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3,249,640

ALKYLSULFONYL PHENOLS

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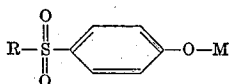
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8 Claims. (Cl. 260-607)

This invention relates to a new class of organic sulfur-containing surface active compounds and to a method for their preparation. More particularly, this invention relates to high molecular weight alkyl and alkylphenyl sulfonylphenol compounds, and especially such sulfonylphenol compounds which possess detergent and bacteriostatic activity.

It is a principal object of this invention to provide a new class of organic sulfur-containing compounds which offer an unusual and unpredictable combination of desirable properties, including ability to remove soil from garments, ability to control bacteria on the fabric, and high degree of adsorption of the compound onto the surface of the fabric.

It is another object to provide improved detergent compositions containing one or more members of the new class of compounds. Since all of the members of the new class of compounds can be mixed together in all proportions without disturbing their valuable characteristics, such mixtures can be employed in detergent compositions.

More especially, the novel compounds of this invention are identified as p-alkyl or p-alkylphenyl sulfonylphenols having the following general formula



wherein R represents a primary or secondary branched or straight chain aliphatic radical, containing from about 10 to 18 carbon atoms, or a p-alkylphenyl group containing from about 10 to 18 carbon atoms in the alkyl substituent, and M is hydrogen or an alkali metal such as sodium or potassium.

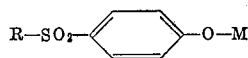
These compounds constitute heretofore unknown compounds possessing a unique blend of physical properties which make them very useful and valuable compounds. Thus, the compounds of this invention have been discovered characteristically to possess detergent activity, combined with bacteriostatic activity against both gram-positive and gram-negative microorganisms. Moreover, it was discovered that these compounds exhibit a high degree of adsorption upon treated fabrics. This property enhances the bacteriostatic property since it increases the efficiency of bacterial control on the fabric. Yet further the compounds described herein exhibit good stability when exposed to light for prolonged periods. This offers good shelf life and greater flexibility in commercial applications of these new compounds.

Compounds offering the above unique blend of properties are fairly difficult to prepare. This difficulty is due in part to the fact that the strongly electron withdrawing

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characteristics of the sulfonyl radical causes the failure of many of the more standard methods for bringing about the structural changes leading up to the preparation of the new compounds. This is especially true in certain steps more than in others. For example, in the last step of a preferred procedure detailed below, a number of commonly useful dealkylating reagents fail to react with the phenyl-methyl ether, because of the unusual strengthening of the carbon-oxygen bond by the p-substituted sulfonyl group. Out of the many dealkylating agents which were tried in this process, only anhydrous pyridine hydrochloride was found to work satisfactorily.

The particularly desirable compounds for realizing the benefits described and claimed are those of the general structure



where R is either a primary or secondary, branched or straight chain alkyl group containing 10 to 14 carbon atoms and M is sodium or hydrogen. The most preferred compound contains a primary straight chain dodecyl radical and sodium and is technically named the sodium salt of p-dodecylsulfonylphenol.

Examples of the novel p-primary straight chain alkylsulfonylphenol compounds of this invention are: p-decylsulfonylphenol, p-dodecylsulfonylphenol, p-tetradecylsulfonylphenol, p-hexadecylsulfonylphenol, p-octadecylsulfonylphenol. Examples of p-secondary straight chain alkylsulfonylphenol compounds of this invention are: p-(2-dodecylsulfonyl) phenol and p-(2-octadecylsulfonyl) phenol. Examples of primary and secondary branched chain compounds are: p-(2-diethyl)-hexyl sulfonylphenol, p-(2-diethyl-4-methyl)-pentylsulfonylphenol. These compounds can be readily neutralized to sodium and potassium salt forms by reacting them with suitably alkaline reagents such as sodium hydroxide and potassium hydroxide. The neutralized alkali metal salt form is generally preferred for employment in the hereafter described detergent and laundry formulations.

