

1

2,814,593

CORROSION INHIBITION

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This invention relates to corrosion inhibiting compositions and more particularly to corrosion inhibiting compositions for use in aqueous solutions which normally corrode metals. The invention also relates to the resulting aqueous solutions containing the corrosion inhibitors of the invention, and to corrosion inhibiting processes employing such compositions.

Metal pickling involves treatment of a metal such as iron or steel with a strong acid bath to remove surface impurities such as oxide scale formed thereon in the course of manufacture. Since the strong acids employed are capable of attacking the metal, itself, it is advantageous to add to the bath a corrosion inhibitor which enhances the selective action of the acid on the surface impurities, and substantially reduces or prevents attack of the metal by the acid.

Another field of metal treatment employing strong aqueous acids is in "acidizing" treatment of oil wells. A strong aqueous mineral acid is introduced into the oil well to increase the flow of oil by attacking the underground porous rock formations containing the oil. Since the acid solutions come in contact with metal equipment of the well, it is advantageous to incorporate a corrosion inhibitor in the acid solution to prevent excessive damage to the metal equipment. Another problem arising in acidizing treatment of oil wells lies in the resolution or inhibition of oil-in-water emulsions which normally tend to form during and as a result of the acidizing treatment. Similar problems arise in many other instances in which acid solutions come in contact with metals, as for example in the transportation, storage and handling of acidic solutions, cleaning of metals, and the like.

Various inhibitors have been proposed for addition to such acid solutions for the purpose of reducing or eliminating the aforementioned undesirable effects of the acidic solutions contacting metals, as for example, sulfur and nitrogen-containing compounds such as mercaptans, organic bases, tertiary alkylol amines, reaction products of an aldehyde with such sulfur and nitrogen compounds, or with other basic amino compounds and the like. Compositions containing quaternized cyclic nitrogen bases have also been proposed as inhibitors which do have some advantages. Thus, U. S. Patent 2,037,762 discloses quaternized coal tar bases having inhibiting properties acceptable for many uses.

There are, however, several definite disadvantages in employing the foregoing sulfur and nitrogen compounds. Due to the insolubility of part of the inhibitor in the acid bath, a scum is always formed on the surface of the bath. The scum not only adheres to the metallic articles with which it is in contact, but also to the sides of the vessel containing same. In addition, the residue or by-products of the inhibitors have an obnoxious and disagreeable odor. Further, the inhibiting properties of such compounds are not entirely satisfactory, perhaps due to their insolubility or other characteristics. Several of such compounds, being of a tar-like consistency, are difficult to handle during the preparation of the inhibited acid solutions. Still further, many of these compounds have been

2

found to be unstable at the elevated temperatures sometimes found necessary in the use of acid solutions containing them.

It is an object of this invention to provide a composition for addition to aqueous solutions which come into contact with metals, which has improved corrosion inhibiting properties and improved solubility and stability in acid, and the like. It is another object of this invention to provide improved aqueous solutions containing such compositions. A further object of this invention is to provide an improved process employing such compositions for inhibiting corrosion of metals. Other objects and advantages will appear as the description proceeds.

The attainment of the above objects is made possible by the instant invention which is based upon the discovery that a composition comprising (A) a non-surface active quaternized N-heterocyclic base, (B) a water soluble non-ionic surface active agent containing a polyoxyethylene group and, desirably, (C) a hydroxylic compound, is a highly effective corrosion inhibitor for metals, particularly iron and steel, unexpectedly exceeding the inhibiting effect weight for weight of any of its respective components when used in acid solutions. Stated otherwise, the compositions of this invention exhibit a synergistic effect with respect to inhibition of corrosion.

In addition to improved corrosion inhibiting efficiencies, the compositions of this invention have the added and desirable property of being soluble and stable in concentrated acids such as hydrochloric and sulfuric acid for long periods of time and at elevated temperatures. This property is important since inhibitors are often sold as concentrates in strong acid such as muriatic acid, stored for extended lengths of time, and subjected to elevated temperatures in use.

