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COMPOSITION OF MATTER

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20 Claims. (Cl. 260—399)

This invention has to do with new chemical compounds or reaction products which may be generally designated as the sulfides, selenides and tellurides of the metal salts of alkyl-substituted aromatic-organic carboxylic acids. Although the invention is broadly concerned with chemical compounds or compositions coming within the above-designated general classification, it contemplates as a preferred group coming within such general classification those compounds or condensation products which are soluble or miscible with mineral oil.

The present invention is based upon the discovery that the oil-miscible sulfides, selenides and tellurides of metal salts of wax-substituted aromatic-organic carboxylic acids are of multifunctional activity when blended with viscous mineral oil fractions in that they effect improvement of several unrelated and related properties of the oil. For example, these preferred oil-miscible compounds or compositions which come within the general field of invention contemplated herein are effective when blended in a minor proportion with mineral oil fractions of the lubricant type, to depress the pour point, improve the viscosity index (V. I.) and inhibit oxidation of the oil. Through a proper choice of metal substituent (lead, copper, tin or zinc, for example) the load-carrying capacity or "lubricity" of the oil may also be improved.

The alkyl substituents on the aryl nucleus of the compounds or condensation products contemplated herein act to impart oil-miscibility to the product and for the preferred general class of oil-miscible compounds these alkyl substituents should contain at least twenty carbon atoms. This preferred sub-group of compounds having the so-called "heavy alkyl groups" of at least twenty carbon atoms (such as are derived, for example, from a Friedel-Crafts condensation with chlorinated paraffin wax) act to improve the oil in the same respects noted above, and in addition, they improve the viscosity index and pour point of the oil.

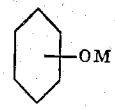
It is to be understood that the present invention is not concerned with mineral oil compositions, such compositions forming the subject matter of my copending application Serial No. 330,532, filed April 19, 1940, now Patent No. 2,319,189, issued May 11, 1943, of which the present application is a continuation-in-part and to which reference is made for further details in the composition of these compounds or reaction products.

It is also to be understood that the present invention is not confined to the oil-miscible or oil-soluble compounds and that the use of the preferred oil-miscible compounds is not confined to the improvement of mineral oils, since this whole class of new materials is possessed of valuable properties irrespective of oil-miscibility. For example, the compounds or condensation products contemplated herein may be used as such as oil-soluble resins for use in paints and varnishes or as intermediates in the production of resins, resin-like materials, rubber substitutes, etc. Certain of the compounds or compositions are possessed of valuable pharmaceutical, insecticidal, or similar properties, such, for example, as those derived from the presence of a particular metal or metal carboxylate group. Numerous other uses and applications of the compounds or compositions contemplated herein will be readily apparent to those skilled in the art from the following description of their composition and typical method of synthesis.

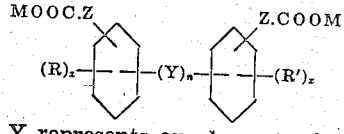
In the aforesaid copending application which is directed to mineral oil compositions having incorporated therein the compounds or compositions of the present invention, and which is a continuation-in-part of my application Serial No. 300,010, filed October 18, 1939 (now Patent No. 2,198,275), I have distinguished over the chemical compounds or compositions described in said patent. Briefly, the compounds or compositions of Patent No. 2,198,275 are alkyl-substituted aromatic-aliphatic carboxylic acid salts; whereas, the compounds or compositions of the present invention are sulfides, selenides or tellurides of alkyl-substituted aromatic-organic carboxylic acid salts wherein at least two of the alkylated aromatic-organic carboxylic acid salt groups are interconnected by at least one atom of sulfur, selenium or tellurium. Thus, through the introduction of sulfur, for example, in the manner or manners to be hereinafter described, I obtain what may be broadly termed a sulfide of an alkyl-substituted aromatic-organic carboxylic acid in which the carboxyl hydrogen is substituted with its equivalent weight of metal.

