THAT WHICH IS CLAIMED IS:

1. A composition which is a zinc-free aqueous brine having a density of about 14.3 pounds per gallon or more, and a true crystallization temperature of about 20°F or less, which composition comprises water and one or more inorganic bromide salts, with the provisos that:

when calcium bromide is present, one or more other water-soluble inorganic salts are also present,

when lithium bromide is present, calcium bromide is absent,

when bismuth(III) bromide is present, one or more other water-soluble inorganic salts are also present, and

for a true crystallization temperature of about 10°F or less, when manganese(II) bromide is present, one or more other water-soluble inorganic salts are also present.

2. A composition as in Claim 1 wherein the inorganic bromide salt is:

manganese(II) bromide, tin(II) bromide, tin(IV) bromide, indium(III) bromide, or a mixture of any two or more of these; or

a combination of calcium bromide and one or more inorganic bromide salts selected from manganese(II) bromide, tin(II) bromide, tin(IV) bromide, bismuth(III) bromide, indium(III) bromide, or a mixture of any two or more of these; or

a combination of bismuth(III) bromide and one or more inorganic bromide salts selected from manganese(II) bromide, tin(II) bromide, tin(IV) bromide, indium(III) bromide, or a mixture of any two or more of these; or

wherein only one inorganic bromide salt is present, and the inorganic bromide salt is tin(IV) bromide or indium(III) bromide.

3. A composition as in Claim 2 wherein the inorganic bromide salt is a combination of calcium bromide and manganese(II) bromide, a combination of calcium bromide, manganese(II) bromide, and tin(IV) bromide, or a combination of calcium bromide, manganese(II) bromide, and bismuth(III) bromide.

4. A composition as in Claim 1 wherein when the inorganic bromide salt is manganese(II) bromide, one or more other water-soluble inorganic salts are also present.

5. A composition as in Claim 1 or 4 wherein the other water-soluble inorganic salt is selected from an inorganic bromide salt, manganese(II) nitrate, and a water-soluble polytungstate salt.

6. A composition as in Claim 1 or 4 wherein the inorganic bromide salt is calcium bromide or manganese(II) bromide, wherein one or more other water-soluble inorganic salts is present, and wherein the one or more other water-soluble inorganic salts is manganese(II) nitrate or a water-soluble polytungstate salt.

7. A composition as in Claim 1 wherein the inorganic bromide salt is lithium bromide in combination with one or more alkali metal polytungstate salts.

8. A composition as in any of Claims 1-3 wherein the composition has a density of about 14.6 pounds per gallon or more.

9. A composition as in any of Claims 1-3 wherein the composition has a density of about 15.0 pounds per gallon or more.

10. A composition as in any of Claims 2-3 wherein the inorganic bromide salt is in a total amount of about 40 wt% to about 75 wt% relative to the total weight of the composition.

11. A composition as in any of Claims 1-10 wherein the composition has a pH in the range of about –2 to about 8.

12. A composition as in Claim 1 wherein:

the inorganic bromide salt is a combination of calcium bromide and manganese(II) bromide, and the composition has a density of about 14.6 ppg or more, and a pH value in the range of about 2.5 to 5; or

the inorganic bromide salt is a combination of calcium bromide, manganese(II) bromide, and tin(IV) bromide, and the composition has a density of about 15.0 ppg or more; or

the inorganic bromide salt is a combination of calcium bromide, manganese(II) bromide, and bismuth(III) bromide, and the composition has a density of about 16.0 ppg or more; or

the inorganic bromide salt is calcium bromide, and the other water-soluble inorganic salt is manganese(II) nitrate, and the composition has a density of about 14.5 ppg or more; or

the inorganic bromide salt is calcium bromide or manganese(II) bromide, and the other water-soluble inorganic salt is a water-soluble polytungstate salt, and the composition has a density of about 14.5 ppg or more.