The corrosion inhibiting compositions of this invention are highly effective in the acid baths employed for pickling which contain, for example, sulfuric, hydrochloric, nitric, hydrofluoric, phosphoric, formic or acetic acid in concentrations of from about 1 to 40 percent or more by weight or in equivalent aqueous solutions of acid salts such as acid sulfates and the like. They are also effective and useful as corrosion inhibitors in the acidizing of oil wells with strong acids (e. g. hydrochloric or hydrofluoric acid) of 5 to 25 percent concentration by weight wherein the corrosion inhibiting compositions also act to prevent or inhibit formation of, and to resolve, water-in-oil emulsions.

In addition to the increased inhibiting properties of the composition of this invention, undesirable odors are decreased or eliminated, and solubility and fluidity properties so constituted that the composition may be easily handled during preparation of the inhibited acid solutions, and is substantially completely dissolved or dispersed in the acid solutions without formation of undesirable scum, tarry residues, or the like.

The compositions of this invention are also effective in inhibiting the corrosive action on metals of aqueous solutions of many diverse types as for example distilled water, boiler water, automobile radiator cooling solutions, acids such as hydrochloric and the like used for boiler cleaning, aqueous brine solutions containing sodium chloride, mixed calcium chloride-magnesium chloride and similar brines used for refrigeration purposes and the like.

As component A in the instant composition, there is employed a quaternized derivative of a compound containing at least one tertiary nitrogen atom as part of a carbon-containing ring. Such heterocyclic nitrogen bases are well known in the corrosion inhibiting art and no claim is made thereto per se. Representative of the heterocyclic nitrogen bases operative in the compositions of this invention are those disclosed in U. S. Patents 2,037,762, 2,080,553, 2,403,153 and 2,606,873. As examples of such

heterocyclic nitrogen bases there may be mentioned pyridine, 2-n-amy1 pyridine, 4-n-amy1 pyridine, 2-hexyl-pyridine, quinoline, isoquinoline, 3-methyl-isoquinoline, 2,7-dimethyl quinoline, quinaldine, acridine, collidine, 2,4-lutidine, 2,6-lepidine, α -picoline, β -picoline, decyl picoline, dimethyl picoline, morpholine, morpholine ethanol, thiomorpholine, thiomorpholine ethanol, phenyl morpholine, vinoxethyl morpholine, N,N-diethyl piperazine, diphenyl piperazine, and their derivatives. Mixtures of one or more of such heterocyclic nitrogen bases may also be employed. These bases may be isolated from their natural sources and used in the pure state, or commercially available materials in which such compounds are present, such as denaturing or flotation pyridines, bone oils, coal tar distillates or the like may be employed. We prefer to employ the commercially available materials rather than the purified materials because the remaining components in the composition of this invention solubilize the unidentified scum and tar forming components of the commercial mixture with a consequent enhancement of the inhibiting effect. The bases derived from coal tar distillates have been found to be highly effective, such as the commercial cuts known as crude pyridine base, crude quinoline fraction or residue, and the like, and these are preferred for use in view of their economy and inhibiting properties.

The aforementioned heterocyclic nitrogen bases containing at least one tertiary nitrogen atom may be quaternized in known manner as described for example in U. S. Patent 2,037,762, by reaction with an organic halide, sulfate or sulfonate. As representative of the quaternizing agents which may be employed for reaction with the heterocyclic nitrogen base, there may be mentioned methyl paratoluene sulfonate, diethyl sulfate, dimethyl sulfate, methyl iodide, ethyl bromide, phenyl methyl iodide or chloride, benzalchloride, benzotrichloride, benzylbromide, phenyl ethyl chloride, phenyl ethyl bromide and substituted phenyl ethyl chlorides and bromides such as ortho-chlorobenzyl chloride, paranitrobenzyl chloride, and the like, benzoyl halides such as benzoyl chloride, benzoyl bromide, m-nitrobenzoyl chloride, halogen substituted ketones of the aryl substituted aliphatic series such as chloroacetophenone, allyl chloride, ethylene chloride, ethylene dichloride, propylene dichloride, dichlorodiethyl ether, naphthyl methyl chloride, bis-chloromethyl chloride, bis-chloromethyl xylene, bis-chloromethyl naphthalene, and the like, and especially benzyl chloride. It should be noted that the quaternized heterocyclic nitrogen bases employed in the compositions of this invention are devoid of alkyl chains of more than five carbon atoms and accordingly do not possess to any appreciable extent the property of surface activity within its generally accepted meaning. No claim is made to the quaternized heterocyclic nitrogen bases per se or their methods of manufacture, the invention herein residing in the combination of the components above mentioned.