The compounds of compositions contemplated by the present invention may be considered to be sulfides, selenides and tellurides of alkyl-substituted aromatic compounds in which at least one nuclear hydrogen of each aromatic nucleus is substituted with an oil-solubilizing alkyl group, and in which at least one other nuclear hydrogen of each aromatic nucleus is substituted with an organic (preferably an aliphatic or cycloaliphatic) carboxylic acid salt radical wherein the carboxyl

hydrogen is substituted with its equivalent weight of metal. A particularly preferred group of compounds is that group in which another nuclear hydrogen of each aromatic nucleus is substituted with a hydroxyl group (OH). Another preferred group of compounds is that group characterized by the presence of the aforesaid oil-solubilizing alkyl group and organic carboxylic acid radical and further characterized by the presence of a metal-oxy group (OM), wherein the metal-oxy is substituted for a nuclear hydrogen of each aromatic nucleus. Accordingly, compounds of this latter group which contain the metal-oxy group may be considered to be arylates or "phenates" for they contain the characterizing phenate group:



The compounds or compositions of the present invention may be further considered to be composed of at least two of the above-described alkyl-substituted aromatic compounds interconnected by at least one atom of an element selected from the group consisting of sulfur, selenium and tellurium and may be represented by the general formula:



in which Y represents an element selected from the group consisting of sulfur, selenium and tellurium, and n represents a whole number equal to at least 1 and preferably from 1 to 4. The group ·Z·COOM represents what may be broadly termed an organic carboxylic acid salt group in which Z is preferably an aliphatic or cyclo-aliphatic hydrocarbon group, a carbon atom of which is directly attached to a carbon atom of the aromatic nucleus (benzene, naphthalene, anthracene, phenanthrene. etc.); and COOM represents at least one carboxyl group attached to Z, the carboxyl hydrogen thereof being substituted with its equivalent weight of a metal M; R and R′ represent aliphatic hydrocarbon groups, at least one R and at least one R′ representing oil-solubilizing aliphatic radicals or groups containing at least twenty carbon atoms; and x represents an integer from 1 to 4.

It is to be understood, of course, that the aryl nuclei (disclosed in the formula above as substituted phenyl groups) may be either monocyclic or poly-cyclic, in which case x may be greater than 4; also that it may carry other substituents, such as ester, keto, alkoxy, alkyl sulfide, aryl sulfide, halogen, amino, hydroxy, metal-oxy, etc., as more fully disclosed in application Serial No. 330,532 of which this is a continuation-in-part. As indicated above, hydroxy and metal-oxy radicals are preferred substituents of this group.

The organic carboxylate group, which constitutes one characterizing substituent in the aromatic nucleus of the compounds or compositions contemplated herein, is preferably either aliphatic or cyclo-aliphatic and may be derived from the corresponding organic acids of various molecular weights. In this regard, it is to be understood that the term "alkyl" or "aliphatic" when used herein in connection with the organic carboxylate group, has reference to both aliphatic and cyclo-aliphatic radicals, and that this alkyl carboxylate group may contain at least one substituent selected from the group consisting of: alkyl, aralkyl, alkaryl, aryl, keto, ether, hydroxyl, halogen, nitro and amino radicals, etc., as disclosed in said copending application Serial No. 330,532. Also, this alkyl carboxylate group may be mono- or poly-basic; and in the event it is poly-basic, it is to be understood that all of the carboxyl groups are substituted with metal.

In general, it appears that any metal may be employed as the metal M in compounds or condensation products of the aforesaid type to provide valuable products. Particularly preferred metals are lead, copper, zinc, tin, barium, and sodium. The metals contemplated herein, however, may be broadly classified as metals of groups I to VIII, inclusive, of the periodic system. These metals comprise the following: the alkali metals: lithium, sodium, potassium, rubidium and caesium; the alkaline earth group: beryllium, magnesium, calcium, strontium, and barium; the metals: zinc, cadmium, mercury and scandium; the metals: aluminium, gallium, indium, thallium, titanium, zirconium, cerium, thorium, germanium, tin and lead; vanadium, colombium and tantalum; arsenic, antimony, and bismuth; chromium, molybdenum, tungsten, and uranium; rhenium, manganese, iron, cobalt and nickel; ruthenium, rhodium, and palladium; osmium, iridium, and platinum.

Some of the rare earth metals are given in the foregoing. Other rare earth metals suitable for use in the "aliphatic carboxylate" group (·Z·COOM) of these condensation products are those now commercially available as the cerium and yttrium group, namely, a mixture of praseodymium, neodymium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thallium and lutecium.

