

CLAIMS

1. A method for producing a biocide comprising:
providing a solution of a hypochlorite oxidant;
providing a solution of an ammonium salt;
mixing said solution of a hypochlorite oxidant with said solution of an ammonium salt, wherein the molar ratio of said ammonium to said hypochlorite oxidant is less than 1:1.
2. The method according to claim 1, wherein said hypochlorite oxidant is sodium hypochlorite.
3. The method according to claim 1 or 2, wherein said providing a solution of a hypochlorite oxidant comprises diluting a concentrated solution of about 8-18% with water immediately prior to use.
4. The method according to any one of claims 1 to 3, wherein said solution of a hypochlorite oxidant has a concentration from about 1000 to about 20,000 ppm.
5. The method according to any one of claims 1 to 4, wherein said solution of a hypochlorite oxidant has a concentration from about 3000 to about 10,000 ppm.
6. The method according to any one of claims 1 to 5, wherein said solution of a hypochlorite oxidant has a concentration from about 3500 to about 7000 ppm.
7. The method according to any one of claims 1 to 6, wherein said ammonium salt is selected from ammonium bicarbonate, ammonium carbonate, ammonium carbamate, ammonium hydroxide, ammonium sulfamate, ammonium bromide, ammonium chloride and ammonium sulfate.
8. The method according to any one of claims 1 to 7, wherein said ammonium salt is selected from ammonium carbamate, ammonium bromide, ammonium hydroxide and ammonium sulfate.

9. The method according to any one of claims 1 to 8, wherein said ammonium salt is ammonium carbamate.

10. The method according to any one of claims 1 to 9, wherein said ammonium salt is a mixture of two or more ammonium salts.

11. The method according to any one of claims 1 to 10, wherein said providing a solution of an ammonium salt comprises diluting a concentrated solution of about 15-50% with water or with said solution of a hypochlorite oxidant immediately prior to use.

12. The method according to any one of claims 1 to 11, wherein said solution of an ammonium salt has a concentration from about 1,000 to about 50,000 ppm.

13. The method according to any one of claims 1 to 12, wherein said solution of an ammonium salt has a concentration from about 12,000 to about 30,000 ppm.

14. The method according to any one of claims 1 to 13, wherein said solution of an ammonium salt further comprises a base.

15. The method according to claim 14, wherein said base is sodium hydroxide.

16. The method according to any one of claims 1 to 15, further comprising monitoring the conductivity of the biocide.

17. The method according to claim 16, wherein said method comprises:
providing an amount of said solution of an ammonium salt;
adding a plurality of amounts of said solution of a hypochlorite oxidant to said amount of said solution of an ammonium salt under mixing conditions;
measuring the conductivity after the addition of each amount of said solution of a hypochlorite oxidant; and

ceasing to add amounts of said solution of a hypochlorite oxidant when a maximum in the conductivity is observed after the observation of a conductivity minimum.

18. The method according to claim 16, wherein said method comprises:

mixing a stream of a hypochlorite solution with a stream of an ammonium salt solution in a mixing chamber at an ammonium:hypochlorite molar ratio of greater than 1:1;

holding the flow rate of one of said streams constant and gradually increasing or decreasing the flow rate of the other of said streams in order to decrease said ammonium:hypochlorite molar ratio;

monitoring the value of the conductivity in a stream leaving said mixing chamber; and

selecting an ammonium:hypochlorite molar ratio to be equal to the ammonium:hypochlorite molar ratio wherein the conductivity value has a local maximum.

19. The method according to claim 18, wherein said monitoring is continuous.

20. The method according to claim 18, wherein said monitoring comprises measuring the control parameter in discrete samples of said stream leaving said mixing chamber.