The water-soluble or water-dispersible non-ionic surface active agents employed as component (B) in the instant invention are well known and may be produced in accordance with the methods disclosed in U. S. Patents 1,970,578, 2,174,761, 2,213,477, 2,194,429, 2,240,937, 2,367,001, 2,510,063, 2,564,757, 2,564,857, 2,593,112 and 2,623,870. In general, component (B) should contain sufficient oxyethylene groups to render the product water-soluble or easily water dispersible. From about 4 to 60, and preferably about 5 to 15 such groups are usually sufficient, and are obtainable by reaction of the requisite number of moles of ethylene oxide, polymers of ethylene oxide or compounds acting as ethylene oxide, with compounds containing at least 10 and generally from about 10 to 20 carbon atoms and an active hydrogen containing group such as hydroxy, carboxy, amino, amido, sulfonamido, mercapto and the like. Mixtures of ethylene oxide, propylene oxide, butylene oxide, and the like may be used, but oxides other than ethylene oxide are not suffi-

ciently hydropyphilic to render the material sufficiently water soluble when used alone. Generally, alkyl phenols containing at least one hydrocarbon substituent, such as alkyl of at least 4 carbon atoms, are preferred for producing the non-ionic surface active agents of component (B). However, any other compounds answering to the above stated requirements may be employed. These include the higher aliphatic and alicyclic primary and secondary amines, alcohols, carboxylic acids, and their corresponding amides, mercaptans, alkyl and alkyl aryl sulfonamides, and the like as disclosed in the above mentioned patents.

In the preferred embodiment of this invention, there is included in the composition of this invention component (C) comprising one or more hydroxylic compounds such as benzyl alcohol, methyl benzyl alcohol, dimethyl benzyl alcohol, nonyl phenol, dinonyl phenol, nonyl phenoxy ethanol, butyl phenol, isobutyl phenol, isoamyl phenol, amyl phenol, isooctyl phenol, alcohols derived from pine oil such as α -terpineol, β -terpineol, terpene carbinol, or crude mixtures containing them, cyclohexanol, ethylene glycol, furfuryl alcohol, ethanol, isopropanol, n-propanol, 2,5-dimethyl-3-butyne-2,5-diol, propargyl alcohol, 2-methyl-3-butyl-2-ol, butyl alcohol, amyl alcohol, "Oxo" tridecyl alcohol and the like. Of the above mentioned hydroxylic compounds, those which have been found highly effective are carbocyclic hydroxylic compounds such as aralkanols, alkyl phenols, and alkyl alicyclic alcohols and mixtures thereof. Mixtures of lower aliphatic alcohols with the carbocyclic hydroxylic compounds have been found particularly effective.

In formulating the compositions of this invention the components are mixed and blended in any desired manner. Where the quaternized heterocyclic nitrogen base component A is of a tarry nature, such as the quaternized crude pyridine and quinoline residues, it is preferable to first warm the material to about 75° C. in order to reduce its viscosity. In general, the compositions will contain by weight about 25 to 75 parts of component (A), 5 to 25 parts of component (B), and preferably, 10 to 60 parts of component (C). In preparing concentrates of the composition, it is generally desirable to add up to 15 parts of water in order to render the composition more fluid. These compositions are effective inhibitors in solutions of up to 40 percent or more acid concentration by weight. Generally, 0.001 to 2 percent and preferably 0.04 to 0.3 percent of the composition of this invention by weight of the acid solution is sufficient to impart the desired corrosion inhibiting properties.

