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(54) **CORROSION INHIBITORS CONTAINING ANIONIC SURFACTANTS**

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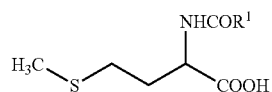
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(57) **ABSTRACT**

The invention relates to the use of compounds of the formula
(1)



in which R¹ is C₁- to C₂₉-alkyl, C₂- to C₂₉-alkenyl, C₆- to C₃₀-aryl or C₇- to C₃₀-alkylaryl, and anionic surfactants as corrosion inhibitors.

CORROSION INHIBITORS CONTAINING ANIONIC SURFACTANTS

[0001] The present invention is described in the German priority application No. 10 2007 041 204.7 filed Aug. 31, 2007, which is hereby incorporated by reference as is fully disclosed herein.

[0002] The present invention relates to a process for corrosion inhibition on and in apparatuses for conveying and transporting hydrocarbons in oil production and processing by adding a metal salt of N-acylmethionine and an ionic surfactant to the corrosive system.

[0003] In industrial processes in which metals come into contact with water or with oil/water two-phase systems, there is the danger of corrosion. This is particularly pronounced if the aqueous phase has a high salt content, as in oil extraction and processing processors, or is acidic due to dissolved acid gases, such as carbon dioxide or hydrogen sulfide. The exploitation of a deposit and the processing of oil are therefore not possible without special additives for protecting the equipment used.

[0004] Although suitable corrosion inhibitors for oil production and processing have long been known, they are unacceptable in future for offshore applications for reasons relating to environmental protection.

[0005] As typical corrosion inhibitors of the prior art, amides, amidoamines or imidazolines of fatty acids and polyamines have an extremely good oil solubility and, owing to poor partitioning, are therefore present only in low concentration in the corrosive water phase. Accordingly, these products must be used at a high dose in spite of their poor biodegradability.

[0006] Quaternary alkylammonium compounds (quats) are alternative corrosion inhibitors of the prior art, which also have biostatic properties in addition to the corrosion-inhibiting properties. In spite of improved water solubility, the quats have a substantially reduced film persistence, for example compared with the imidazolines, and therefore likewise lead to effective corrosion protection only in relatively high doses. The strong algae toxicity and the moderate biodegradability are increasingly limiting the use of quats to ecologically insensitive fields of use.

[0007] U.S. Pat. No. 4,240,823 describes N-acylmethionine derivatives which are used as growth regulators in the area of crop protection.

[0008] JP-A-8 337 562 and JP-A-8 337 563 describe N-acylamino acids and their alkali metal salts, which can also be used as corrosion inhibitors.

[0009] JP-A-49 026 145 describes alkali metal salts of N-acylamino acids, which salts can be used as corrosion inhibitors. N-Lauroylglycine sodium salt is mentioned as an example.

[0010] A disadvantage of the compounds of the prior art is, however, that their activity at low doses is often not sufficient.

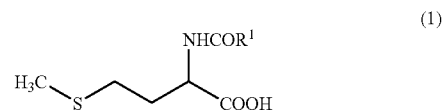
[0011] DE-10 2006 002 784 discloses N-acylmethionine ammonium salts which have an excellent effect as corrosion inhibitors and show good biodegradability and reduced toxicity. A disadvantage of these compounds is, however, their complicated preparation and the associated relatively high production costs.

[0012] It was an object of the present invention to provide novel corrosion inhibitors which, in combination with improved corrosion protection, also afford improved biode-

gradability and lower toxicity in comparison with the corrosion inhibitors of the prior art in addition to good water solubility. Furthermore, the novel corrosion inhibitors should be capable of being produced at an economically acceptable price.

[0013] It has now surprisingly been found that metal salts of N-acylmethionine as a mixture with anionic surfactants have an excellent effect as corrosion inhibitors and show good biodegradability and reduced toxicity. Owing to a synergistic effect between the metal salt of N-acylmethionine and anionic surfactant, the dosages can be substantially reduced in comparison with the prior art, with the result that the novel corrosion inhibitor mixtures are also advantageous economically.

[0014] The invention therefore relates to the use of compositions containing metal salts of compounds of the formula (1)



[0015] in which R^1 is C_1 - to C_{29} -alkyl, C_2 - to C_{29} -alkenyl, C_6 - to C_{30} -aryl or C_7 - to C_{30} -alkylaryl, and anionic surfactants as corrosion inhibitors.

