CLAIMS

1. A method comprising:

directing an aqueous solution having a first concentration of dissolved carbon dioxide and a first concentration of dissolved ozone into a vessel;

removing an amount of the dissolved carbon dioxide from the aqueous solution to produce a first effluent having a second concentration of dissolved carbon dioxide lower than the first concentration of dissolved carbon dioxide; and

irradiating the first effluent with ultraviolet light at a dosage effective to decompose a predetermined amount of the dissolved ozone in the first effluent, to produce a second effluent having a second concentration of dissolved ozone lower than the first concentration of dissolved ozone.

2. The method of claim 1, wherein removing the amount of dissolved carbon dioxide comprises controlling pH of the aqueous solution to a value effective to convert the amount of the dissolved carbon dioxide into at least one of carbonate and bicarbonate.

3. The method of claim 2, comprising controlling the pH of the aqueous solution to be at least about 8.

4. The method of claim 3, comprising controlling the pH of the aqueous solution to be between about 8.3 and 11.

5. The method of claim 2, further comprising measuring at least one of the pH of the aqueous solution and a pH of the first effluent, and

responsive to the measurement, adding a predetermined amount of an acid or a base to control the pH of the aqueous solution.

6. The method of claim 1, wherein the first effluent is substantially free of dissolved carbon dioxide.

7. The method of claim 1, wherein removing the amount of dissolved carbon dioxide comprises contacting the aqueous solution with a membrane degasifier.

8. The method of claim 7, further comprising measuring at least one of a dissolved carbon dioxide concentration in the aqueous solution and a dissolved carbon dioxide concentration in the first effluent, and

responsive to the measurement, controlling a removal rate of the amount of dissolved carbon dioxide with the membrane degasifier by at least one of adjusting a vacuum level of the membrane degasifier, adjusting sweep gas flow rate through the membrane degasifier, and controlling flow rate of the aqueous solution through the membrane degasifier.

9. The method of claim 1, wherein the first concentration of dissolved carbon dioxide is at least about 20 ppm.

10. The method of claim 1, wherein the first concentration of dissolved ozone is at least about 30 ppm.

11. The method of claim 10, wherein the second concentration of dissolved ozone is less than about 10 ppb.

12. The method of claim 11, wherein the second concentration of dissolved ozone is less than about 2 ppb.

13. The method of claim 12, wherein the second concentration of dissolved ozone is less than about 1 ppb.

14. The method of claim 1, further comprising measuring at least one of the first concentration of dissolved ozone and the second concentration of dissolved ozone, and

responsive to the measurement, controlling at least one of the dosage of the ultraviolet irradiation and flow rate of at least one of the aqueous solution and the first effluent.

15. The method of claim 1, wherein the aqueous solution comprises semiconductor manufacturing process water.

16. A system comprising:

a channel fluidly connected to a source of an aqueous solution having a first concentration of dissolved carbon dioxide and a first concentration of dissolved ozone;

a dissolved carbon dioxide removal subsystem fluidly connected to the channel and configured to remove an amount of the dissolved carbon dioxide from the aqueous solution to produce a first effluent; and

a source of ultraviolet irradiation positioned downstream from the dissolved carbon dioxide removal subsystem and configured to irradiate the first effluent to produce a second effluent.

17. The system of claim 16, wherein the dissolved carbon dioxide removal subsystem comprises a source of a pH adjuster fluidly connected to the channel and configured to dose the aqueous solution with the pH adjuster to produce the first effluent.

18. The system of claim 17, further comprising a mixer positioned downstream from the source of the pH adjuster and upstream from the source of the ultraviolet irradiation.

19. The system of claim 17, further comprising a pH sensing subsystem comprising an inlet pH sensor configured to detect a pH of the aqueous solution and an outlet pH sensor configured to detect a pH of at least one of the first effluent and the second effluent,

the pH sensing subsystem configured to output a pH signal indicative of a measurement obtained by at least one of the inlet pH sensor and the outlet pH sensor.

20. The system of claim 16, wherein the dissolved carbon dioxide removal subsystem comprises a membrane degasifier fluidly connected to the channel.

21. The system of claim 20, wherein the dissolved carbon dioxide removal subsystem comprises at least one of a vacuum pump and a source of a sweep gas associated with the membrane degasifier.

22. The system of claim 20, further comprising a dissolved carbon dioxide sensing subsystem comprising an inlet dissolved carbon dioxide sensor configured to detect a dissolved carbon dioxide concentration of the aqueous solution and an outlet dissolved carbon dioxide sensor configured to detect a dissolved carbon dioxide of at least one of the first effluent and the second effluent,

the dissolved carbon dioxide sensing subsystem configured to output a dissolved carbon dioxide signal indicative of a measurement obtained by at least one of the inlet dissolved carbon dioxide sensor and the outlet dissolved carbon dioxide sensor.

23. The system of claim 16, further comprising a flow meter configured to measure flow rate of at least one of the aqueous solution, the first effluent, and the second effluent, and

configured to output a flow rate signal indicative of the measurement obtained by the flow meter.