The following examples are illustrative of this invention and are not to be regarded as limitative. Parts and proportions are by weight unless otherwise indicated.

EXAMPLE 1

	Parts
Quaternized quinoline base.....	70
Non-ionic surface active agent obtained by condensing 1 mole of nonyl phenol with 9 moles of ethylene oxide	20
Water.....	10

The above composition is less viscous, is handled more readily, solubilizes faster and more completely, and has a better corrosion inhibiting effect than the unformulated quaternized quinoline base, perhaps due to the solubilizing of unidentified, otherwise insoluble components in the crude base.

EXAMPLE 2

	Parts
Quaternized quinoline base.....	60
Non-ionic surface active agent obtained by condensing 1 mole of nonyl phenol with 10 moles of ethylene oxide	18
Isopropanol	11
Water	11

7
Table 4

PERCENT WEIGHT LOSS, MILD STEEL PANELS
[10% H₂SO₄-97° C.]

	Conc. (Percent)	Example 2
First 2 hour period.....	0.05 0.10 0.20 0.30 0.50	0.462 0.304 0.144 0.116 0.621
Second 2 hour period.....	0.10 0.20 0.30 0.50	0.317 0.154 0.121 0.559
Third 2 hour period.....	0.10 0.20 0.30	0.337 0.184 0.117
	Blank 0.00	36.0 in 2 hours

The data in Table 4 show the excellent corrosion inhibiting properties of the subject inhibitor for steel in sulfuric acid.

In another series of experiments, the corrosion inhibiting efficiency of the composition of Example 2 was compared with the corrosion inhibiting efficiencies of similar compositions to which other hydroxylic compounds had been added in varying amounts, and with the corrosion inhibiting efficiencies of certain hydroxylic compounds alone. The tests were run on duplicate 2" x 2" x 0.038" SAE 1015 mild steel panels in 200 grams of 15 percent hydrochloric acid at 97° C. for 6 hours, containing 0.20 percent ("as is basis") of the tested inhibitor. The results are shown in Table 5.

Table 5

PERCENT WEIGHT LOSS, MILD STEEL PANELS
[15% HCl-97° C.-6 hours.]

Example	Hydroxylic compound	Weight ratio of hydroxylic compound to inhibitor of Example 2	Percent weight loss
4.....	α,α -Dimethylbenzyl alcohol.	1:1.....	0.374.
5.....	Dinonyl phenol	1:3.....	0.524.
6.....	Nonyl phenol bottoms ¹	1:3.....	0.536.
7.....	Nonyl phenol	1:3.....	0.952.
8.....	Propargyl alcohol	1:3.....	1.12.
9.....	α,α -Dimethylbenzyl alcohol.	1:3.....	1.18.
10.....	Oxo Tridecyl alcohol (from tetrapropylene).	1:3.....	1.27.
11.....	Nonylphenoxy ethanol.	1:3.....	1.31.
12.....	Cyclohexanol	1:3.....	1.70.
	No added hydroxylic compound.	0:1 (0.20% conc.)	1.77.
	do.	0:1 (0.175% conc.)	1.87.
	do.	0:1 (0.10% conc.)	2.06.
	α,α -Dimethylbenzyl alcohol.	1:0 (100% alcohol, 0.20% conc.)	100.0 in 2½ hours.
	Nonyl phenol.	1:0 (100% alcohol, 0.20% conc.)	100.0 in 2½ hours.

¹ Still residues from nonylphenol distillation, containing appreciable amounts of dinonylphenol.

The data in Table 5 show that the hydroxylic compounds do not have any corrosion inhibiting powers themselves but that they exhibit a synergistic effect when employed in the compositions of this invention.