[0016] The invention furthermore relates to a process for inhibiting corrosion on metal surfaces, in particular of iron-containing metals, by adding at least one metal salt of compounds of the formula (1) and an anionic surfactant to a corrosive system which is in contact with the metal surfaces.

[0017] The invention furthermore relates to compositions containing at least one metal salt of a compound of the formula (1) and at least one anionic surfactant.

[0018] The invention furthermore relates to the use of metal salts of compounds of the formula (1) together with anionic surfactants as metal processing compositions. Here, the compositions according to the invention also afford very good corrosion protection even under strong mechanical load, such as during grinding, cutting and drilling of metal workpieces.

[0019] Corrosive systems in the context of this invention are preferably liquid/liquid or liquid/gaseous multiphase systems consisting of water and hydrocarbons which contain corrosive constituents, such as salts and acids, in free and/or dissolved form. The corrosive constituents may also be gaseous, such as, for example, hydrogen sulfide and carbon dioxide.

[0020] Hydrocarbons in the context of this invention are organic compounds which are constituents of mineral oil/natural gas, and the secondary products thereof. Hydrocarbons in the context of this invention are also readily volatile hydrocarbons, such as, for example, methane, ethane, propane and butane. For the purposes of this invention, these also include the further gaseous constituents of mineral oil/natural gas, such as, for example, hydrogen sulfide and carbon dioxide.

[0021] Preferred surfactants are those which, in a concentration of 0.5% by weight in water, produce a surface tension of this aqueous solution of not more than 55 mN/m, particularly preferably of not more than 50 mN/m and especially not more than 45 mN/m.

[0022] In a further preferred embodiment of the invention, R¹ is C₃- to C₂₃-alkyl, C₃- to C₂₃-alkenyl, C₆- to C₂₄-aryl or C₇- to C₂₅-alkylaryl, in particular an alkyl or alkenyl group having 7 to 17 carbon atoms.

[0023] The preparation of metal salts of N-acylmethionine is effected by acylation of methionine by means of carboxylic acid chloride or carboxylic anhydride in the presence of a base (e.g. sodium hydroxide). For economic reasons, DL-methionine is preferably used for this purpose, but the pure enantiomeric forms may likewise be used. C₈₋₁₈ alkyl or alkenyl chlorides, such as, for example, octanoyl chloride, decanoyl chloride, dodecanoyl chloride, coconut fatty acid chloride or oleyl chloride, are preferably used for the acylation.

[0024] The hydroxides of alkali metals or alkaline earth metals are preferred as the base used for the preparation of the metals salts according to the invention. The hydroxides of Na, K, Ca and Mg are particularly preferred. Accordingly, the metal salts according to the invention are preferably alkali metal or alkaline earth metal salts, in particular Na, K, Ca or Mg salts, of the compounds of the formula 1.

[0025] In contrast to DE-10 2006 002 784, the metal salts of N-acylmethionine are present in unneutralized and isolated form and are formulated directly with the anionic surfactants according to the invention to give the corrosion inhibitor mixture according to the invention. As a result, the preparation process for the corrosion inhibitors according to the invention is substantially more economical.

[0026] The metal salts of N-acylmethionine according to the invention are obtained as a rule as 10-50% strength solutions in water and are formulated directly with one or more anionic surfactants to give the corrosion inhibitor mixture. For stabilizing the aqueous formulations, alcoholic solvents, such as, for example, methanol, ethanol, propanol, isopropanol, butanol, 2-ethylhexanol, methyl glycol, butyl glycol or butyl diglycol, may be added.

[0027] Suitable anionic surfactants are:

[0028] Alkylsulfonates, olefinsulfonates, alkylsulfates, alkylaryl ether sulfates, alkyl ether sulfates, sulfosuccinates, alkylsuccinates, alkylphosphates, alkyl ether phosphates, alkylphosphonates, alkylpolyalkylene glycol ether carboxylates, alkylarylpolyalkylene glycol ether carboxylates, fatty acid isethionates, N-acylmethyltaurates, N-acylsarcosinates, alkylbenzenesulfonates, alkylnaphthalenesulfonates, N-acylglutamates, amphotoacetates, alkylsulfamidocarboxylates, alkyl- and alkenylglycerylsulfates and fatty acid-protein condensates which are obtained by reacting fatty acid chlorides with oligopeptides.