The alkylphenyl radicals contemplated in the novel p-alkylphenylsulfonylphenol compounds of this invention are those in which the carbon content of the aliphatic substituent is a primary or secondary straight or branched chain alkyl containing from 10 to 18 carbon atoms. Such radicals are: decylphenyl, dodecylphenyl, tetradecylphenyl, hexadecylphenyl, octadecylphenyl and branched chain isomers of these radicals, such as 2-dodecylphenyl, 3-dodecylphenyl, (2-diethyl-4-methyl) pentylphenyl and (2-diethyl)-hexylphenyl.

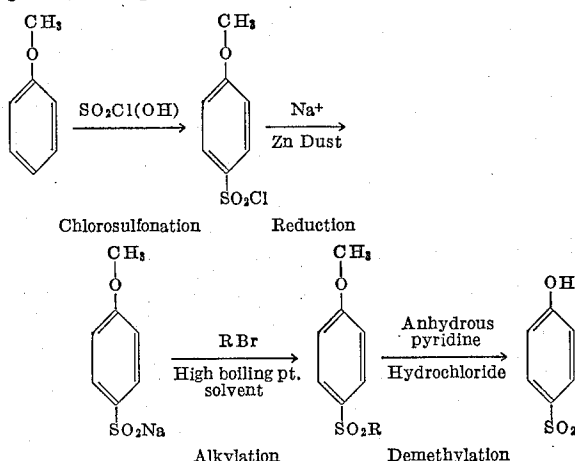
The methods of preparing the compounds of the invention generally comprise the following sequence of steps

- (1) The chlorosulfonation of an alkylphenyl ether;
- (2) Reduction of the chlorosulfonated alkylphenyl ether in an alkaline medium to form alkali metal p-alkylphenyl ether sulfinate;
- (3) Reacting the sulfinate from the second step with an organic halide in a high boiling solvent; and finally,
- (4) Dealkylating the alkyl ether substituent by fusion with pyridine hydrochloride.

The method just described may be more readily understood by a review of the following reaction flow diagram

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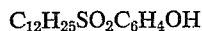
equations which relate to a preferred method. (For emphasis, the equations have not been balanced.)



The following example will illustrate the foregoing method of preparing the novel compounds but it is merely intended to illustrate the invention and not in any manner define limits thereof.

EXAMPLE I

Para-dodecylsulfonyl phenol



Step 1.—In a nitrogen swept 5 liter 3-necked flask, fitted with a mechanical stirrer, a thermometer, and a 500 ml. addition funnel protected with a CaCl_2 drying tube, were placed 462 g. (4.28 moles) of methoxybenzene (anisole) and 1600 ml. of chloroform. The solution was stirred and cooled in an ice-salt bath to -7°C ., and 1000 g. (8.56 moles) of chlorosulfonic acid were added dropwise, keeping the reaction temperature below 0°C .. At the end of the addition, the ice bath was removed and the reaction mixture was stirred at room temperature for an additional 40 minutes, after which it was poured into 2 liters of cracked ice with stirring. The chloroform layer was separated and washed four times with 500 ml. portions of ice water and then dried over anhydrous MgSO_4 . The mixture was filtered and the solvent evaporated at atmospheric pressure. The product was distilled under vacuum, B.P. $114-120^\circ\text{C}$. at 0.45 mm., to give 518.7 g. (58.4%) of colorless crystals of p-methoxyphenylsulfonyl chloride.

Step 2.—The p-methoxyphenylsulfonyl chloride was reduced with zinc in an alkaline medium as follows. Five liters of water were heated to 80°C . with live steam in a 15 liter tank, fitted with a stirrer, a thermometer, and a trap for the steam line. Zinc dust (516.7 g., 7.90 g. atom) was added to the vigorously stirred water, and 518 g. (2.498 moles) of p-methoxyphenylsulfonyl chloride from step 1 were added over 20 minutes maintaining the temperature at $80-85^\circ\text{C}$. Stirring was continued for 10 minutes, then the temperature was raised to 90°C ., and 500 ml. of 6 N NaOH were added. Sodium carbonate (400 g.) was then added cautiously, keeping the temperature at 90°C (pH 10-11). The hot mixture was filtered through a Buchner funnel and the filter cake was slurried in 750 ml. of hot distilled water and filtered. The combined filtrates were placed in evaporating dishes and evaporated overnight on the steam bath to a low volume. After cooling to room temperature, the crystals were filtered. After air drying, the material was broken up and divided among three 3 liter beakers. The beakers were filled with alcohol and heated on the steam bath for 4 hours. The insoluble material was filtered out and the filtrates were cooled in the refrigerator for about 5 hours. The crystals were filtered out and washed with ice cold ethanol. The product consisted of 124.3 g. (25.6%) of sodium p-methoxyphenylsulfonate.