Particularly preferred compounds or compositions contemplated herein are those in which the oil-solubilizing groups are aliphatic hydrocarbon radicals or groups characteristic of aliphatic hydrocarbons of high molecular weight and which may be termed "heavy alkyl groups." For obtaining the preferred group of compounds or compositions which are miscible with mineral oil and which possess multifunctional oil-improving properties, I have found that this "heavy alkyl" substituent in the sulfides (selenides and tellurides) of the metal salts described above is preferably derived from a predominantly straight-chain aliphatic hydrocarbon of at least twenty carbon atoms such as characterize petroleum wax. As a matter of fact, paraffin wax is considered to be a preferred source of the "heavy alkyl" substituent, and it is for that reason that the preferred compounds or compositions described herein are referred to as "wax"-substituted. It is to be understood, however, that the term "wax" as used herein, is applied in a broad sense and is intended to include any pure compound or mixture of compounds predominantly aliphatic in nature and containing at least twenty carbon atoms which is susceptible of attachment to an aromatic nucleus to provide a substituent which, in the proper proportions, will impart to the characterizing group the multifunctional oil-improving properties referred to.

It will be understood that when a mixture of aliphatic hydrocarbon compounds such as characterize petroleum wax, for example, is used to provide the heavy alkyl substituent, the resulting composition will be an intimate mixture of sulfides (selenides or tellurides) of alkyl-substituted

aromatic-organic carboxylic acid salts which differ from each other with respect to the nature of the "heavy alkyl" substituent.

In other words, where the alkylation of the aryl nucleus has been affected with a mixture of aliphatic hydrocarbons of at least twenty carbon atoms, the resulting composition will be a mixture of compounds differing in their "heavy alkyl" substituents but having in common the characterizing nuclear group hereinabove referred to.

As indicated above by the general formula, the term "sulfide" as used herein is inclusive of the monosulfides, disulfides, trisulfides, tetrasulfides, etc., that is, it includes both monosulfides and polysulfides; and it is also intended to include such polymers and related derivatives as may be formed by the procedures hereinafter described, which are provided to illustrate the synthesis of the compounds or reaction products contemplated herein.

The sulfides or sulfur derivatives of alkylated aromatic-aliphatic acid salts are the preferred class of compounds or compositions contemplated herein, and for that reason, the invention will be specifically described in connection with the sulfur derivatives, although, as aforesaid, the corresponding selenides and tellurides are contemplated as coming within the scope of this invention.

The sulfides of metal salts of alkyl-substituted aromatic-carboxylic acids can be prepared by the reaction of alkyl-substituted aromatic-carboxylic acids obtained as indicated in Patent No. 2,198,275, with sulfur or sulfur halides followed by substitution of the carboxyl hydrogen with metal. With sulfur dichloride, for example, the monosulfide (n=1 in general formula I) or polymer thereof is formed, and with sulfur monochloride the disulfide (n=2) or polymer thereof is formed. A mixture of sulfur monochloride and sulfur dichloride may be employed to obtain a corresponding mixture of condensation products. Sulfur condensation products or "sulfides" of higher sulfur content can be formed by (*a*) reaction of alkyl- and mercapto- substituted aromatic-carboxylic acids with sulfur monochloride or sulfur dichloride, and (*b*) reaction of a compound of the general type hereinabove described having a disulfide linkage, with sulfur or alkali polysulfide or alkyl tetrasulfide.

The alkylated aromatic-aliphatic acids used in preparing the sulfur condensation products from which the corresponding metal carboxylates are formed, may be obtained in various ways. Details in desirable procedures for obtaining the preferred wax-substituted aromatic-aliphatic acids are described in the aforesaid Patent 2,198,275, where such acids are intermediate products in the formation of the wax-substituted aromatic-aliphatic acid salts described and claimed therein.

The initial step in synthesizing the sulfides of alkylated aromatic-aliphatic acid salts, is to prepare the alkylated aromatic compound. A preferred procedure involves condensing a high molecular weight aliphatic hydrocarbon material with the desired aromatic compound, which, as aforesaid, may carry other substituents, such as a hydroxy group, a metal-oxy group, or the like. The condensation may be affected by first halogenating the aliphatic material and condensing the same with aromatic material by means of a Friedel-Crafts reaction, as described in detail in Patent 2,198,275. This alkylation may also be carried out with unsaturated hydrocarbons or aliphatic alcohols, using sulfuric acid or anhydrous aluminum chloride as a catalyst. For obtaining the preferred multifunctional compounds or compositions with unsaturated hydrocarbons or aliphatic alcohols they should be high molecular weight compounds containing at least twenty carbon atoms, such as eicosylene, cerotene, melene, polymerized isobutylene, etc., and myricyl alcohol, ceryl alcohol, etc.