13. A composition as in any of Claims 5, 6, or 12 wherein the water-soluble polytungstate salt is an alkali metal polytungstate, an alkaline earth metal polytungstate, or manganese polytungstate.

14. A composition as in Claim 13 wherein the water-soluble polytungstate salt is an alkali metal polytungstate, and is lithium metatungstate, sodium metatungstate, or potassium metatungstate.

15. A composition as in any of Claims 1-14 wherein glycerol and/or formic acid is present.

16. A composition as in any of Claims 1-14 wherein the composition has a true crystallization temperature of about 10°F or less.

17. A process for forming a zinc-free aqueous brine composition having a density of about 14.3 pounds per gallon or more, and a true crystallization temperature of about 20°F or less, which process comprises combining, in any order, components comprising water and one or more inorganic bromide salts, with the provisos that:

when the inorganic bromide salt is calcium bromide, one or more other water-soluble inorganic salts is also included,

when the inorganic bromide salt is lithium bromide, calcium bromide is not used,

when the inorganic bromide salt is bismuth(III) bromide, one or more other water-soluble inorganic salts is also included, and

for a true crystallization temperature of about 10°F or less, when the inorganic bromide is manganese(II) bromide, one or more other water-soluble inorganic salts is also included.

18. A process as in Claim 17 wherein one or more inorganic bromide salts are formed during the process from (i) an inorganic oxide and/or hydroxide and (ii) hydrogen bromide and/or bromine.

19. A process as in Claim 18 wherein the inorganic oxide and/or hydroxide is one or more oxides and/or hydroxides of calcium, manganese(II), tin(II), tin(IV), indium(III), or a mixture of any two or more of the foregoing; or

one or more oxides and/or hydroxides of manganese(II), tin(IV), and/or bismuth(III) in combination with calcium bromide and/or oxides and/or hydroxides of calcium.

20. A process as in any of Claims 16-19 wherein the inorganic bromide salt is manganese(II) bromide, tin(II) bromide, tin(IV) bromide, indium(III) bromide, or a mixture of any two or more of these; or

a combination of calcium bromide and manganese(II) bromide, tin(II) bromide, tin(IV) bromide, bismuth(III) bromide, indium(III) bromide, or a mixture of any two or more of these; or

a combination of bismuth(III) bromide and manganese(II) bromide, tin(II) bromide, tin(IV) bromide, indium(III) bromide, or a mixture of any two or more of these; or

wherein only one inorganic bromide salt is present, and the inorganic bromide salt is tin(IV) bromide or indium(III) bromide.

21. A process as in Claim 20 wherein the inorganic bromide salt is a combination of calcium bromide and manganese(II) bromide, a combination of calcium bromide, manganese(II) bromide, and tin(IV) bromide, or a combination of calcium bromide, manganese(II) bromide, and bismuth(III) bromide.

22. A process as in Claim 17 wherein when the inorganic bromide salt is manganese(II) bromide, one or more other water-soluble inorganic salts is also used.

23. A process as in Claim 17 or 22 wherein the other water-soluble inorganic salt is selected from an inorganic bromide salt, manganese(II) nitrate, and a water-soluble polytungstate salt.

24. A process as in Claim 17 or 22 wherein the inorganic bromide salt is calcium bromide or manganese(II) bromide, wherein one or more other water-soluble inorganic salts is used, and wherein the one or more other water-soluble inorganic salts is manganese(II) nitrate or a water-soluble polytungstate salt.

25. A process as in Claim 17 wherein the inorganic bromide salt is lithium bromide, and wherein one or more alkali metal polytungstate salts is also used.

26. A process as in Claim 23 or 24 wherein the water-soluble polytungstate salt is an alkali metal polytungstate, an alkaline earth metal polytungstate, or manganese polytungstate.

27. A process as in any of Claims 17-21 wherein the composition has a density of about 14.6 pounds per gallon or more, and/or wherein the inorganic bromide salt is in a total amount of about 40 wt% to about 75 wt%, relative to the total weight of the composition.

