[0009] There is a need in the art for solid, concentrated amine, protonated amine or quaternary ammonium-containing compositions that are easily dispersed in water, and which leave no residue after being used in the desired application. It would also be an advantage to have a solid composition that is flowable.

SUMMARY OF THE ~~INVENTION~~DISCLOSURE

[0009a] In one aspect, there is provided a solid composition comprising:

(a) from about 5% to about 70% by weight of at least one quaternary ammonium compound, amine or protonated amine, or mixtures thereof;

(b) from about 30% to about 95% by weight of water-soluble polysaccharide having an aerated bulk density in the range of 150 g/L to 600 g/L; and

(c) optionally, up to 30% by weight of a solubilizer;

wherein,

the quaternary ammonium compound, amine or protonated amine has at least one alkyl chain of 10 carbons or greater, and is absorbed by the polysaccharide; with the proviso that, when the water-soluble polysaccharide is not agglomerated, the amount of the quaternary ammonium compound, amine, or protonated amine in the solid composition is not greater than 20% by weight, and when the water-soluble polysaccharide is agglomerated and has an aerated bulk density in the range of 250 g/L to 600 g/L, the amount of the quaternary ammonium compound, amine, or protonated amine in the solid composition is not greater than 35% by weight.

[0009b] In another aspect, there is provided a method of making a water-dispersible solid composition comprising the steps of:

providing a water-soluble polysaccharide in an amount of about 30% to about 95% by weight, based on the total weight of the solid composition;

adding from about 5% to about 70% by weight of at least one liquid or molten amine, protonated amine, or quaternary ammonium compound, or mixtures thereof, to the water-soluble polysaccharide, with the proviso that, when the water-soluble polysaccharide is not agglomerated, the amount of the amine, protonated amine, or quaternary ammonium compound added to the water-soluble polysaccharide is not greater than 20% by weight of the solid composition, and when the water-soluble polysaccharide is agglomerated, and has an aerated bulk density in the range of 250 g/L to 600 g/L, the amount of the amine, protonated amine, or quaternary ammonium compound added to the agglomerated polysaccharide is not greater than 35% by weight of the solid composition; and

mixing the water-soluble polysaccharide and the amine, protonated amine or quaternary ammonium compound until the amine, protonated amine or quaternary ammonium compound is absorbed by the water-soluble polysaccharide to form the water-dispersible solid composition.

[0010] One ~~aspect~~ example of the present technology is directed to a water-dispersible solid composition that comprises (a) from about 30% to about 95% by weight of at least one polysaccharide, (b) from about 5% to about 70% by weight of at least one amine, protonated amine, or quaternary ammonium compound, and (c) optionally, 0 to about 30% by weight of a solubilizer, wherein the amine, protonated amine, or quaternary ammonium compound has at least one alkyl chain of 10 carbons or greater, and is

absorbed by the polysaccharide; with the proviso that, when the water-soluble polysaccharide is not agglomerated, the amount of the quaternary ammonium compound, amine, or protonated amine in the solid composition is not greater than 20% by weight, and when the water-soluble polysaccharide is agglomerated and has an aerated bulk density in the range of 250 g/L to 600 g/L, the amount of the quaternary ammonium compound, amine, or protonated amine in the solid composition is not greater than 35% by weight.

[0011] In another ~~aspect~~example, the present technology is directed to end use products that can be formulated with the solid composition, including hair care repair and conditioning compositions, fabric care compositions, antimicrobial compositions, and oilfield compositions.

[0012] In a further ~~aspect~~example, the present technology is directed to a method of making the solid water-dispersible composition.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] Figure 1 is a graph showing the corrosion rate profile for a solid composition of the present technology.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0014] While the present technology will be described in connection with one or more preferred embodiments, it will be understood by those skilled in the art that the technology is not limited to only those particular embodiments. To the contrary, the presently described technology includes all alternatives, modifications, and equivalents as may be included within the spirit and scope of the appended claims.

[0015] “Biorenewable Carbon Index” (BCI) refers to a calculation of the percent carbon derived from a biorenewable resource, and is calculated based on the number of biorenewable carbons divided by the total number of carbons in the entire molecule.

[0016] “Biorenewable” is defined herein as originating from animal, plant, or marine material.

[0017] “VOC” refers to volatile organic compounds. Such compounds have a vapor pressure of greater than 2 mm Hg at 25ºC, less than 7 carbon atoms, and a boiling point at atmospheric pressure of less than 120ºC.