Examples of the aromatic compounds which may be used as starting materials for the alkylation or wax-condensation reaction for obtaining either a product in which the aromatic nucleus is otherwise unsubstituted or a product in which the aromatic nucleus carries a hydroxyl group are as follows: benzene, naphthalene and anthracene (either substituted or unsubstituted); phenol, resorcinol, hydroquinone, catechol, cresol, hydroxy-diphenyl, benzyl phenol, alpha- and beta-naphthol and betal-methyl naphthol, anthranol, phenyl methyl naphthol, etc.; and aryl ethers such as disphenyl ether and naphthyl ether. Mixed alkyl-aryl or aralkyl-aryl ethers such as anisole, naphthyl methyl ether and benzyl phenyl ether can be used because the Friedel-Crafts reaction with these ethers is accompanied by some re-arrangement, yielding free hydroxy groups. Preference, in general, as has been previously indicated, is to the mono- and poly-cyclic aromatics (preferably naphthalene) and to the mono-hydroxy phenols otherwise unsubstituted, particular preference being given to phenol and alpha- and beta naphthol.

The organic carboxylate substituent may be derived from any organic carboxylic acid, and preferably from any aliphatic or cyclo-aliphatic mono- or poly-basic carboxylic acid, illustrative of which are acetic, butyric, valeric, heptylic, nonylic, palmitic and stearic acids, which typify saturated acids, and must be used as the corresponding halo-acid in which substitution takes place at the alpha carbon atoms of the aliphatic acid group. Other aliphatic acid substituents may be obtained by using unsaturated carboxylic acids of the oleic series, $C_2H_{2n-2}O_2$, in which case substitution on the nucleus takes place at the double bond of the unsaturated acid. Halogenated cyclo-aliphatic acids, such as chlornaphthenic acid may be used to obtain compounds in which the alkylated aromatic group carries a cyclo-aliphatic substituent. The term "alkyl" or "aliphatic" when used herein in connection with the aliphatic carboxylate substituent is intended as inclusive of both aliphatic and cyclo-aliphatic acid groups or radicals.

Where it is desired to obtain a compound or condensation product in which the aryl nucleus contains another substituent in addition to or instead of residual hydrogen, it is pointed out that with the exception of substituents such as aralkyl, aryl, alkaryl, halogen, hydroxyl and aroxy, such substituent groups are introduced after alkylation and after introduction of the alkyl-carboxyl group. The usual methods for the introduction of these substituents into non-alkylated hydroxyaromatic and aromatic compounds may be employed in connection with the alkylated aromatic-alkyl acids and it is to be understood that the introduction of these substituents into the aromatic nucleus will in some cases be accompanied by similar substitution in the heavy alkyl substituent and in the aliphatic acid group. Methods for the introduction of such substituents will be apparent from methods described in my aforesaid copending application Serial No. 330,532.

As aforesaid, the preferred products contemplated herein are those having multifunctional properties wherein the alkyl substituent in the aryl nucleus contains at least twenty carbon atoms. In this preferred class of compounds, special preference is given to the condensation products derived from alkyl-substituted hydroxyaromatic compounds in which the alkyl substituent is derived from petroleum wax. The details in a typical procedure for synthesizing a so-called wax-substituted hydroxyaromatic compound, wax-phenol, are described in my prior application Serial No. 206,683 filed May 7, 1938 (now Patent No. 2,197,833, issued April 23, 1940). Briefly, this procedure involves reacting a chlorinated wax, such as chlorinated paraffin wax, with a phenol in the presence of a Friedel-Crafts catalyst at elevated temperature. The chlorine wax should have a chlorine content of from about 10 per cent to about 16 per cent, and the reaction mixture may contain about three atomic proportions of chlorine (in a chlorwax of 16 per cent chlorine content) to one molecular proportion of phenol. A "wax-phenol" obtained from such a reaction mixture may be designated as wax-phenol (3–16). Parenthetical expressions of the type (A—B) will be used hereinafter in connection with the wax-substituted derivatives to designate: (A) the number of atomic proportions of chlorine in the chlorinated wax reacted with one mol of hydroxyaromatic compound and (B) the chlorine content of the chlorinated wax. In the above example A=3 and B=16. The same designation will also apply to the sulfides of metal salts of wax-substituted aromatic-organic carboxylic acids which constitute the ultimate product derived from the wax-phenol.