28. A process as in any of Claims 17-27 wherein the composition has a pH, the process further comprising adjusting the pH to a value in the range of about –2 to about 8 by adding an inorganic oxide and/or hydroxide, and/or by adding an acid.

29. A process as in Claim 28 wherein:

the inorganic oxide and/or hydroxide is manganese(II) oxide and/or hydroxide, tin(II) oxide and/or hydroxide, tin(IV) oxide and/or hydroxide, bismuth(III) oxide and/or hydroxide, indium(III) oxide and/or hydroxide, an alkali metal oxide and/or hydroxide, an alkaline earth metal oxide and/or hydroxide, or a mixture of any two or more of the foregoing, and/or

the acid is hydrogen bromide.

30. A process as in any of Claims 17-29 further comprising adding glycerol and/or formic acid.

31. A process as in any of Claims 17-22 which further comprises heating during and/or after the combining.

32. A process as in any of Claims 17-30 wherein the composition formed has a true crystallization temperature of about 10°F or less.

Claims:

1. A composition which is a zinc-free aqueous brine having a density of about 14.3 pounds per gallon or more, and a true crystallization temperature of about 20°F or less, which composition comprises water and one or more inorganic bromide salts, with the provisos that:

when calcium bromide is present, one or more other water-soluble inorganic salts are also present,

when lithium bromide is present, calcium bromide is absent,

when bismuth(III) bromide is present, one or more other water-soluble inorganic salts are also present, and

for a true crystallization temperature of about 10°F or less, when manganese(II) bromide is present, one or more other water-soluble inorganic salts are also present.

2. A composition as in Claim 1 wherein the inorganic bromide salt is:

manganese(II) bromide, tin(II) bromide, tin(IV) bromide, indium(III) bromide, or a mixture of any two or more of these; or

a combination of calcium bromide and one or more inorganic bromide salts selected from manganese(II) bromide, tin(II) bromide, tin(IV) bromide, bismuth(III) bromide, indium(III) bromide, or a mixture of any two or more of these; or

a combination of bismuth(III) bromide and one or more inorganic bromide salts selected from manganese(II) bromide, tin(II) bromide, tin(IV) bromide, indium(III) bromide, or a mixture of any two or more of these; or

wherein only one inorganic bromide salt is present, and the inorganic bromide salt is tin(IV) bromide or indium(III) bromide.

3. A composition as in Claim 2 wherein the inorganic bromide salt is a combination of calcium bromide and manganese(II) bromide, a combination of calcium bromide, manganese(II) bromide, and tin(IV) bromide, or a combination of calcium bromide, manganese(II) bromide, and bismuth(III) bromide.

4. A composition as in Claim 1 wherein the other water-soluble inorganic salt is selected from an inorganic bromide salt, manganese(II) nitrate, and a water-soluble polytungstate salt.

5. A composition as in Claim 1 wherein the inorganic bromide salt is calcium bromide or manganese(II) bromide, wherein one or more other water-soluble inorganic salts is

o

present, and wherein the one or more other water-soluble inorganic salts is manganese(II) nitrate or a water-soluble polytungstate salt.

6. A composition as in any of Claims 1-3 wherein the composition has a density of about 14.6 pounds per gallon or more.

7. A composition as in any of Claims 1-3 wherein the composition has a density of about 15.0 pounds per gallon or more.

8. A composition as in Claim 1 wherein:

the inorganic bromide salt is a combination of calcium bromide and manganese(II) bromide, and the composition has a density of about 14.6 ppg or more, and a pH value in the range of about 2.5 to 5; or

the inorganic bromide salt is a combination of calcium bromide, manganese(II) bromide, and tin(IV) bromide, and the composition has a density of about 15.0 ppg or more; or

the inorganic bromide salt is a combination of calcium bromide, manganese(II) bromide, and bismuth(III) bromide, and the composition has a density of about 16.0 ppg or more; or

the inorganic bromide salt is calcium bromide, and the other water-soluble inorganic salt is manganese(II) nitrate, and the composition has a density of about 14.5 ppg or more; or

the inorganic bromide salt is calcium bromide or manganese(II) bromide, and the other water-soluble inorganic salt is a water-soluble polytungstate salt, and the composition has a density of about 14.5 ppg or more.