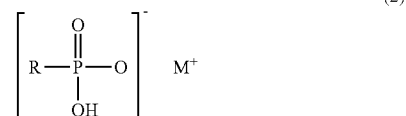
[0029] Preferred anionic surfactants are described in more detail below:

[0030] Suitable alkylphosphates are salts of the formula (RO)_n(O=P)(OM)_i, in which R is a C₆-C₃₀-alkyl or a C₇-C₃₀-alkylaryl radical, preferably a C₈-C₁₈-alkyl or a C₁₀-C₂₄-alkylaryl radical. For n and i, 0<n<3 and 0<i<3, with the proviso that n+i=3. Preferably, 1≤n≤2 and 1≤i≤2. M is a cation, such as, for example, sodium, potassium, ammonium, mono-, di- or triethanolammonium, calcium or magnesium and mixtures thereof.

[0031] Suitable alkyl ether phosphates are salts of the formula [RO(A)_m]_n(O=P)(OM)_i, in which R is a C₆-C₃₀-alkyl or a C₇-C₃₀-alkylaryl radical, preferably a C₈-C₁₈-alkyl or a C₁₀-C₂₄-alkylaryl radical. A is an ethoxy or propoxy unit, m

is a number greater than 0, preferably from 0.5 to 20, particularly preferably from 2 to 12. For n and i, 0<n<3 and 0<i<3, with the proviso that n+i=3. Preferably, 1≤n≤2 and 1≤i≤2. M is a cation, such as, for example, sodium, potassium, ammonium, mono-, di- or triethanolammonium, calcium or magnesium and mixtures thereof.

[0032] Suitable alkylphosphonates are salts of the formula (2)



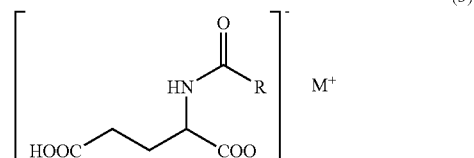
[0033] in which R is a C₆-C₃₀-alkyl or a C₇-C₃₀-alkylaryl radical, preferably a C₈-C₁₈-alkyl or a C₁₀-C₂₄-alkylaryl radical. M is a cation, such as, for example, sodium, potassium, ammonium, mono-, di- or triethanolammonium, calcium or magnesium and mixtures thereof.

[0034] Suitable alkylpolyalkylene glycol ether carboxylates or alkylarylpolyalkylene glycol ether carboxylates are salts of the formula RO(A)_mCO₂M, in which R is a C₄-C₃₀-alkyl or a C₇-C₃₀-alkylaryl radical, preferably a C₈-C₁₈-alkyl or a C₁₀-C₂₄-alkylaryl radical. A is an ethoxy or propoxy unit, m is a number greater than 0, preferably from 0.5 to 20, particularly preferably from 2 to 12, and M is a cation, such as, for example, sodium, potassium, ammonium, mono-, di- or triethanolammonium, calcium or magnesium and mixtures thereof.

[0035] Suitable N-acylmethyltaurates are salts of the formula R(C=O)(NCH₃)CH₂CH₂SO₃M, in which R is a C₅-C₂₉-alkyl or a C₅-C₂₉-alkenyl radical, preferably a C₇-C₁₇-alkyl, or a C₇-C₁₇-alkenyl radical. M is a cation, such as, for example, sodium, potassium, ammonium, mono-, di- or triethanolammonium, calcium or magnesium and mixtures thereof.

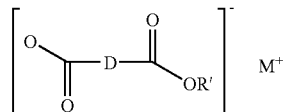
[0036] Suitable N-acylsarcosinates are salts of the formula R(C=O)(NCH₃)CH₂CO₂M, in which R is a C₅-C₂₉-alkyl or a C₅-C₂₉-alkenyl radical, preferably a C₇-C₁₇-alkyl or an C₇-C₁₇-alkenyl radical. M is a cation, such as, for example, sodium, potassium, ammonium, mono-, di- or triethanolammonium, calcium or magnesium and mixtures thereof.