EXAMPLE 13

Quaternized quinoline base.....	Parts 60
Non-ionic surface active condensation product of 1 mole of nonyl phenol with 10 moles of ethylene oxide	18
α,α -Dimethylbenzyl alcohol.....	11
Water	11

EXAMPLE 14

Quaternized quinoline base.....	Parts 60
Non-ionic surface active condensation product of 1 mole of nonyl phenol with 10 moles of ethylene oxide	18

Terpene carbinol.....	11
Water	11

EXAMPLE 15

Quaternized quinoline base.....	Parts 10
Non-ionic surface active condensation product of 1 mole of iso-octylphenol with 9 moles of ethylene oxide	4
Ethanol	4

EXAMPLE 16

Quaternized quinoline base.....	Parts 10
Non-ionic surface active condensation product of 1 mole of dinonylphenol with 17 moles of ethylene oxide	4
Tertiary butyl alcohol.....	4

EXAMPLE 17

Quaternized quinoline base.....	Parts 10
Non-ionic surface active condensation product of 1 mole of nonylphenol with 6 moles of ethylene oxide	4
Terpineol	4

The corrosion inhibiting compositions of Examples 2 and 13 to 17 were compared in 10% hydrochloric acid and 10% sulfuric acid for two hours at 74° C. on SAE 1010 steel panels at 0.20 percent ("as is basis") inhibitor concentration in the acid solutions. The weight losses were determined and the results are shown in Table 6.

Table 6

PERCENT WEIGHT LOSS SAE 1010 STEEL PANELS
[74° C.-2 hours.]

Inhibitor	10% HCl	10% H ₂ SO ₄
Example 2.....	0.0460	0.107
Example 13.....	0.0345	0.110
Example 14.....	0.0311	0.173
Example 15.....	0.0405	0.0892
Example 16.....	0.0788	0.199
Example 17.....	0.0341	0.124

From the data disclosed in the tables included hereinabove, it will be seen that the components of the composition of this invention exhibit a synergistic effect with respect to inhibition of corrosion of metals in acidic solutions. It will also be evident that the amount of inhibitor required in any instance will depend upon the identity and strength of the acid, the temperature and time of treatment, the type of metal being treated, and the like, and that within limits, the weight loss sustained by the metal being treated decreases as the concentration of inhibitor is increased.

The "quaternized quinoline base" employed in the above examples was derived from Barrett's quinoline residue coal tar base No. 32,085, B. P. of 80 percent over 242° C. in the following manner:

EXAMPLE 18

455.7 g. of Barrett's quinoline residue were heated in a reaction flask to 115° C. with stirring. From a dropping funnel, 265.5 g. of benzyl chloride were added to the flask over a period of 28 minutes while maintaining the reaction temperature at 112-119° C. This temperature was maintained for an additional 3 hours, when titration indicated completion of the desired quaternizing reaction.

While the invention has been disclosed with respect to several specific embodiments thereof, various modifications and variations of this invention will be obvious to the worker skilled in the art and it is to be understood that such modifications and variations are to be included within the purview of this application and the spirit and scope of the appended claims.

5 EXAMPLE 3

Quaternized quinoline base.....	60
Non-ionic surface active condensation product of 1 mole of nonyl phenol with 6 moles of ethylene oxide	18
Isopropanol	11
Water	11

The compositions of Examples 2 and 3 may be prepared by combining the components in the proper proportions and mixing for a sufficient length of time at room temperature until the mass is thoroughly blended. Due to the tarry nature of the quaternized quinoline residue, however, it is preferable to first warm this material to about 75° C. in order to reduce its viscosity, and then add the remaining components. The following procedure may be followed:

Add to a three-necked flask equipped with a stirrer, heater, and reflux condenser, 60 parts of the quaternized quinoline residue. Warm the material to 50–75° C. and begin to stir the mass. After the mass becomes sufficiently fluid, add 18 parts of the non-ionic surfactant. The addition of this material will increase the fluidity of the mass. Stir until completely blended. Add 11 parts of isopropanol with continued stirring. Allow the mixture to reflux for a short period of time to clean the upper parts of the mixing apparatus and bring all of the quaternized quinoline residue into admixture with the mass. The mixture is, at this point, fluid enough so that it can be allowed to start cooling down to room temperature. Therefore, discontinue heating and while it is cooling add 11 parts of water with continued stirring. Allow to stir until cooled to room temperature and until all the components are well blended into a uniform fluid mass.