9. A composition as in any of Claims 4, 5, or 8 wherein the water-soluble polytungstate salt is an alkali metal polytungstate, an alkaline earth metal polytungstate, or manganese polytungstate.

10. A process for forming a zinc-free aqueous brine composition having a density of about 14.3 pounds per gallon or more, and a true crystallization temperature of about 20°F or less, which process comprises combining, in any order, components comprising water and one or more inorganic bromide salts, with the provisos that:

when the inorganic bromide salt is calcium bromide, one or more other water-soluble inorganic salts is also included,

when the inorganic bromide salt is lithium bromide, calcium bromide is not used,

o

when the inorganic bromide salt is bismuth(III) bromide, one or more other water-soluble inorganic salts is also included, and

for a true crystallization temperature of about 10°F or less, when the inorganic bromide is manganese(II) bromide, one or more other water-soluble inorganic salts is also included.

11. A process as in Claim 10 wherein one or more inorganic bromide salts are formed during the process from (i) an inorganic oxide and/or hydroxide and (ii) hydrogen bromide and/or bromine.

12. A process as in Claim 11 wherein the inorganic oxide and/or hydroxide is

one or more oxides and/or hydroxides of calcium, manganese(II), tin(II), tin(IV), indium(III), or a mixture of any two or more of the foregoing; or

one or more oxides and/or hydroxides of manganese(II), tin(IV), and/or bismuth(III) in combination with calcium bromide and/or oxides and/or hydroxides of calcium.

13. A process as in any of Claims 10-12 wherein the inorganic bromide salt is

manganese(II) bromide, tin(II) bromide, tin(IV) bromide, indium(III) bromide, or a mixture of any two or more of these; or

a combination of calcium bromide and manganese(II) bromide, tin(II) bromide, tin(IV) bromide, bismuth(III) bromide, indium(III) bromide, or a mixture of any two or more of these; or

a combination of bismuth(III) bromide and manganese(II) bromide, tin(II) bromide, tin(IV) bromide, indium(III) bromide, or a mixture of any two or more of these; or

wherein only one inorganic bromide salt is present, and the inorganic bromide salt is tin(IV) bromide or indium(III) bromide.

14. A process as in Claim 13 wherein the inorganic bromide salt is a combination of calcium bromide and manganese(II) bromide, a combination of calcium bromide, manganese(II) bromide, and tin(IV) bromide, or a combination of calcium bromide, manganese(II) bromide, and bismuth(III) bromide.

15. A process as in Claim 10 wherein the other water-soluble inorganic salt is selected from an inorganic bromide salt, manganese(II) nitrate, and a water-soluble polytungstate salt.

16. A process as in Claim 10 wherein the inorganic bromide salt is calcium bromide or manganese(II) bromide, wherein one or more other water-soluble inorganic salts is used, and

o

wherein the one or more other water-soluble inorganic salts is manganese(II) nitrate or a water-soluble polytungstate salt.

17. A process as in Claim 15 or 16 wherein the water-soluble polytungstate salt is an alkali metal polytungstate, an alkaline earth metal polytungstate, or manganese polytungstate.

18. A process as in any of Claims 10-14 wherein the composition has a density of about 14.6 pounds per gallon or more, and/or wherein the inorganic bromide salt is in a total amount of about 40 wt% to about 75 wt%, relative to the total weight of the composition.

19. A process as in any of Claims 10-14 which further comprises heating during and/or after the combining.

20. A process as in any of Claims 10-14, 15-16, or 17-18 wherein the composition formed has a true crystallization temperature of about 10°F or less.