr. 23, 1940
2,383,738	Richardson	Aug. 28, 1945