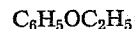
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Step 3.—Sodium p-methoxyphenylsulfonate (120.0 g., 0.618 mole) was put in a 2 liter flask equipped with an air condenser. n-Dodecyl bromide (182.0 g., 0.618 mole) was added to the flask, followed by 1200 ml. of dimethylformamide. The mixture was heated to reflux for 21 hours, and then distilled under reduced pressure. When bumping became too vigorous, concentration was continued on a Rinco evaporator, using an oil bath at $90-110^\circ\text{C}$. The warm residue was allowed to solidify in an evaporating dish and was then broken up and extracted overnight in a Soxhlet thimble with 1 liter of acetone. The acetone extract was evaporated on the steam bath to give 200 g. (99.7%) of dodecyl p-methoxyphenylsulfone.

Step 4.—The dodecyl p-methoxyphenylsulfone was demethylated by heating with anhydrous pyridine hydrochloride. Pyridine hydrochloride (200 g., 1.730 moles) was added to 200 g. (0.616 mole) of dodecyl p-methoxyphenylsulfone from step 3 in an N_2 flushed 1 liter flask fitted with a reflux condenser protected by a CaCl_2 tube. The mixture was heated in a silicone bath at 210°C . for 12 hours. After cooling, the dark brown gelatinous mixture was transferred to a 6 liter separatory funnel with 4 liters of distilled water. The mixture was extracted with five 1 liter portions of diethyl ether. The ether solution was extracted with 3 liters of 0.29 molar NaOH solution divided into 5 portions. The aqueous alkaline extract was acidified with HCl (100 ml. conc. HCl diluted with 100 ml. of distilled water) to pH 2 with continuous stirring. The acidic extract was extracted 6 times with 500 ml. portions of diethyl ether. The ether extracts were combined and dried over MgSO_4 . After filtering, fresh MgSO_4 was added for further drying. The ether extract was again filtered and the solvent distilled off under reduced pressure to give 130.5 g. (64.9%) of crude product. The crude product was recrystallized twice from a mixture of diethyl ether (125 ml.) and petroleum ether (300 ml.) by cooling in an ice bath. The precipitate was filtered by suction and washed 3 times with cold diethyl ether (50 ml.) plus petroleum ether (300 ml.). The melting point of the recrystallized p-dodecylsulfonylphenol (93.1 g., 46.3%) was $59.4-60.0^\circ\text{C}$. Anal. for $\text{C}_{18}\text{H}_{30}\text{SO}_3$: S, calc. 9.82%, found 10.07%.

In the foregoing example the starting material was methoxybenzene (anisole), $\text{C}_6\text{H}_5\text{OCH}_3$, a phenyl-methyl ether that boils at 154°C . and which is insoluble in water, but soluble in chloroform, ether and hexane. When methoxybenzene is the starting material it is important to keep the reaction temperature in the chlorosulfonating step below about 10°C . and preferably at or below 0°C . in order to moderate the reaction and to obtain the maximum yield of p-methoxyphenylsulfonyl chloride. Temperatures on the order of -20°C . to about 10°C . can be employed, with a preferred range being from -10°C . to about 0°C .

In place of methoxybenzene as a starting material, comparable results are obtained by using another O-substituted phenol, e.g. ethoxybenzene (phenetole),



Actually, any lower alkylphenyl ether can be used in which the alkyl radical contains from 1 to about 6 carbon atoms. The temperature range previously recited in connection with methoxybenzene is applicable to any of the additional alkylphenyl ethers.

The initial chlorosulfonation reaction proceeds well when the reactants are employed in the preferred ratio of one mole of the ether to two moles of chlorosulfonic acid. Generally, the ratio of these reactants is about 3:1 to about 1:3 of the ether to the acid.