[0037] Suitable N-acylglutamates are salts of the formula (3)



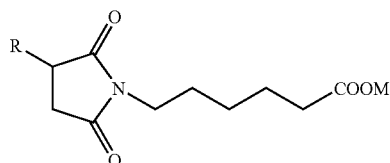
[0038] in which R is a C₅-C₂₉-alkyl or a C₅-C₂₉-alkenyl radical, preferably a C₇-C₁₇-alkyl or a C₇-C₁₇-alkenyl radical. M⁺ is a cation, such as, for example, sodium, potassium, ammonium, mono-, di- or triethanolammonium, calcium or magnesium and mixtures thereof.

[0039] Suitable alkylsuccinates are salts of the formula (4)



[0040] in which D=CH₂CHR and R is a C₆-C₃₀-alkyl or a C₆-C₃₀-alkenyl radical, preferably a C₈-C₁₈-alkyl or a C₈-C₁₈-alkenyl radical, R' is hydrogen or a C₁-C₈-alkyl or a C₃-C₁₈-alkenyl radical. M is a cation, such as, for example, sodium, potassium, ammonium, mono-, di- or triethanolammonium, calcium or magnesium and mixtures thereof.

[0041] Suitable alkylsuccinimides are salts of the formula (5)



[0042] in which R is a C₆-C₃₀-alkyl or a C₆-C₃₀-alkenyl radical, preferably a C₈-C₁₈-alkyl or a C₈-C₁₈-alkenyl radical. M is a cation, such as, for example, sodium, potassium, ammonium, mono-, di- or triethanolammonium, calcium or magnesium and mixtures thereof.

[0043] The compositions according to the invention can be used alone or in combination with other known corrosion inhibitors. In general, the composition according to the invention is used in an amount such that sufficient corrosion protection is obtained under the given conditions.

[0044] Preferred concentrations in which the compositions according to the invention are used are from 5 to 5000 ppm, preferably from 10 to 1000 ppm, in particular from 15 to 150 ppm, based on the weight of the phases to be inhibited with respect to the corrosion properties. The mixing ratio between metal salt of the compound 1 and anionic surfactant is preferably from 1:9 to 9:1, in particular from 3:7 to 7:3, especially from 1:2 to 2:1.

[0045] Mixtures of the compositions according to the invention with other corrosion inhibitors and/or those of the prior art are also particularly suitable as corrosion inhibitors.

EXAMPLES

[0046] General Method for the Preparation of Metal Salts of N-acylmethionine

[0047] In a standard stirred apparatus, 1 mol of DL-methionine in 300 ml of water are neutralized with 50% strength aqueous metal hydroxide solution. 1 mol of carboxylic acid chloride is metered into the resulting solution at 15-20° C., the pH being kept at 10-13 by simultaneous metering of 15% strength aqueous metal hydroxide solution. The reaction solution is stirred for a further 3 h at room temperature. The resulting metal salt of N-acylmethionine is characterized by means of the alkali number (AN) and active substance con-

tent. Stated percentages are percentages by weight, based on the weight of the salt according to the invention.

Example 1

N-Cocoyl-DL-methionine Sodium Salt (Comparison)

[0048] N-Cocoyl-DL-methionine sodium salt having an active substance content of 40% and an AN=65 mg KOH/g was obtained from coconut fatty acid chloride, DL-methionine and sodium hydroxide.

Example 2

N-Oleoyl-DL-methionine potassium Salt (Comparison)

[0049] N-Oleoyl-DL-methionine potassium salt having an active substance content of 40% and an AN=56 mg KOH/g was obtained from oleoyl chloride, DL-methionine and potassium hydroxide.

Example 3

Corrosion Inhibitor Mixture 1

[0050] 40 g of N-cocoyl-DL-methionine sodium salt from example 1 were mixed with 40 g of a 20% strength solution of sodium di(2-ethylhexyl)phosphate and 20 g of butylglycol.

Example 4

Corrosion Inhibitor Mixture 2

[0051] 40 g of N-cocoyl-DL-methionine sodium salt from example 1 were mixed with 40 g of a 20% strength solution of sodium bis(lauryltetraethoxy)phosphate and 20 g of butylglycol.