[0018] The compositions of the present technology are solid compositions that comprise one or more polysaccharides, and at least one amine, protonated amine, or quaternary ammonium compound that is absorbed by the polysaccharide. In some

Claims

1. A solid composition comprising:

(a) from about 5% to about 70% by weight of at least one quaternary ammonium compound, amine or protonated amine, or mixtures thereof;

(b) from about 30% to about 95% by weight of water-soluble polysaccharide having an aerated bulk density in the range of 150 g/L to 600 g/L; and

(c) optionally, up to 30% by weight of a solubilizer;

wherein,

the quaternary ammonium compound, amine or protonated amine has at least one alkyl chain of 10 carbons or greater, and is absorbed by the polysaccharide; with the proviso that, when the water-soluble polysaccharide is not agglomerated, the amount of the quaternary ammonium compound, amine, or protonated amine in the solid composition is not greater than 20% by weight, and when the water-soluble polysaccharide is agglomerated and has an aerated bulk density in the range of 250 g/L to 600 g/L, the amount of the quaternary ammonium compound, amine, or protonated amine in the solid composition is not greater than 35% by weight.

2. The composition of claim 1, wherein the water-soluble polysaccharide comprises maltodextrin, preferably agglomerated maltodextrin.

3. The composition of claim 1 or 2, wherein the at least one amine, protonated amine or quaternary ammonium compound is at least one esteramine or esterquat.

4. The composition of claim 3, wherein the at least one esteramine or esterquat is the reaction product of an alkanolamine reacted with a fatty acid source.

5. The composition of claim 4, wherein the fatty acid source is derived from sunflower oil, canola oil, low erucic acid rapeseed (LEAR) oil, or a combination thereof.

~~6. The composition of claim 4, wherein the fatty acid source is canola fatty acid, LEAR rapeseed fatty acid, or a combination thereof.~~

~~7. The composition of any one of claims 4-6, wherein the alkanolamine is triethanolamine (TEA) or methyldiethanolamine (MDEA).~~

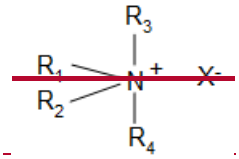
6~~8~~. The composition of any one of claims 4-5~~7~~, wherein the alkanolamine is TEA, and the fatty alkyl chain to alkanolamine ratio is about 1.3:1 to about 2.2:1.

7~~9~~. The composition of any one of claims 4-5~~7~~, wherein the alkanolamine is MDEA, and the fatty alkyl chain to alkanolamine ratio is about 1.0:1 to about 2.0:1.

8~~10~~. The composition of any one of claims 3-~~79~~, wherein the quaternary ammonium compound is an esterquat having a Hansen polarity parameter of greater than about 5.

9~~11~~. The composition of 1 or 2, wherein the at least one amine, protonated amine or quaternary ammonium compound is at least one amidoamine, amidoamine salt, or amidoamine quat.

~~12. The composition of claim 1 or 2, wherein the at least one quaternary ammonium compound has the following chemical formula:~~



~~where R_1 is a straight or branched, saturated or unsaturated, alkyl or alkene chain having~~

~~from 6 to 22, preferably from 8 to 18 carbon atoms;~~

~~R_2 is a straight or branched, saturated or unsaturated, alkyl or alkene chain having from 1 to 16 carbon atoms, preferably from 1 to 10 carbon atoms;~~

~~R_3 is methyl, ethyl, benzyl or ethylbenzyl;~~

~~R_4 is methyl or ethyl; and~~

~~X^- is: Cl^-, Br^-, F^-, I^-, $(SO_4^{2-})_{\frac{1}{2}}$, $CH_3OSO_3^-$, HCO_3^-, $(CO_3^{2-})_{\frac{1}{2}}$, CH_3COO^-.~~

~~13. The composition of any one of claims 1-12, wherein the solubilizer is selected from the group consisting of citric acid, sodium citrate, potassium carbonate, urea, sodium acetate, magnesium sulfate, and combinations thereof.~~

10~~14~~. The composition of any one of claims 1-9~~13~~, wherein the solid composition is water-dispersible.

11~~15~~. The composition of any one of claims 1-10~~14~~, wherein the solid composition is in the form of a powder.

12~~16~~. The composition of any one of claims 1-11~~15~~, wherein the solid composition has a flowability parameter value above about 2.0 and a cohesion parameter value below about 2.0.

~~17. The composition of any one of claims 1-14, wherein the solid composition is in the form of a pod, a packet, a pouch, or a capsule.~~

~~18. The composition of any one of claims 1-14, wherein the solid composition is in the form of a tablet, a stick, a puck, pastilles, or pellets.~~

~~19. A hair conditioning composition comprising the solid composition of any one of claims 1-14.~~

~~20. A fabric softening composition comprising the solid composition of any one of claims 1-14.~~

~~21. An antimicrobial composition comprising the solid composition of any one of claims 12-14.~~

~~22. A corrosion inhibitor for use in oilfield applications comprising the solid composition of any one of claims 1-14.~~