The reduction of the p-methoxyphenylsulfonyl chloride by a zinc dust reducing agent in the second step of the example requires a fairly strong alkaline medium, i.e., between about pH 9-12 and temperatures in the neighborhood of 75° to about 100°C . If the pH of the reaction

medium drops too low, a problem arises in that excessive reduction of sulfinic acid salt will occur and the yield of the desired compound will be diminished. The appropriate alkaline medium may be obtained by using any basic materials such as sodium hydroxide, potassium hydroxide, sodium carbonate, or other well known basic materials. The preferred temperatures are in the range of 80° to 95° C.

In place of the n-dodecyl bromide used in the example, other sufficiently reactive high molecular weight organic halides can be used. For instance, primary or secondary straight or branched chain C₁₀ to C₁₈ alkyl halides are sufficiently reactive and can be used with equally good results. For instance, decylbromide produces as the end product p-decylsulfonylphenol, tetradecylbromide produces p-tetradecylsulfonylphenol, and hexadecylbromide and octadecylbromide produce corresponding compounds. Alkyl bromides are the preferred halides but chlorides and iodides can also be used. Secondary alkyl halides which are contemplated are decyl-2-bromide, dodecyl-3-bromide and tetradecyl-2-bromide.

Alkylphenyl halides such as p-decylphenylchloride, p-dodecylphenylbromide, p-tetradecylphenylbromide, p-hexadecylphenylbromide and p-octadecylphenylbromide also produce good results and form the corresponding p-alkylphenylsulfonylphenols.

The temperature required for this alkylation reaction is between about 70° C. to about 130° C. and a preferred range is about 80° C. to 120° C.

The high boiling point solvent essential for this alkylation step can be dimethylformamide as in the example. In place of the dimethyl formamide, satisfactory results can be obtained with dimethylsulfoxide and dimethylacetamide.

The final demethylating step was found to present unusually difficult problems. Only anhydrous pyridine hydrochloride was capable of dealkylating the lower alkyl ether substituent while other conventional dealkylating agents failed to function in a satisfactory manner. Pyridine hydrochloride is a commercially available material, but in order to obtain satisfactory results the commercial material should be rendered anhydrous before use. The salt should be prepared directly from pyridine under conditions that alternatively allow its isolation in an anhydrous condition.

EXAMPLE II

A relative detergency evaluation of the new class of compounds of this invention was made by taking a representative member of the novel class and performing a standardized detergency test.

Naturally soiled swatches of desized print cloth were washed for ten minutes in an aqueous solution of a detergent to be evaluated. A miniature machine (Tergometer) having normal reciprocating agitation was used. The cleansing composition contained 20% synthetic organic detergent surfactant in this instance sodium p-dodecylsulfonylphenol, 50% sodium tripolyphosphate, and 30% sodium sulfate. The composition was used at a level of 0.1% concentration. Water of 7 grains per gallon hardness at a temperature of 140° F. was used. The pH of the solution was 10.0.

After washing, rinsing, and drying, the amount of lipid soil remaining on the washed swatch was determined by extraction with organic solvent. By comparison with similar determinations of the amount of lipid soil in similarly soiled unwashed swatches, the percent soil removal by the washing treatment can be found.

A relative measure of detergency efficiency was determined by repeating the above test procedure with a similar standardized cleansing composition in which the sodium p-dodecylsulfonylphenol was replaced in turn by dodecylbenzenesulfonate, sodium p-tetradecylsulfonylphenol and sodium p-hexadecylsulfonylphenol. The dodecylbenzenesulfonate was the sodium salt of sulfonated

alkylbenzene in which the alkyl radicals range from about 9 to about 15 carbon atoms and average about 12 carbon atoms. The dodecyl radical was derived from a propylene polymer, predominantly tetrapolypropylene.

A comparison of the results of the data so obtained established that the long chain, high molecular weight sulfonylphenol compounds of this invention were fairly comparable to dodecylbenzenesulfonate as a detergent compound. Similarly favorable results can be obtained by using the p-alkylphenyl-sulfonylphenol derivatives of this invention.