Example 5

Corrosion Inhibitor Mixture 3

[0052] 40 g of N-cocoyl-DL-methionine sodium salt from example 1 were mixed with 40 g of a 20% strength solution of sodium octylphosphonate and 20 g of butylglycol.

Example 6

Corrosion Inhibitor Mixture 4

[0053] 40 g of N-cocoyl-DL-methionine sodium salt from example 1 were mixed with 40 g of a 20% strength solution of (oleyl alcohol+10 EO)-ether carboxylic acid sodium salt and 20 g of butylglycol.

Example 7

Corrosion Inhibitor Mixture 5

[0054] 40 g of N-cocoyl-DL-methionine sodium salt from example 1 were mixed with 40 g of a 20% strength dispersion of coconut fatty acid methyltaurate sodium salt and 20 g of butylglycol.

Example 8

Corrosion Inhibitor Mixture 6

[0055] 40 g of N-cocoyl-DL-methionine sodium salt from example 1 were mixed with 40 g of a 20% strength solution of sodium lauroyl sarcosinate and 20 g of butylglycol.

Example 9

Corrosion Inhibitor Mixture 7

[0056] 40 g of N-cocoyl-DL-methionine sodium salt from example 1 were mixed with 40 g of a 20% strength solution of sodium N-cocoylglutamate and 20 g of butylglycol.

Example 10

Corrosion Inhibitor Mixture 8

[0057] 40 g of N-cocoyl-DL-methionine sodium salt from example 1 were mixed with 40 g of a 20% strength solution of potassium monoisopropyl octenylsuccinate and 20 g of butylglycol.

Example 11

Corrosion Inhibitor Mixture 9

[0058] 40 g of N-cocoyl-DL-methionine sodium salt from example 1 were mixed with 40 g of a 20% strength solution of potassium dodecylsuccinimidohexanoate and 20 g of butylglycol.

Example 12

Corrosion Inhibitor Mixture 10

[0059] 40 g of N-oleoyl-DL-methionine potassium salt from example 2 were mixed with 40 g of a 20% strength solution of sodium di(2-ethylhexyl)phosphate and 20 g of butylglycol.

Example 13

Corrosion Inhibitor Mixture 11

[0060] 40 g of N-oleoyl-DL-methionine potassium salt from example 2 were mixed with 40 g of a 20% strength solution of sodium bis(lauryltetraethoxy)phosphate and 20 g of butylglycol.

Example 14

Corrosion Inhibitor Mixture 12

[0061] 40 g of N-oleoyl-DL-methionine potassium salt from example 2 were mixed with 40 g of a 20% strength solution of sodium octylphosphonate and 20 g of butylglycol.

Example 15

Corrosion Inhibitor Mixture 13

[0062] 40 g of N-oleoyl-DL-methionine potassium salt from example 2 were mixed with 40 g of a 20% strength solution of (oleyl alcohol+10 EO)-ethercarboxylic acid sodium salt and 20 g of butylglycol.

Example 16

Corrosion Inhibitor Mixture 14

[0063] 40 g of N-oleoyl-DL-methionine potassium salt from example 2 were mixed with 40 g of a 20% strength dispersion of coconut fatty acid methyltaurate sodium salt and 20 g of butylglycol.

Example 17

Corrosion Inhibitor Mixture 15

[0064] 40 g of N-oleoyl-DL-methionine potassium salt from example 2 were mixed with 40 g of a 20% strength solution of sodium lauroyl sarcosinate and 20 g of butylglycol.

Example 18

Corrosion Inhibitor Mixture 16

[0065] 40 g of N-oleoyl-DL-methionine potassium salt from example 2 were mixed with 40 g of a 20% strength solution of sodium N-cocoylglutamate and 20 g of butylglycol.

Example 19

Corrosion Inhibitor Mixture 17

[0066] 40 g of N-oleoyl-DL-methionine potassium salt from example 2 were mixed with 40 g of a 20% strength solution of potassium monoisopropyl octenylsuccinate and 20 g of butylglycol.

Example 20

Corrosion Inhibitor Mixture 18

[0067] 40 g of N-oleoyl-DL-methionine potassium salt from example 2 were mixed with 40 g of a 20% strength solution of potassium dodecylsuccinimidohexanoate and 20 g of butylglycol.

