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ANTICORROSION COMPOSITION

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1 This invention relates to non-gaseous oleaginous compositions, and especially to petroleum hydrocarbon compositions, such as gasoline, fuel oils, such as Diesel fuel oils, lubricating oils, waxes, and the like, containing small amounts of certain addition agents, which oleaginous compositions possess very high anti-corrosive, and especially rust-protective properties.

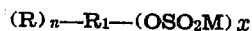
The addition of certain materials to oleaginous compositions, such as the addition of high molecular weight polycarboxylic acids, compounds of phosphorus, arsenic, and antimony, various esters, and organo-metallic compounds, has been stated to impart corrosion inhibiting properties to hydrocarbon oils. However, in view of the exacting characteristics and properties which an additive must possess in order to impart anti-corrosive properties to hydrocarbon oils, this problem has not been completely satisfactorily solved heretofore. For example, it is believed that the anti-corrosive additives may form a protective film or coating on the exposed surface of the metal, which film in order to satisfactorily prevent corrosion of the metal surface must be tenacious and flexible, and many of the heretofore described materials fail in this respect. Furthermore, the additive must not of itself attack the metal, and it is preferably soluble in the oil, since suspensions, emulsions and dispersions tend to separate from the oil, which thereby loses the desired properties. Additives heretofore described as imparting anti-corrosive properties to oils may possess one or more of the desired characteristics or properties, but, as above stated, a material which imparts completely satisfactory anticorrosive properties to hydrocarbon oils has not heretofore been demonstrated.

Accordingly, an object of the present invention is to provide oleaginous compositions of satisfactory corrosion-protective properties. A further object is to provide hydrocarbon oil compositions of satisfactory corrosion-inhibiting properties. A special object of this invention is to provide lubricating oils having improved corrosion-protective properties. Other objects will be apparent hereinafter.

It has now been discovered that the addition to oleaginous materials, such as hydrocarbon oils, of a minor quantity of a material having a nucleus composed of one aromatic ring fused to one cycloaliphatic ring, and having attached to said nucleus at least one oleophilic organic radical, such as an aliphatic radical, and at least one metallic sulfonate radical, as hereinafter fully described, imparts substantially complete-

2 ly satisfactory corrosion protective properties to said hydrocarbon oils.

In accordance with the present invention a material, or additive, which may be represented by the general formula:

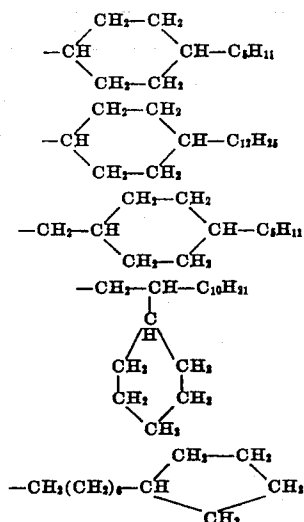


wherein R_1 represents a nucleus having an aromatic ring fused to a cycloaliphatic ring (i. e., the two rings have two carbon atoms in common); R represents an organophilic, preferably oleophilic, such as a non-aromatic hydrocarbon radical of from 8 to 30 carbon atoms, M represents a chemical base cation, preferably a metallic element, and n and x each represent an integer selected from the group consisting of 1, 2, and 3, is incorporated in an oleaginous material, such as a hydrocarbon oil. The nucleus, as above described, wherein one aromatic ring is fused to one cycloaliphatic ring, in the case of a six-membered cycloaliphatic ring, is commonly designated as "tetralin," or, "1,2,3,4-tetrahydronaphthalene," which is the preferred nucleus of the additives of the present invention, but the cycloaliphatic ring may contain more or less carbon atoms, such as a five or seven carbon atom ring. As illustrative of suitable oleophilic radicals which R may represent are the nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, docosyl, eicosyl, tetracosyl, hexacosyl, octacosyl and triacontyl radicals. These radicals may contain branched chains, such as where one or more groups such as the methyl, ethyl, propyl, etc., groups are attached to a carbon atom of the alkyl chain, but it is preferable to keep the total number of carbon atoms below about 30, where there is but one alkyl substituent. If desired, other substituents may be attached to a carbon atom of the alkyl chain, such as the amino, chloro, hydroxy and thiocyano groups, and the like. The alkyl group is preferably saturated, but there may be one or more unsaturated linkages between carbon atoms without deleteriously affecting the results; for example, excellent results may be obtained where R represents the oleoyl group. As indicated by the above formula, 1, 2 or 3 alkyl radicals may be attached to the nucleus. It is preferable, where there are 2 or 3 alkyl groups attached to the nucleus, to keep the total number of the carbon atoms in all of the groups so attached so as not to exceed about 45, and where there is only one alkyl substituent, the total number of carbon atoms should not exceed about 30, as hereinbefore stated. In the

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preceding formula, M represents a metallic element equivalent, such as lithium, sodium, potassium, rubidium or cesium. Other metals and chemical base equivalents which M may represent are, for example, magnesium, calcium, strontium, barium, manganese, copper, ammonium, etc. Of course, in the case of a polyvalent metal, two or more radicals will be attached to each atom of the metal, depending on the valence of the metal.