Illustrative procedures which may be followed in preparing the sulfides of alkyl-substituted aromatic-aliphatic acid salts are given in the following examples, wherein the "alkylated phenol" is preferably a wax-substituted phenol of the type described directly above for obtaining the "wax"-substituted derivatives which are especially preferred because of their multifunctional oil-improving properties.

EXAMPLE I

Preparation of Stannous Carboxylate of Wax-Phenol Stearic Acid Disulfide

(a) Reaction mixture

	Parts by weight
Wax-phenol stearic acid (3–14)	100
Mineral oil of 67 secs. S. U. V. @ 210, as diluent	300
Sulfur monochloride	5.05
Sodium (dissolved in butanol as sodium butylate)	3.46
Stannous chloride (anhydrous)	7.1

(b) Reaction procedure

Wax-phenol stearic acid (3–14) is prepared by condensing wax-phenol (3–14) with oleic acid, according to the procedure described in Examples I(*a*)—(*b*) of Patent 2,198,275. It is then diluted with mineral oil and converted to the sodium phenate-sodium carboxylate salt by reaction with sodium butylate by heating a mixture thereof at the reflux temperature (about 225° F.) for one hour. The disodium salt is then further diluted with butanol until the mixture can be readily stirred at 100° F., and then S_2Cl_2 is added at this temperature at a rate sufficiently slow to avoid appreciable temperature rise by the heat of reaction developed. The mixture is stirred at this temperature for about one hour to complete the sulfurization. In the reaction with sulfur monochloride, one-half of the sodium in the aforesaid salt is neutralized by reaction with hydrochloric acid formed therein, leaving the sodium carboxylate of the wax-phenol stearic acid disulfide as the reaction product. The stannous salt is then formed by adding stannous chloride in solution in butanol, and heating at the reflux temperature for about one hour, whereby double decomposition takes place between the stannous chloride and the sodium salt to form the stannous carboxylate of wax phenol stearic acid disulfide. The alcohol is then distilled and the reaction product is filtered through "Hi-Flo" to remove sodium chloride. The product is then steam treated at about 300° F. until all traces of alcohol solvent are removed. Upon cooling, vacuum is applied or a current of nitrogen is run through the mixture to remove water vapor and thereby obtain the finished product, which is approximately a ¼ blend in mineral oil. By diluting the mixture sufficiently with Stoddard's solvent or other appropriate light diluent, the mixture can be centrifuged to remove reaction salts and the light diluent can be removed by distillation in order to obtain the pure product per se.

EXAMPLE II

Preparation of Stannous Phenate-Stannous Carboxylate of Wax-Phenol Stearic Acid Disulfide

(a) Reaction mixture

	Parts by weight
Wax-phenol stearic acid (3–14)	100
Mineral oil of 67 secs. S. U. V. at 210° F. as diluent	300
Sodium (dissolved in butanol as sodium butylate)	5.19
Sulfur monochloride	5.05
Stannous chloride (anhydrous)	14.2

(b) Reaction procedure

The disodium salt of the wax-phenol stearic acid disulfide is formed by the procedure of Example I. In order to substitute both the phenolic and carboxyl hydrogens with tin, the stannous chloride in butanol solution is added, followed by addition of sodium butylate equivalent to the phenol content. One equivalent of stannous butylate and one equivalent of stannous chloride are then available for reaction with the sodium salt of the wax-phenol stearic acid-disulfide. The temperature of the reaction mixture is then raised to reflux (about 225° F.) and said mixture is stirred for about one hour to complete the reaction. The alcohol is then distilled and the reaction mixture is filtered, steamed and purified as in Example I to obtain the pure product.

EXAMPLE III

Preparation of Stannous Carboxylate of Wax-Phenoxy Phenyl Stearic Acid Disulfide

(a) Reaction mixture

	Parts by weight
Wax-phenoxy phenyl stearic acid (3–16)	100
Mineral oil of 67 secs. S. U. V. at 210° F. as diluent	200
Sulfur monochloride	6.0
Sodium (dissolved in butanol as sodium butylate)	2.0
Stannous chloride (anhydrous)	2.5