Example 21

Corrosion Inhibitor Mixture 19

[0068] 55 g of N-cocoyl-DL-methionine sodium salt from example 1 were mixed with 10 g of a 20% strength solution of potassium dodecylsuccinimidohexanoate, 20 g of butylglycol and 15 g of water.

[0069] Activity of the compounds according to the invention as corrosion inhibitors

[0070] The compounds according to the invention were tested as corrosion inhibitors in the Shell wheel test. Coupons of C steel (DIN 1.1203 with 15 cm² surface area) were immersed in a salt water/petroleum mixture (9:1,5% strength NaCl solution adjusted to pH 3.5 with acetic acid) and exposed to this medium at a speed of 40 rpm at 70° C. for 24 hours. The inhibitor dose was 50 ppm of a 24% solution of the inhibitor. The protection values were calculated from the decrease in the mass of the coupons, based on a blank value.

[0071] In the following tables, "comparison 1" designates a commercially available residue amine quat based on dicocosalyl dimethylammonium chloride, "comparison 2" a commercially available imidazoline salt based on oleic acid diethylenetriamine and "comparison 3" an example from DE-10 2006 002 784 (morpholinium salt of N-cocoyl-DL-methionine, corrosion inhibitor of the prior art).

TABLE 1

(Shell wheel test)		
Example	Corrosion inhibitor	ø protection %
Comparison 1	Standard quat	28
Comparison 2	Oleic acid DETA imidazoline	70
Comparison 3	Morpholinium salt of N-cocoyl-DL-methionine	75

TABLE 1-continued

(Shell wheel test)		
Example	Corrosion inhibitor	ø protection %
Comparison 4	from example 1	67
Comparison 5	from example 2	69
21	from example 3	77
22	from example 4	79
23	from example 5	86
24	from example 6	88
25	from example 7	81
26	from example 8	88
27	from example 9	90
28	from example 10	80
29	from example 11	91
30	from example 12	76
31	from example 13	76
32	from example 14	84
33	from example 15	85
34	from example 16	76
35	from example 17	82
36	from example 18	87
37	from example 19	78
38	from example 20	92
39	from example 21	81

[0072] As is evident from table 1, the compositions according to the invention have very good corrosion inhibition properties at a very low dose and in some cases even substantially surpass the activity of the inhibitors of the prior art.

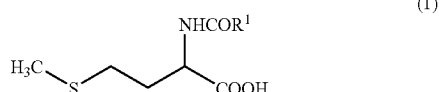
[0073] In comparison with example 29, example 39 shows that the synergistic effect of the metal salt of N-acylmethionine in combination with an anionic surfactant decreases at a ratio of >9:1 but is still present.

TABLE 2

Biodegradability (OECD 306) and toxicity (EC ₅₀ <i>Skeletonema Costatum</i>) of selected corrosion inhibitors according to the invention			
Example	Corrosion inhibitor	Biodegradability [%]	Toxicity EC ₅₀ [mg/l]
Comparison 1	Standard quat	15.2	0.57
Comparison 2	Oleic acid DETA imidazoline	6.8	0.33
39	from example 6	93.0	80.5
40	from example 9	95.3	65.3
41	from example 10	86.9	120.5
42	from example 15	90.5	105.9
43	from example 18	92.1	91.4
44	from example 19	85.4	150.2

[0074] As can clearly be seen from table 4, the compounds according to the invention exhibit improved biodegradability and lower toxicity compared to the comparative examples from the prior art.

1. A method for inhibiting corrosion on a metal surface, said method comprising contacting said metal surface with a composition comprising a metal salt of the compound of the formula (1)



in which R¹ is C₁- to C₂₉-alkyl, C₂- to C₂₉-alkenyl, C₆- to C₃₀-aryl or C₇- to C₃₀-akylaryl, and an anionic surfactant.

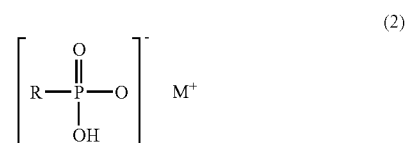
2. The method of claim 1, wherein R¹ is an alkyl or alkenyl group having 7 to 17 carbon atoms.

3. The method of claim 1, wherein the metal salt is an alkali metal salt.

4. The method of claim 1, wherein the anionic surfactant is an alkylphosphate which carries an alkyl group having 6 to 30 carbon atoms or an alkylaryl group having 7 to 30 carbon atoms.