13~~23~~. A method of making a water-dispersible solid composition comprising the steps of:

providing a water-soluble polysaccharide in an amount of about 30% to about 95% by weight, based on the total weight of the solid composition;

adding from about 5% to about 70% by weight of at least one liquid or molten amine, protonated amine, or quaternary ammonium compound, or mixtures thereof, to the water-soluble polysaccharide, with the proviso that, when the water-soluble polysaccharide is not agglomerated, the amount of the amine, protonated amine, or quaternary ammonium compound added to the water-soluble polysaccharide is not greater than 20% by weight of the solid composition, and when the water-soluble polysaccharide is agglomerated, and has an aerated bulk density in the range of 250 g/L to 600 g/L, the amount of the amine, protonated amine, or quaternary ammonium

compound added to the agglomerated polysaccharide is not greater than 35% by weight of the solid composition; and

mixing the water-soluble polysaccharide and the amine, protonated amine or quaternary ammonium compound until the amine, protonated amine or quaternary ammonium compound is absorbed by the water-soluble polysaccharide to form the water-dispersible solid composition.

14~~24~~. The method of claim 13~~23~~, further comprising the step of adding from about 0.5% to about 50% by weight of a solubilizer before, during, or after the addition of the protonated amine or quaternary ammonium compound.

15~~25~~. The method of claim 13~~23~~ or 14~~24~~, wherein the water-soluble polysaccharide comprises maltodextrin, preferably agglomerated maltodextrin.

16~~26~~. The method any one of claims 13-15~~23-25~~, wherein the at least one amine, protonated amine, or quaternary ammonium compound is at least one esteramine or esterquat.

17~~27~~. The method of claim 16~~26~~, wherein the at least one esteramine or esterquat is the reaction product of an alkanolamine reacted with a fatty acid source.

1828. The method of claim 1727, wherein the fatty acid source is derived from sunflower oil, canola oil, LEAR rapeseed oil, or a combination thereof.

~~29. The method of claim 27, wherein the fatty acid source is canola fatty acid, LEAR rapeseed fatty acid, or a combination thereof.~~

~~30. The method of any one of claims 27-29, wherein the alkanolamine is triethanolamine (TEA) or methyldiethanolamine (MDEA).~~

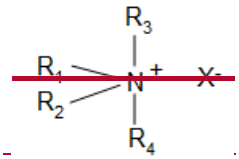
~~31. The method of any one of claims 27-30, wherein the alkanolamine is TEA, and the fatty alkyl chain to alkanolamine ratio is about 1.3:1 to about 2.2:1.~~

~~32. The method of any one of claims 27- 30, wherein the alkanolamine is MDEA, and the fatty alkyl chain to alkanolamine ratio is about 1.0:1 to about 2.0:1.~~

~~33. The method of any one of claims 26-32, wherein the quaternary ammonium compound is an esterquat having a Hansen polarity parameter of greater than about 5.~~

1934. The method of any one of claims 13-1523-25, wherein the at least one amine, protonated amine, or quaternary ammonium compounds is at least one amidoamine, amidoamine salt, or amidoamine quat.

~~35. The method of any one of claims 23-25, wherein the at least one quaternary ammonium compound has the following chemical formula:~~



~~where R_1 is a straight or branched, saturated or unsaturated, alkyl or alkene chain having from 6 to 22, preferably from 8 to 18 carbon atoms;~~

~~R_2 is a straight or branched, saturated or unsaturated, alkyl or alkene chain having from 1 to 16 carbon atoms, preferably from 1 to 10 carbon atoms;~~

~~R_3 is methyl, ethyl, benzyl or ethylbenzyl;~~

~~R_4 is methyl or ethyl; and~~

~~X^- is: Cl^-, Br^-, F^-, I^-, $(SO_4^{2-})_{\frac{1}{2}}$, $CH_3OSO_3^-$, HCO_3^-, $(CO_3^{2-})_{\frac{1}{2}}$, CH_3COO^-.~~

20~~36~~. The method of any one of claims 14-19~~24-35~~, wherein the solubilizer is selected from the group consisting of citric acid, sodium citrate, potassium carbonate, urea, sodium acetate, magnesium sulfate, and combinations thereof.

21~~37~~. The method of any one of claims 13-20~~23-36~~, wherein the solid composition is in the form of a powder.

22~~38~~. The method of claim 21~~37~~, wherein the powder is encapsulated within a water-soluble or water-rupturable film or coating.

~~39. The method of any one of claims 23-36, wherein the solid composition is formed into a tablet, a stick, a puck, pastilles, or pellets.~~

~~40. The composition of any one of claims 1-21, the corrosion inhibitor of claim 22, or the method of any one of claims 23-39, wherein the solid composition comprises one or more additional ingredients selected from the group consisting of nonionic surfactants, cationic surfactants, amphoteric surfactants, imidazolines, mercaptans, glycerides, glycerin, silicones, cationic polymers, and combinations thereof, in an amount up to 30% by weight of the solid composition.~~