Duplicate SAE 1015 mild steel panels 2" x 2" x 0.038" were treated for 6 hours at 97° C. in 200 grams of 15 percent hydrochloric acid containing variously 0.060 percent by weight of the composition of Example 2 ("active basis," e. g. calculated on the weight of the quaternized quinoline residue in the composition), 0.120 percent of the same composition of Example 2 ("active basis"), 0.060 percent by weight of unformulated quaternized quinoline residue, and 0.120 percent by weight of unformulated quaternized quinoline residue. A control test was simultaneously conducted with a duplicate steel panel in the same acid solution containing no inhibitor. The panels were then removed from the acid solution and their weight loss determined. The weight loss was expressed as percent of the original panel weight. Inhibiting efficiencies are accordingly inversely proportional, roughly, to the percent weight loss. The results of the tests were as follows:

Table 1
PERCENT WEIGHT LOSS ON MILD STEEL PANELS
[15% HCl—6 hours—97° C.]

Conc. of inhibitor	Example 2	Quaternized quinoline residue
0.060%.....	1.77	2.33
0.120%.....	2.06	9.15
0.000 (blank).....	100	-----

The data in Table 1 demonstrate the increased effectiveness of the composition of Example 2 as compared with the unformulated quaternized quinoline residue when used as a corrosion inhibitor in acidic solutions. This increased corrosion inhibiting efficiency is obviously due to the synergistic effect of the non-ionic surface active agent and hydroxylic compound included in the composition of this invention.

6

In another test, Yaloy steel panels (nickel-copper alloy of iron containing 2.0 percent nickel, 1.0 percent copper and about 0.08 percent carbon) were treated in 15 percent hydrochloric acid for 5 days at 38° C. In one case, the hydrochloric acid contained 0.20 percent of the unformulated quaternized quinoline residue and in the other case the acid contained 0.096 percent (on an active basis) of the composition of Example 2. The percent weight losses sustained by the panels are shown in Table 2.

Table 2
PERCENT WEIGHT LOSS ON YOLOY STEEL PANELS
[15% HCl—5 days—38° C.]

Inhibitor	Conc., percent	Percent weight loss
Quaternized quinoline residue.....	0.20	2.1
Example 2.....	0.096	0.81

The data in Tables 1 and 2 both indicate that the inhibition of the composition of Example 2 is greater than that of the quaternized quinoline residue per se since in both cases said composition gives a significantly lower weight loss.

In another experiment, the compositions of Examples 2 and 3 were tested on mild steel panels in 15 percent hydrochloric acid at 97° C. in three successive 2 hour periods. Solutions containing varying amounts ("as is basis" e. g. calculated on total weight of inhibitor) of the two inhibiting compositions were prepared. Panels were immersed in these solutions for 2 hours. After this period they were withdrawn and the weight loss determined. Fresh panels were then immersed in the same solution for a second 2 hour period, and finally a third series of panels was introduced and the weight loss tabulated on all panels. The results are shown in Table 3.

Table 3
PERCENT WEIGHT LOSS, MILD STEEL PANELS
[15% HCl—97° C.]

	Conc. (Percent)	Example 2	Example 3
First 2 hour period.....	0.025	7.84	8.24
	0.050	2.40	2.44
	0.100	0.935	0.975
	0.200	0.579	0.670
	0.300	0.500	0.382
Second 2 hour period.....	0.025	9.96	9.83
	0.050	2.75	3.95
	0.100	1.01	1.21
	0.200	0.723	0.683
	0.300	0.574	0.521
Third 2 hour period.....	0.025	9.53	9.65
	0.050	3.68	4.32
	0.100	1.14	1.15
	0.200	-----	0.718
	0.300	0.552	0.570
Blank 0.000		98.0 in 2 hours	

The data shown in Table 3 indicate that the corrosion inhibiting efficiencies of the compositions of Examples 2 and 3 are substantially similar, the composition of Example 2, however, being very slightly superior in most instances. The data also shows that the corrosion inhibiting efficiencies of the compositions of Examples 2 and 3 are maintained to a substantial degree despite continued use, whereby efficiencies may be maintained merely by addition of slight amounts of replenishing composition from time to time.