Short chain p-alkylsulfonylphenol compounds as a broad class of compounds have previously been synthesized. It was surprising to discover, however, that the particular C₁₀ to C₁₈ p-alkyl- and p-alkylphenyl-sulfonylphenol compounds of this invention possess the highly desirable properties for use as organic detergents as exemplified by the preceding example, whereas the previously known short chain p-alkyl-sulfonylphenol compounds did not possess cleaning power.

As mentioned earlier, the members of this new class of compounds have been discovered to also possess bacteriostatic properties. This bacteriostatic activity was discovered by conducting "Standard Tube Dilution Tests." Such tests are in vitro and consist essentially of preparing test tubes of standardized broth medium containing serial dilutions of a compound being tested, inoculating each tube with a preselected microorganism and, after an incubation period, calculating the growth of bacteria in each.

The broth medium employed in these assay tests was an FDA phenol coefficient test nutrient broth. Stock solutions of the test product were then prepared in sterile distilled water. Serial dilutions were then prepared of the test stock solution and then placed into the contact tubes containing the nutrient broth.

The contact tubes were then inoculated with bacterial organisms prepared in the following manner. A washed 24 hour broth culture of gram-positive *Staphylococcus aureus* ATCC 6538 was standardized to a predetermined turbidity, by dilution with sterile nutrient broth, to contain about 500,000,000 organisms per milliliter. One-tenth milliliter quantities of standardized inoculum were added to each previously prepared contact tube. Samples were similarly prepared for a representative gram-negative organism, *Escherichia coli* ATCC 10536.

Four contact tubes were thusly prepared for each inoculating organism at each serial dilution tested, of which three were inoculated and one was retained as an uninoculated control.

The inoculated tubes are shaken thoroughly, allowed to stand for 10 minutes for air bubbles to rise, then read for a zero-hour turbidity value using a Coleman Junior Model 6A spectrometer set at a wave length of 610 millimicrons.

After 24 hours of incubation at 37° C., the tubes are again shaken, allowed to stand for ten minutes, and then read to obtain 24 hour turbidity values. Differences in turbidity values are used as a measure of growth of the bacteria in the contact tubes. In this manner there was determined the minimum effective concentration of the antibacterial which prevents growth of the organism after incubation. This concentration (parts per million of bacteriostatic agent) is called the bacteriostatic breakpoint. (See Table I.)

In order to allow for a comparison of the relative bacteriostatic effectiveness of the novel p-alkylsulfonylphenol compounds, similar in vitro tests were run with the same surfactant compound that was used in the cleaning evaluations, namely dodecylbenzenesulfonate, referred to also as ABS. As before indicated, the ABS employed was the sodium salt of the sulfonic acid derived from the condensation product of benzene and propylenes having from 9 to about 15 carbon atoms and averaging 12 carbon atoms. Compared with other common anionic or non-

ionic detergents, ABS is regarded as having relatively fair bacteriostatic effectiveness. Accordingly, compounds which evidence substantially greater antibacterial effectiveness than dodecylbenzenesulfonate are considered in the art to be useful detergent bacteriostats and as such are always in demand for manifold useful purposes.

The results of the comparative in vitro tests described above are tabulated in Table I.

TABLE I

Bacteriostatic Compounds	Breakpoints (parts per million)	
	<i>Staphylococcus aureus</i> ATCC 6538	<i>Escherichia coli</i> ATCC 10536
Sodium p-dodecylsulfonyl phenol-----	1.5	75
Sodium dodecylbenzene sulfonate-----	37.5	100

The compounds of this invention are useful, per se, as detergent and surface active agents or they can be used conjointly with other materials to form detergent compositions, as for example, liquid, tablet or granular compositions. Such detergent compositions can contain the p-alkyl- and p-alkylphenylsulfonylphenol compounds of the present invention and water-soluble inorganic alkaline builder salts, water-soluble organic alkaline sequestrant builder salts or mixtures thereof in a ratio of the sulfonylphenol to builder salt of about 4:1 to about 1:20. A preferred ratio is 2:1 to 1:10. Builders are hereinafter more fully described.

Water-soluble inorganic alkaline builder salts used alone or in admixture are alkali metal carbonates, borates, phosphates, polyphosphates, bicarbonates and silicates. (Ammonium or substituted ammonium salts can also be used.) Specific examples of such salts are sodium tripolyphosphate, sodium carbonate, sodium tetraborate, sodium pyrophosphate, sodium bicarbonate, potassium tripolyphosphate, sodium hexametaphosphate, sodium sesquicarbonate, sodium mono- and di-orthophosphate and potassium bicarbonate.

