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CORROSION INHIBITOR

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This invention relates to compositions for inhibiting corrosion. In one aspect, the invention relates to two component corrosion inhibiting compositions suitable for use in hydrocarbon systems.

A high resistance to rust or corrosion is important in the use of hydrocarbon fuels or lubricants which are in contact with metal surfaces in the presence of water. Fuels for internal combustion engines are examples of materials which desirably have incorporated therein an additive which provides corrosion inhibiting properties.

In addition, inhibitors are frequently employed in the processing and transporting of a wide variety of hydrocarbon fractions, for example, in storage tanks, fractionators, pipe lines, transport vessels, etc. Water is almost always present as a contaminant in the processing and storage of hydrocarbon oils; thus the problem of corrosion is always present.

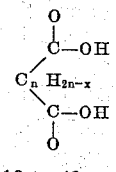
It is an object of this invention to provide corrosion inhibiting compositions which are suitable for use with hydrocarbon oils.

It is another object of this invention to provide corrosion inhibiting compositions for use in hydrocarbons which are in contact with metals in the presence of water and other corrosive materials.

These and other objects of the invention will become more readily apparent from the detailed description and discussion.

The foregoing objects are achieved broadly by providing a corrosion inhibiting composition containing a dimerized fatty acid and a quaternary ammonium compound. In one aspect, the invention comprises hydrocarbon oils containing said corrosion inhibiting composition.

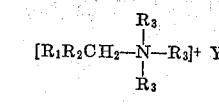
Dimerized fatty acids which are employed in the compositions of this invention have the general formula:



wherein n varies from 10 to 42 and x varies from 6 to 10.

Specific acids which can be employed include dimers of dienoic acid, such as the dimers of sorbic acid, palmitoleic acid, linoleic acid, and eicosadienoic acid; also dimers of trienoic acids, such as dimers of linolenic acid and eleostearic acid.

The quaternary ammonium compounds which make up the other component of the inhibiting composition are described by the general formula as follows:



wherein R_1 is an alkyl group containing 6–15 carbon atoms, R_2 is aryl, R_3's are alkyl groups containing 1–4 carbon atoms, and Y is a halogen.

Specific examples of the quaternary ammonium compounds include materials such as dodecylbenzyl trimethyl ammonium chloride, heptylbenzyl triethyl ammonium chloride, heptylbenzyl triethyl ammonium bromide, octylnaphthylmethyl tributyl ammonium chloride, octylbenzyl trimethyl ammonium bromide, octylbenzyl tripropyl ammonium chloride, nonylbenzyl trimethyl ammonium chloride, nonylnaphthylmethyl triethyl ammonium chloride, nonylbenzyl triethyl ammonium bromide, hexylbenzyl trimethyl ammonium chloride, octylnaphthylmethyl triethyl ammonium chloride, tridecylbenzyl tripropyl ammonium chloride, and hexylbenzyl tripropyl ammonium chloride. Of the quaternary ammonium compounds, the preferred material is dodecylbenzyl trimethyl ammonium chloride. This compound is prepared by chloromethylating dodecylbenzene to dodecylbenzyl chloride followed by reaction with trimethyl amine to obtain the final quaternary product.

The relative quantities of the two components employed in the inhibitor can vary over a wide range; however usually the dimerized acid is present in the composition in an amount from about 92 to about 60 percent by weight. Preferably, the dimer acid component is employed in the composition in an amount between about 80 and 90 percent by weight.

The inhibitor compositions of this invention can be employed generally for the prevention of corrosion in systems containing hydrocarbon oils. For example, they can be employed with heavy fuel oils, diesel oils, various heating oils, naphthas, gasolines, etc., or with individual hydrocarbons. Only small amounts of the corrosion inhibitor are required in combination with the hydrocarbon oil. For example, usually the inhibitor is present in an amount between about 1 and about 500 parts per million by weight. Larger amounts of inhibitor can be employed; however they usually are not necessary.

The inhibitor compositions can be prepared in any conventional manner, for example, the acid can be added to the quaternary or vice versa. Also the combination of the inhibitor with the hydrocarbon oil can be effected in any suitable manner. If desired, either of the components of the inhibitor composition can first be added to the hydrocarbon oil and then the other component.

It has been found that the combination of the dimer acid and the quaternary ammonium compound provides a synergistic effect in that the combination provides better corrosion resistance than either of the individual components. The efficacy of the compositions in preventing corrosion is even more unexpected, since the quaternary compounds exhibit little or no corrosive inhibition effects and may even cause corrosion when used alone.