In another experiment, the composition of Example 2 was tested on mild steel panels in 10% sulfuric acid at 97° C. in three successive 2 hour periods as in Table 3. The results are shown in Table 4.

We claim:

1. A corrosion inhibiting composition for addition to aqueous solutions normally corrosive to metal surfaces comprising (A) a water soluble non-surface active quaternized N-heterocyclic base containing water-insoluble components, and (B) a water soluble non-ionic surface active agent containing a polyoxyethylene group.

2. A composition as defined in claim 1 wherein component (A) is quaternized coal tar base.

3. A composition as defined in claim 1 wherein component (B) is the condensation product of one mole of an alkyl phenol containing at least 10 carbon atoms with about 4 to 60 moles of ethylene oxide.

4. A corrosion inhibited aqueous composition comprising an aqueous acidic solution, normally corrosive toward metal surfaces, containing dispersed therein a small amount sufficient to inhibit such corrosion of a composition as defined in claim 1.

5. A process for pickling iron and steel which comprises immersing the metal in a concentrated hydrochloric acid solution containing dispersed therein a small amount of a corrosion inhibiting composition as defined in claim 1.

6. A process for the treatment of oil wells which comprises introducing into the well an acid solution containing dispersed therein a small amount of a corrosion inhibiting composition as defined in claim 1.

7. A corrosion inhibiting composition for addition to aqueous solutions normally corrosive to metal surfaces comprising (A) a water soluble non-surface active quaternized N-heterocyclic base containing water-insoluble components, (B) a water-soluble non-ionic surface active agent containing a polyoxyethylene group, and (C) a hydroxylic compound selected from the group consisting of lower aliphatic alcohols, carbocyclic hydroxylic compounds, and mixtures thereof.

8. A composition as defined in claim 7 wherein component (A) is quaternized coal tar base.

9. A composition as defined in claim 7 wherein component (B) is the condensation product of one mole of an alkyl phenol containing at least 10 carbon atoms with about 4 to 60 moles of ethylene oxide.

10. A corrosion inhibited aqueous composition comprising an acidic aqueous solution, normally corrosive toward metal surfaces, containing dispersed therein a small amount sufficient to inhibit such corrosion of a composition as defined in claim 7.

11. A corrosion inhibiting composition for addition to aqueous solutions normally corrosive to metal surfaces comprising (A) a water soluble quaternized coal tar base containing water-insoluble components, (B) a water-soluble non-ionic surface active condensation product of one mole of an alkyl phenol containing at least 10 carbon atoms with about 4 to 60 moles of ethylene oxide, and (C) a hydroxylic compound selected from the group consisting of lower aliphatic alcohols, carbocyclic hydroxylic compounds, and mixtures thereof.

12. A composition as defined in claim 11 wherein the hydroxylic compound is isopropanol.

13. A composition as defined in claim 11 wherein the hydroxylic compound is α,α -dimethylbenzyl alcohol.

14. A composition as defined in claim 11 wherein the hydroxylic compound is terpene carbinol.

15. A composition as defined in claim 11 wherein the hydroxylic compound is a mixture of isopropanol and α,α -dimethylbenzyl alcohol.

16. A corrosion inhibited aqueous composition comprising an acidic aqueous solution, normally corrosive toward metal surfaces, containing dispersed therein a small amount sufficient to inhibit such corrosion of a composition as defined in claim 11.

17. A composition as defined in claim 11 wherein component (C) is a mixture of isopropanol and propargyl alcohol.

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