CLAIMS

1. A method for controlling aerosol production during absorption of sulfur dioxide from a flue gas, the method comprising applying an ammonium salt gradient to the flue gas.

2. The method of claim 1 further comprising applying a reaction condition gradient to the flue gas.

3. The method of claim 1 wherein the applying an ammonium salt gradient comprises applying:

a first ammonium salt concentration at a first stage; and

a second ammonium salt concentration at a second stage;

wherein the first stage is upstream, relative to the flue gas, from the second stage.

4. The method of claim 3 wherein the salt includes ammonium sulfite.

5. The method of claim 3 wherein the salt includes ammonium bisulfite.

6. The method of claim 3 wherein the salt includes ammonium sulfate.

7. The method of claim 3 wherein the first concentration is greater than the second concentration.

8. The method of claim 7 wherein the applying a first ammonium salt concentration at a first stage comprises spraying absorption circulation liquid on the flue gas in a sulfur dioxide absorption process.

9. The method of claim 8 wherein the applying a second ammonium salt concentration at a second stage comprises spraying absorption circulation liquid on the flue gas in the sulfur dioxide absorption process.

10. The method of claim 7 wherein the applying a first ammonium salt concentration at a first stage comprises spraying fine particle washing circulation liquid on the flue gas in a fine particle washing process.

11. The method of claim 10 wherein the applying a second ammonium salt concentration at a second stage comprises spraying fine particle washing circulation liquid on the flue gas in the fine particle washing process.

12. Apparatus for controlling aerosol production in ammonia desulfurization, the apparatus comprising:

a gas purification and removal system that is configured to apply an ammonium salt gradient to flue gas;

an oxidation system; and

an auxiliary system.

13. The apparatus of claim 12 wherein the oxidation system includes an oxidation vessel that is configured to:

force oxidation of input ammonium solution to yield a plurality of outputs of different degrees of oxidation of the ammonium solution; and

provide the outputs to the gas purification and removal system to define the gradient.

14. The apparatus of claim 12 wherein the auxiliary system comprises:

an ammonium sulfate post-processing system;

an ammonia supply system; and

a process water system.

15. The apparatus of claim 12 further comprising:

a tower that:

houses the gas purification and removal system; and includes:

a pre-washing zone;

an absorption zone; and

a fine particle control zone;

a component disposed between the absorption zone and the pre-washing zone that allows only gas to pass; and

a plurality of spraying layers, each of the pre-washing zone, the absorption zone, and the fine particle control zone including a spraying layer of the plurality;

wherein the tower is configured to provide divisional control of solution compositions to the spraying layers.

16. The apparatus of claim 15 wherein the oxidation system:

includes the spraying layers; and

is configured to control interaction between liquid sprayed at different ones of the spraying layers and the flue gas at the different ones of the spraying layers to naturally oxidize the liquid to yield a plurality of outputs of different degrees of oxidation of ammonium solution to define the gradient.

17. The apparatus of claim 16 wherein the oxidation system is configured to control an operation temperature of the pre-washing zone to control the gradient.

18. The apparatus of claim 17 wherein the oxidation system is configured to control an operation temperature of the absorption zone to control the gradient.

19. The apparatus of claim 18 wherein the oxidation system is configured to control an operation temperature of the fine particle control zone to control the gradient.

20. The apparatus of claim 16 wherein the oxidation system is configured to control an operation temperature of the pre-washing zone and to control an operation temperature of the fine particle zone, to control the gradient.

21. The apparatus of claim 16 wherein the oxidation system is configured to control an operation temperature of the absorption zone to control the gradient.

22. The apparatus of claim 21 wherein the oxidation system is configured to control an operation temperature of the fine particle zone to control the gradient.

23. The apparatus of claim 16 wherein the oxidation system is configured to control an operation temperature of the fine particle zone to control the gradient.

24. The apparatus of claim 16 wherein the oxidation system does not include a forced oxidation vessel.

25. The apparatus of claim 16 wherein the oxidation system is configured to route pre-washing liquid into the absorption zone.

26. The apparatus of claim 15wherein each zone includes a single spraying layer.

27. The apparatus of claim 15 wherein a zone of the zones includes a plurality of spraying layers; and/or

28. The apparatus of claim 15 further comprising a component disposed between the absorption zone and the fine particle control zone that allows only gas to pass.

29. The apparatus of claim 15 further comprising a component disposed within the absorption zone that allows only gas to pass.

30. The apparatus of claim 15 further comprising a component disposed within the fine particle control zone that allows only gas to pass.