(b) *Reaction procedure*

Wax-phenoxy phenyl stearic acid (3–16) is prepared by condensing wax-phenyl ether (3–16) with oleic acid, according to the procedure outlined in Example III(*a*) of Patent 2,198,275. It is then diluted with mineral oil and converted to the sodium salt by reaction with sodium butylate by heating a mixture thereof at the reflux temperature of butanol for one hour. Sulfur monochloride is added at about 100° F. at a rate regulated to prevent appreciable temperature rise by the resulting heat of reaction; it is preferable for obtaining light colored products that the temperature be not too high at this stage of the preparation. The mixture is stirred at this temperature for one hour to complete the sulfurization. In the reaction with sulfur monochloride, the sodium salt is neutralized by reaction with the hydrochloric acid formed, resulting in the formation of the wax-phenoxy phenyl stearic acid disulfide as the reaction product. Stannous chloride is added to the free acid to form the corresponding stannous salt, followed by addition of an equivalent amount of sodium butylate and heating at the reflux temperature for about one hour to complete the reaction. In this reaction, stannous butylate is formed by reaction of stannous chloride with sodium butylate, and in turn, is reacted with the carboxyl group to form the stannous carboxylate derivative. The alcohol is then distilled off and the reaction product is filtered to remove sodium chloride. The product thus obtained is steam-treated at about 300° F. to remove any traces of solvent. Upon cooling, vacuum is applied or a current of nitrogen is run through the mixture to remove water vapor to give the finished product. The pure product per se may be obtained by following the purification procedure indicated in Example I.

Sulfides of wax-substituted aromatic-aliphatic acid salts, which represent a preferred group of compounds or compositions, of the general character described above which are derived from wax-phenol, may be broadly classified as sulfides of wax-phenyl aliphatic acid salts. Corresponding sulfides can be prepared from wax-substituted aromatic compounds other than phenol, either mono- or poly-cyclic and substituted or unsubstituted, an example of which is wax-naphthol (3–14). As aforesaid, high molecular weight aliphatic compounds or materials other than petroleum wax may be used as the source of the heavy alkyl ("wax") substituent, and it is also emphasized that the invention is not limited to products obtained from stearic acid as a source of the aliphatic acid substituent but any halogenated aliphatic or cyclo-aliphatic acid, including the alkali salt thereof, can be used to obtain various aliphatic and cycle-aliphatic radicals or groups in the aliphatic or cyclo-aliphatic acid salt substituent.

Sulfides of wax-aryl aliphatic salts of the type described above are highly viscous rubber-like products, which with the phenolic ratio properly controlled are readily soluble in mineral oils. Their color is such that they can be readily blended with light colored mineral oil fractions without substantial darkening of the oil fraction, which makes them particularly desirable for use in this connection.

Although products of the oil-miscible type are designated herein as preferred, because of their multifunctional improving properties in mineral oil blends, it is again emphasized that the invention is not limited to sulfides (selenides or tellurides) of metal salts of "wax"-aryl aliphatic acids in which the phenolic ratio is adjusted for oil solubility, but that it is inclusive of oil-solubility.

Listed below are several typical compounds of the type contemplated herein. The procedures for preparing these compounds or reaction products will be apparent to those skilled in the art from the foregoing examples of representative procedures.

Stannous carboxylate of wax-phenol stearic acid disulfide

Stannous phenate-stannous carboxylate of wax-phenol stearic acid disulfide

Stannous carboxylate of wax-phenoxy phenyl stearic acid disulfide

Stannous carboxylate of wax-naphthyl stearic acid monosulfide

Barium carboxylate of wax-phenyl palmitic acid disulfide

Barium phenate-barium carboxylate of wax-phenol palmitic acid disulfide.

Zinc carboxylate of wax-phenol stearic acid tetrasulfide

Zinc naphthate-zinc carboxylate of wax-naphthol stearic acid disulfide

Plumbous carboxylate of wax-phenol nonylic acid trisulfide

Plumbous phenate-plumbous carboxylate of wax-phenol stearic acid monosulfide.

It is to be understood that the foregoing examples of procedures and typical products or compounds are merely illustrative and that the invention includes within its scope such changes and modifications as fairly come within the spirit of the appended claims.

I claim:

1. A new composition of matter consisting of the condensation product characterized by at least two aromatic nuclei interconnected by at least one atom of an element selected from the group consisting of sulfur, selenium and tellurium, each of said aromatic nuclei having attached thereto an organic aliphatic carboxylic acid group, a carbon of which is directly attached to a carbon atom of the aromatic nucleus, the carboxyl hydrogens of said organic aliphatic carboxylic acid groups being substituted with metal, and each of said aromatic nuclei being substituted with at least one alkyl group.