5. The method of claim 1, wherein the anionic surfactant is an alkyl ether phosphate which carries an alkyl group having 6 to 30 carbon atoms or an alkylaryl group having 7 to 30 carbon atoms.

6. The method of claim 1, wherein the anionic surfactant is an alkylphosphonate of the formula (2)



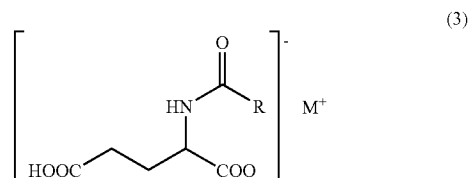
in which R is a C₆- to C₃₀-alkyl radical or a C₇- to C₃₀-alkylaryl radical and M is a cation.

7. The method of claim 1, wherein the anionic surfactant is an alkylpolyalkylene glycol ether carboxylate or alkylarylpolyalkylene glycol ether carboxylate of the formula RO(A)_mCO₂M, in which R is a C₄-C₃₀-alkyl or a C₇-C₃₀-alkylaryl radical, A is an ethoxy or propoxy unit, m is a number greater than 0 and M is a cation.

8. The method of claim 1, wherein the anionic surfactant is an N-acylmethyletaurate of the formula R(C=O)(NCH₃)CH₂CH₂SO₃M, in which R is a C₅-C₂₉-alkyl or a C₅-C₂₉-alkenyl radical and M is a cation.

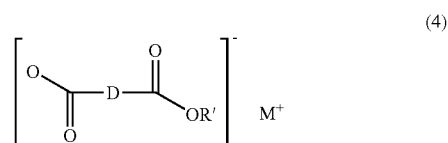
9. The method of claim 1, the anionic surfactant is an N-acylsarcosinate of the formula R(C=O)(NCH₃)CH₂CO₂M, in which R is a C₅-C₂₉-alkyl or a C₅-C₂₉-alkenyl radical and M is a cation.

10. The method of claim 1, wherein the anionic surfactant is an N-acylglutamate of the formula (3)



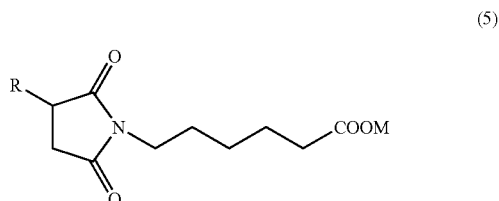
in which R is a C₅-C₂₉-alkyl or a C₅-C₂₉-alkenyl radical and M is a cation.

11. The method of claim 1, wherein the anionic surfactant is an alkylsuccinate of the formula (4)



in which D is $-\text{CH}_2\text{CHR}-$, R is a C_6 - C_{30} -alkyl or a C_6 - C_{30} -alkenyl radical, R' is hydrogen or a C_1 - C_{18} -alkyl or a C_3 - C_{18} -alkenyl radical and M is a cation.

12. The method of claim 1, the anionic surfactant is an alkylsuccinimide of the formula (5)



in which R is a C_6 - C_{30} -alkyl or a C_6 - C_{30} -alkenyl radical and M is a cation.

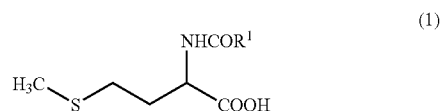
13. The method of claim 1, wherein a total amount of metal salt to nonionic surfactant is from 5 to 5000 ppm.

14. The method of claim 1, wherein a weight ratio of metal salt to nonionic surfactant is from 1:9 to 9:1.

15. The method of claim 1, wherein said composition further comprises a hydrocarbon and said metal surface is an apparatus for conveying and transporting the hydrocarbon.

16. The method of claim 1, wherein the composition further comprises a metal processing composition.

17. A composition containing at least one metal salt of a compound of the formula (1)



in which R¹ is C_1 - to C_{29} -alkyl, C_2 - to C_{29} -alkenyl, C_6 - to C_{30} -aryl or C_7 - to C_{30} -alkylaryl, and at least one anionic surfactant.

18. The composition as claimed in claim 17, wherein a weight ratio of metal salt to nonionic surfactant is from 9:1 to 1:9.

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