Examples of organic alkaline sequestrant builder salts used alone or in admixture are alkali metal, ammonium or substituted ammonium, aminopolycarboxylates, e.g., sodium and potassium ethylenediaminetetraacetate, sodium and potassium N-(2-hydroxyethyl)-ethylenediamine-triacetates, sodium and potassium nitrilotriacetates and sodium, potassium and triethanolammonium N-(2-hydroxyethyl)-nitrilodiacetates. Mixed salts of these polycarboxylates are also suitable. The alkali metal salts of phytic acid, e.g., sodium phytate are also suitable as organic alkaline sequestrant builder salts (see U.S. Patent 2,739,942).

Granular detergent compositions offering each of the foregoing described properties preferably contain about 5% to about 50% of a sulfonylphenol compound or mixtures thereof, and liquid formulations preferably contain about 2% to about 30% of such new compounds. Granular detergent compositions preferably contain at least an equal amount of an alkaline builder salt. Liquid formulations preferably contain from 5% to about 40% of a water soluble alkaline builder salt, the balance of the composition being a solvent such as water, and/or other liquid vehicles.

In addition to being mixed with the builder materials, the p-alkyl and p-alkylphenyl sulfonylphenols of this invention can be used together with other well known active detergent compounds including anionic and nonionic detergent compounds.

Anionic organic detergents which can be used in the compositions of this invention if desired include both the soap and non-soap detergents. Examples of suitable

soaps are the sodium, potassium, ammonium and alkylolammonium salts of higher fatty acids (C₁₀-C₂₀). Particularly useful are the sodium and potassium salts of the mixtures of fatty acids derived from coconut oil and tallow, i.e., sodium or potassium tallow and coconut soap. Examples of anionic organic non-soap detergents are: alkyl glyceryl ether sulfonates; alkyl sulfates; alkyl monoglyceride sulfates or sulfonates; alkyl polyethenoxy ether sulfates; acyl sarcosinates; acyl esters of isethionates; acyl N-methyl taurides; alkylbenzenesulfonates; alkyl phenol polyethenoxy sulfonates. In these compounds the alkyl and acyl groups, respectively, contain 10 to 20 carbon atoms. They are used in the form of water-soluble salts, the sodium, potassium, ammonium, and alkylolammonium salts, for example. Specific examples are: sodium lauryl sulfate; potassium N-methyl lauryl tauride; dodecylbenzene sulfonate.

The examples of nonionic organic detergents which can be used in the compositions of this invention if desired are: polyethylene oxide condensates of alkyl phenols wherein the alkyl group contains from 6 to 12 carbon atoms (e.g., t-octylphenol) and the ethylene oxide is present in a molar ratio of ethylene oxide to alkyl phenol in the range of 10:1 to 25:1, condensation products of ethylene oxide with the product resulting from the reaction of propylene oxide and ethylene diamine wherein the molecular weight of the condensation products ranges from 5,000 to 11,000; the condensation products of from about 5 to 30 moles of ethylene oxide with one mole of a straight or branched chain aliphatic alcohol containing from 8 to 18 carbon atoms (e.g., lauryl alcohol); C₁₀-C₁₈ alkyl di-(C₁-C₂ alkyl) amine oxides (e.g., dodecyl dimethyl amine oxide).

Another unexpected property of these new compounds which makes more valuable the foregoing bacteriostatic properties is that the new compounds are highly adsorbent on cloth fabrics. The high substantivity of the new compounds towards fabrics washed with detergent compositions containing such new compounds enhances the effect which is obtained through bacteriostatic behavior of the compounds.

The detergent compositions of this invention can contain any of the usual adjuvants, diluents and additives, for example, ampholytic, cationic or zwitterionic detergents, perfumes, antitarnishing agents, antiredeposition agents, bacteriostatic agents, dyes, fluorescers, suds builders, suds depressors and the like without detracting from the advantageous properties of the composition.