2. A new composition of matter consisting of the condensation product characterized by at least two aromatic nuclei interconnected by at least one atom of an element selected from the group consisting of sulfur, selenium and tellurium, each of said aromatic nuclei having attached thereto an organic aliphatic carboxylic acid group, a carbon of which is directly attached to a carbon atom of the aromatic nucleus, the carboxyl hydrogens of said organic aliphatic carboxylic acid groups being substituted with metal, and each of said aromatic nuclei being substituted with at least one alkyl group having at least twenty carbon atoms.

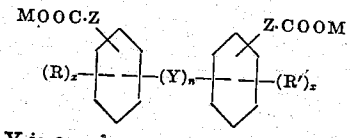
3. A new composition of matter consisting of the condensation product characterized by at least two aromatic nuclei interconnected by at least one atom of sulfur, each of said aromatic nuclei having attached thereto an organic aliphatic carboxylic acid group, a carbon of which is directly attached to a carbon atom of the aromatic nucleus, the carboxyl hydrogens of said organic aliphatic carboxylic acid groups being substituted

with metal, and each of said aromatic nuclei being substituted with at least one wax group.

4. A new composition of matter consisting of the condensation product characterized by at least two aromatic nuclei interconnected by at least one atom of an element selected from the group consisting of sulfur, selenium and tellurium, each of said aromatic nuclei having attached thereto an organic aliphatic carboxylic acid group, a carbon of which is directly attached to a carbon atom of the aromatic nucleus, the carboxyl hydrogens of said organic aliphatic carboxylic acid groups being substituted with metal, each of said aromatic nuclei being substituted with a metal-oxy group, and each of said aromatic nuclei being substituted with at least one wax group.

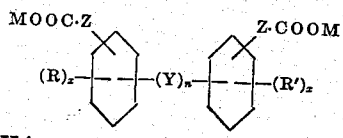
5. A new composition of matter consisting of the condensation product characterized by at least two aromatic nuclei interconnected by at least one atom of an element selected from the group consisting of sulfur, selenium and tellurium, each of said aromatic nuclei having attached thereto an organic aliphatic carboxylic acid group, a carbon of which is directly attached to a carbon atom of the aromatic nucleus, the carboxyl hydrogens of said organic aliphatic carboxylic acid groups being substituted with metal, each of said aromatic nuclei being substituted with a hydroxy group, and each of said aromatic nuclei being substituted with at least one wax group.

6. A new composition of matter consisting of a metalorganic compound having the general formula:



in which Y is an element selected from the group consisting of sulfur, selenium and tellurium; n is a whole number from 1 to 4; ·Z·COOM represents an organic carboxylic acid salt group in which Z represents a radical selected from the group consisting of alkyl and cycloalkyl radicals, a carbon atom of which is directely attached to a carbon atom of a benzene nucleus; ·COOM represents at least one carboxyl group attached to the radical Z, the carboxyl hydrogen thereof being substituted by a metal M; R and R′ represent alkyl groups having at least twenty carbon atoms; and x is a whole number from 1 to 4.

7. A new composition of matter consisting of a metalorganic compound having the general formula:



in which Y is an element selected from the group consisting of sulfur, selenium and tellurium; n is a whole number from 1 to 4; ·Z·COOM represents an organic carboxylic acid salt group in which Z represents a radical selected from the group consisting of alkyl and cycloalkyl radicals, a carbon atom of which is directly attached to a carbon atom of a benzene nucleus; ·COOM represents at least one carboxyl group attached to the radical Z, the carboxyl hydrogen thereof being substituted by a metal M; R and R′ represent alkyl groups of the type which characterize the aliphatic hydrocarbon constituents of halogenated petroleum wax; and x is a whole number from 1 to 4.

8. A composition of matter as defined in claim 6 wherein the metal is selected from the group consisting of lead, copper, zinc, tin, barium and sodium.

9. A composition of matter as defined in claim 6 in which the metal is tin.

10. A composition of matter as defined in claim 7 wherein the metal is selected from the group consisting of lead, copper, zinc, tin, barium and sodium.

11. A composition of matter as defined in claim 7 in which the metal is tin.

12. A new composition of matter consisting of stannous carboxylate of wax-phenol stearic acid disulfide.

13. A new composition of matter consisting of stannous phenate-stannous carboxylate of wax-phenol stearic acid disulfide.