A preferred group of materials for employment in the present invention is where a non-aromatic hydrocarbon group, represented in the above formula by R, has a cycloaliphatic group connected in or attached to an alkyl chain. Thus, for example, preferred hydrocarbon radicals may be represented by the following formulas:



and the like. However, it is emphasized that the total number of carbon atoms of all of the substituent groups should not exceed about 45, and that this number of carbon atoms may be distributed between 2 or 3 substituent groups, since, as above described, where there is only one hydrocarbon substituent, the total number of carbon atoms should not exceed about 30.

It is generally contemplated that the substituents attached to the tetralin nucleus will be attached to the aromatic portion thereof, since excellent results are obtained therewith in accordance with the present invention, and also since such compounds are more readily prepared than where the substituents are attached to the cycloaliphatic portion. However, in the case where the sum of the number of oleaginous and sulfonate substituents is 5 or 6, 1 or 2, respectively, groups will be attached to the cycloaliphatic portion.

As illustrative of preferred specific additives of the present invention may be mentioned disodium octadecyltetralin disulfonate, disodium hexadecyltetralin disulfonate, disodium cyclopentylheptyltetralin disulfonate, sodium cyclohexylamyltetralin sulfonate, and the like. In general, the exact positions of the groups attached to the tetralin nucleus are immaterial for the purposes of the present invention. For example, with disodium octadecyltetralin disulfonate, the sodium sulfonate groups may occupy the 1 and 4 positions, and the octadecyl group the 2 or 3 position, or the sodium sulfonate groups may occupy the 1 and 3 positions, and the

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octadecyl group the 2 or 4 position. Of course, mixtures of such compounds are within the scope of the present invention.

In accordance with the present invention, a minor amount of a compound as above defined is incorporated in an oleaginous material, preferably a hydrocarbon oil. Although the compositions of the present invention are of general applicability, and substantially completely prevent corrosion to metal parts which might otherwise be caused by the environment or by the oil itself, they are especially suitable for use in lubricating oils employed with internal combustion engines which may be exposed to conditions favorable for corrosion of the metal parts, such as marine Diesel engines, and the like.

The quantity of additive to be incorporated in lubricating or other oils may be varied considerably according to the particular application, but may advantageously be within the range of from about 0.1% to about 5% in most instances. In instances where relatively severe corrosion inducing conditions may be encountered, a larger quantity of additive may be incorporated in the oil, whereas, if only mild conditions are anticipated less than 0.1% may be employed. For example, disodium octadecyltetralin disulfonate may be dissolved in concentrations of substantially 5% in most hydrocarbon oils. If it is desired to incorporate a quantity of additive in the oil greater than its solubility therein, the additive may be dispersed or emulsified in the oil, but it is generally contemplated that the relatively high solubility of the additives, as hereinbefore explained, will permit the use of solutions rather than dispersions or emulsions. Also, solubilizers, such as glyceryl mono-oleate and other partial esters of polyhydric alcohols with higher fatty acids may be used to effect greater solution of the additive in the oil.

The additives of the present invention may be prepared by any convenient means. For example, tetralin may be alkylated, sulfonated, and treated with an alkaline material such as sodium or potassium hydroxide, to produce preferred additives.

The following examples illustrate the present invention, which is not to be considered as limited thereby.

Example I

A strip of open hearth low carbon steel was immersed at room temperature for 1 minute in a composition consisting of a refined lubricating oil of SAE grade number 30 containing incorporated therein 4.5% by weight of disodium octadecyltetralin disulfonate. The steel was then allowed to drain for 16 hours while being held at a temperature of about 130° F., and subsequently was exposed to an atmosphere of from 95 to 100% relative humidity at about 100° F. for 11 days. On examination the steel strip was completely free of corrosion.

The test was repeated omitting the additive; severe rusting was observed in less than 1 day.

Example II

A steel strip similar to that described for Example I was immersed in a 0.1% aqueous hydrobromic acid solution, quickly removed and quickly immersed in the same oil composition as described for Example I. The steel was removed from and immersed in the oil 12 times in 60 seconds, and then stored in air for four hours. On examination the steel strip was completely free from corrosion.