The following examples are presented in illustration of the invention:

EXAMPLE 1

500 ml. of gasoline was placed in a test vessel with 50 ml. of brine. A mild steel coupon was extended vertically in the gasoline brine mixture which was agitated. The temperature of the mixture was increased to 140° F. where it was maintained for 96 hours. The results of the test are presented in Table I.

The corrosion rates are recorded as penetration depth in milliinches per year.

Table I

Petroleum Fraction	Inhibitor, 25 p.p.m.	Weight Loss, gm.	Corrosion Rate, m.p.y.
High Test Gasoline	None	0.4695	51.00
Do	Ethylene Diamine Sulfonate.	0.0007	0.08
Do	Dimer A [1]	0.0010	0.11
Do	Quaternary [2]	0.5580	60.70
Do	Dimer A + Quaternary.	0.0010	<0.01

[1] 9,11 Octadecadienoic acid.
[2] Dodecylbenzyl trimethyl ammonium chloride.

It is apparent from the table that the combination of dimer acid and quaternary compound (90 percent acid and 10 percent quaternary by weight) provide substantially better results than either of these materials when used individually. The results are unusual when it is considered that the quaternary compound actually was corrosive, since it causes a greater corrosion rate than no inhibitor. It is noted also that the combination of dimer acid and quaternary provide better results than a known corrosion inhibitor, ethylene diamine sulfonate.

EXAMPLE 2

An additional test was carried out utilizing the same procedure employed in Example 1 but with a different dimer acid. The results of this test are presented in Table II.

Table II

Petroleum Fraction	Inhibitor, 25 p.p.m.	Weight Loss, gm.	Corrosion Rate, m.p.y.
High Test Gasoline	Dimer B [1]	0.0010	0.11
Do	Quaternary [2]	0.5580	60.70
Do	Dimer B Plus Quaternary.	0.0007	0.08
Do	Dimer C [3] Plus Quaternary.	0.0020	0.02

[1] An acid dimer having the following properties:

Specific gravity at 60°/60° F	0.884
Viscosity—	
SUS 210° F	52
SUS 100° F	259
Flash Point ° F. (C.O.C.)	170
A.S.T.M. Color	5½
A.S.T.M. Pour Point ° F	−30

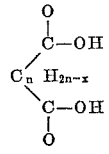
[2] Dodecylbenzyl trimethyl ammonium chloride.
[3] Mixture of dimer and trimer of octadecadienoic acid.

It is again noted that the combination of dimer acid and quaternary compound (90 percent acid and 10 percent quaternary by weight) provide substantially better results.

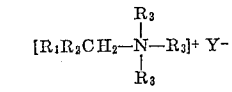
Having thus described the invention by providing specific examples thereof, it is to be understood that no undue limitations or restrictions are to be drawn by reason thereof and that many variations and modifications are within the scope of the invention.

I claim:

1. A composition consisting essentially of from about 92 to about 60 weight percent of an acid having the formula:



wherein n varies from 10 to 42 and x varies from 6 to 10 and a quaternary ammonium compound having the formula:



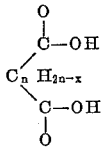
wherein R_1 is an alkyl group containing 6–15 carbon atoms, R_2 is aryl, R_3's are alkyl groups containing 1–4 carbon atoms, and Y is a halogen.

2. The composition of claim 1 containing from about 80 to about 90 weight percent acid.

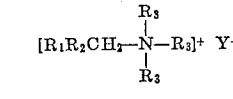
3. The composition of claim 2 in which the quaternary ammonium compound is dodecylbenzyl trimethyl ammonium chloride.

4. The composition of claim 3 in which the acid is 9,11 octadecadienoic.

5. A composition comprising a major proportion of hydrocarbon oil and between about 1 and about 500 parts per million by weight based on the hydrocarbon oil of a corrosion inhibitor consisting essentially of from about 92 to 60 percent by weight of an acid having the formula:



wherein n varies from 10 to 42 and x varies from 6 to 10 and a quaternary ammonium compound having the formula:



wherein R_1 is an alkyl group containing 6–15 carbon atoms, R_2 is aryl, R_3's are alkyl groups containing 1–4 carbon atoms, and Y is a halogen.

6. The composition of claim 5 in which the inhibitor is present in an amount between about 1 and 500 parts per million by weight based on the hydrocarbon oil and in which the inhibitor contains between about 80 and 90 weight percent acid.

7. The composition of claim 6 in which the hydrocarbon oil is gasoline, the dimer acid is the dimer of 9,11 octadecadienoic acid, and the quaternary ammonium compound is dodecylbenzyl trimethyl ammonium chloride.

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