14. A new composition of matter consisting of stannous carboxylate of wax-phenoxy phenyl stearic acid disulfide.

15. A new composition of matter consisting of an intimate mixture of sulfides of metal salts of alkyl-substituted aromatic-aliphatic carboxylic acids, the compounds in said mixture differing from each other with respect to the nature of the alkyl-substituents, the said alkyl substituents being attached to the aryl nuclei and comprising essentially aliphatic hydrocarbon groups having a composition corresponding substantially to the different aliphatic hydrocarbons contained in paraffin wax, the said aryl nuclei being interconnected by at least one atom of sulfur.

16. A new composition of matter consisting of an intimate mixture of sulfides of metal salts of alkyl-substituted phenyl-aliphatic carboxylic acids, the compounds in said mixture differing from each other with respect to the nature of the alkyl substituents, the said alkyl substituents being attached to the phenyl nuclei and comprising essentially aliphatic hydrocarbon groups having a composition corresponding substantially to the different aliphatic hydrocarbons contained in paraffin wax, the said phenyl nuclei being interconnected by at least one atom of sulfur.

17. The method of preparing a sulfide of an alkali metal salt of a wax-substituted aromatic-aliphatic carboxylic acid which comprises: first condensing an aromatic hydrocarbon compound with a halogenated paraffin wax in the presence of a Friedel-Crafts catalyst to form a wax-substituted aromatic hydrocarbon product; then condensing said wax-substituted aromatic hydrocarbon product with a halogenated aliphatic carboxylic acid to obtain a wax-substituted aromatic-aliphatic carboxylic acid; then substituting the carboxyl hydrogen of said carboxylic acid with an alkali metal; and reacting the alkali metal salt thus formed with a sulfur halide to form the corresponding sulfide of said salt.

18. The method of preparing a sulfide of a metal salt of a wax-substituted aromatic-aliphatic carboxylic acid which comprises: first condensing an aromatic hydrocarbon compound with a halogenated paraffin wax in the presence of a Friedel-Crafts catalyst to form a wax-substituted aromatic hydrocarbon product; then condensing said wax-substituted aromatic hydrocarbon product with a halogenated aliphatic carboxylic acid to obtain a wax-substituted aromatic-aliphatic carboxylic acid; then substituting the carboxyl hydrogen of said carboxylic acid with an alkali metal; reacting the alkali metal

salt thus formed with a sulfur halide to form the corresponding sulfide of said salt; and by metathesis substituting the metal in the sulfide of said alkali metal salt thus formed, with another metal.

19. The method of preparing a sulfide of a metal carboxylate salt of a wax-substituted hydroxyaromatic-aliphatic carboxylic acid which comprises: first condensing a hydroxyaromatic hydrocarbon compound with a halogenated paraffin wax in the presence of a Friedel-Crafts catalyst to form a wax-substituted hydroxyaromatic hydrocarbon product; then condensing said wax-substituted aromatic hydrocarbon product with a halogenated aliphatic carboxylic acid to obtain a wax-substituted hydroxyaromatic-aliphatic carboxylic acid; then substituting the carboxyl and hydroxyl hydrogens of said hydroxyaromatic-aliphatic carboxylic acid with alkali metal; reacting the alkali arylate-alkali carboxylate salt thus formed with a sulfur halide to form the corresponding sulfide of the wax-substituted hydroxyaromatic-aliphatic carboxylate salt in which only the carboxyl hydrogen is substituted with alkali metal; and by metathesis, substituting another metal for the alkali metal in the product obtained in the preceding step.

20. The method of preparing a sulfide of a metal arylate-metal carboxylate salt of a wax-substituted hydroxyaromatic-aliphatic carboxylic acid which comprises: first condensing a hydroxyaromatic hydrocarbon compound with a halogenated paraffin wax in the presence of a Friedel-Crafts catalyst to form a wax-substituted hydroxyaromatic hydrocarbon product; then condensing said wax-substituted aromatic hydrocarbon product with a halogenated aliphatic carboxylic acid to obtain a wax-substituted hydroxyaromatic-aliphatic carboxylic acid; then substituting the carboxyl and hydroxyl hydrogens with alkali metal; reacting the alkali arylate-alkali carboxylate salt thus formed with a sulfur halide to form the corresponding sulfide of the wax-substituted hydroxy-aromatic-aliphatic carboxylate salt in which only the carboxyl hydrogen is substituted with alkali metal; and by metathesis, substituting another metal for the alkali metal and the hydroxyl hydrogen in the product obtained in the preceding step.

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