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The test was repeated, omitting the additive; the oil completely failed the test, the metal being severely corroded practically immediately.

Example III

A steel strip as described in Example I was immersed in the same oil composition as described in Example I for 1 minute at room temperature, and allowed to drain for 16 hours at room temperature. The steel was then immersed in a synthetic sea water containing the indicated quantities, expressed as grams per liter of solution, of the following: magnesium chloride hexahydrate=11; anhydrous calcium chloride=1.2; anhydrous sodium sulfate=4.0; and sodium chloride=25.0, for 20 hours, after which it was removed and rinsed with acetone. On examination the steel strip was completely free from corrosion.

The test was repeated, omitting the additive; the metal was severely corroded by the aqueous bath.

Example IV

When Example I is repeated using a castor oil instead of the refined lubricating oil, the steel strip remains free of corrosion, substantially as described in Example I.

The above examples, which are not intended to limit the present invention, demonstrate the excellent corrosion inhibiting properties imparted to oleaginous compositions, such as hydrocarbon oils, and especially lubricating oils, by the additives of the present invention. Substantially similar results may be achieved by employing a composition containing the mono- or trisodiumsulfonate of octadecyltetralin in place of the disodiumsulfonate, as hereinbefore described. As illustrative of other oleaginous materials which may be employed in the present invention may be mentioned gasoline, kerosene, fuel oils, petroleum and vegetable waxes, animal and vegetable oils, such as sperm oil, fish oils, castor oil, and the like, and comparable synthetic oils and compositions.

The physical properties of the compositions of the present invention are substantially identical to those of the hydrocarbon oil employed in the preparation of the composition. For example, the specific gravity, viscosity, flash point, fire point, pour point, neutralization number, color, carbon residue, and the like, of the compositions of the present invention are substantially identical to those of the lubricating oil employed in the preparation of the composition.

Other additives may be incorporated in the compositions of the present invention where desirable. For example, pour point depressants such as paraffin wax derivatives, aluminum stearate, and the like; viscosity index improvers such as natural or synthetic resins, esters such as tristearyl cellulose, and the like; oiliness carriers such as halogenated organic compounds, and the like, may be incorporated in the compositions of the present invention without adversely affecting the action of the additives of the present invention and the beneficial effects of the additional additive or additives are obtained.

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A still further advantage of the compositions of the present invention is the protection of the oil from any catalytic action which the contacting metal may have thereon, thereby in large measure preventing the deposition of sludge. Still other advantages and modifications of the present invention will be apparent to those skilled in the art, which modifications are within the scope of the present invention.

I claim as my invention:

1. A non-aqueous oil composition which comprises a hydrocarbon oil and a minor but effective corrosion-inhibiting amount of an unsubstituted alkylated fused-polycyclic sulfonate consisting essentially of a tetralin nucleus and, attached to said nucleus, 1 alkyl radical of from about 18 to about 30 carbon atoms and from 1 to 3, inclusive, metallic sulfonate groups.

2. A non-aqueous oil composition which comprises a hydrocarbon oil and a minor but effective corrosion inhibiting amount of an unsubstituted alkylated fused-polycyclic sulfonate consisting essentially of a tetralin nucleus and, attached to said nucleus, 1 alkyl radical of from about 18 to about 30 carbon atoms and 2 metallic sulfonate groups.

3. The composition of claim 2 wherein the alkylated fused-polycyclic sulfonate is disodium octadecyltetralin disulfonate.

4. A non-aqueous lubricating oil composition which comprises a lubricating oil and, as an effective anti-corrosive agent, from about 0.1% to about 5% of an unsubstituted alkylated fused-polycyclic sulfonate consisting essentially of a tetralin nucleus and, attached to said nucleus, 1 alkyl radical of from about 18 to 30 carbon atoms and 2 sodium sulfonate groups.

5. The composition of claim 4 wherein the alkylated fused-polycyclic sulfonate is disodium octadecyltetralin disulfonate.

6. The composition of claim 2 wherein the alkylated fused-polycyclic sulfonate is disodium octadecyltetralin disulfonate and the hydrocarbon oil is a refined mineral lubricating oil.

7. The composition of claim 2 wherein the alkylated fused-polycyclic sulfonate is monosodium sulfonate of octadecyltetralin and the hydrocarbon oil is a refined mineral lubricating oil.

8. The composition of claim 2 wherein the alkylated fused-polycyclic sulfonate is trisodiumsulfonate of octadecyltetralin and the hydrocarbon oil is a refined mineral lubricating oil.

9. A non-aqueous oil composition which comprises a castor oil and a minor but effective corrosion-inhibiting amount of disodium octadecyltetralin disulfonate.

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