Cleansing and detergent compositions prepared according to this invention which have found particular applicability in the majority of household laundering situations can contain from about 2% to 50% by weight of the p-alkyl- and p-alkylphenylsulfonylphenol compounds, 25% to 80% by weight of sodium tripolyphosphate, 12% to 45% by weight of sodium sulfate, 0% to 15% by weight of sodium silicate and 0% to about 40% by weight of water.

The following examples are presented for illustrative purposes only.

An excellent granular detergent composition was prepared having the following formula:

	Percent
Sodium salt of p-dodecylsulfonylphenol -----	17.5
Sodium sulfate -----	23.0
Sodium tripolyphosphate -----	50.0
Sodium silicate -----	6.0
Water -----	3.5

A water solution containing from 0.15% to 0.45% concentration of the above formula provides very good cleaning results in both laundering and dishwashing situations.

The following are additional examples of suitable formulations containing compounds of the present invention.

Granular detergent

	Percent	
Sodium salt of p-dodecylsulfonylphenol	10	
Sodium dodecylbenzenesulfonate (the dodecyl group being derived from tetrapropylene)	10	5
Sodium tripolyphosphate	50	
Sodium sulfate	30	

Granular detergent

Sodium salt of p-tetradecylsulfonylphenol	10	10
Condensation product of one mole of nonyl phenol and nine moles of ethylene oxide	10	
Sodium pyrophosphate	50	
Sodium carbonate	3	
Trisodium phosphate	3	15
Sodium sulfate	24	

Liquid detergent

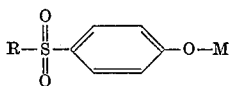
Potassium salt of p-dodecylsulfonylphenol	6	
Sodium dodecylbenzenesulfonate	6	20
Potassium pyrophosphate	20	
Potassium toluene sulfonate	8	
Sodium silicate	3.8	
Carboxymethyl hydroxyethyl cellulose	0.3	
Water	Balance	25

In addition to being incorporated in laundering and dishwashing compositions to obtain the advantages discussed above, the compounds of this invention can be used as ingredients in cleansing creams or similar cosmetic preparations where the antiseptic properties of the new compounds can be utilized.

The foregoing description of the invention has been presented describing certain operable and preferred embodiments. It is not intended that the invention should be so limited since variations and modifications thereof will be obvious to those skilled in the art, all of which are within the spirit and scope of this invention.

What is claimed is:

1. Compounds having the structural formula



wherein R is a p-alkylphenyl radical containing from 10 to 18 carbon atoms in the alkyl substituent, and wherein M is selected from the group consisting of hydrogen and an alkali metal.

2. As a detergent and bacteriostatic compound, the sodium salt of p-dodecylphenylsulfonylphenol.

3. The method of preparing the compounds of claim 1 comprising

- (1) chlorosulfonating an alkylphenyl ether in which the alkyl radical contains from 1 to about 6 carbon atoms at a temperature below about 10° C.,
 - (2) reducing the chlorosulfonated alkylphenyl ether with zinc dust in an alkaline medium at a temperature of 75° C. to 100° C. to form alkali metal p-alkylphenyl ether sulfinate;
 - (3) reacting the sulfinate from the second step with a high molecular weight organic alkylphenyl halide selected from the group consisting of p-decylphenylchloride, p-dodecylphenylbromide, p-tetradecylphenylbromide, p-hexadecylphenylbromide, and p-octadecylphenylbromide in a high boiling point solvent at a temperature in the range of 70° C. to 130° C.
 - (4) and finally, dealkylating the alkyl ether substituent by fusion with and anhydrous pyridine hydrochloride.
4. The method of claim 3 wherein the reducing step of the chlorosulfonated alkylphenyl ether is performed in an alkaline medium having a pH of 9 to 12.
5. The method of claim 3 wherein the high boiling point solvent is selected from the group consisting of dimethyl formamide, dimethyl sulfoxide and dimethyl acetamide.
6. The method of claim 3 wherein the alkylphenyl ether is selected from anisole and phenetole.
7. The method of claim 3 wherein the zinc dust reduction is carried on within a temperature range of 80° to 95° C.
8. The method of claim 3 wherein the alkylation in step 3 occurs within a temperature range of about 80° C. to about 120° C.

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