CLAIMS

1. A method of operation of a cleaning solution mixing system comprising:

providing ultrapure water from an ultrapure water source;

filtering an amount of ammonia gas through an ammonia filter;

filtering an amount of hydrogen peroxide gas through a hydrogen peroxide filter;

forming ultra-dilute ammoniated water by dissolving the ammonia gas in a first portion of the ultrapure water;

separately dissolving the hydrogen peroxide gas in a second portion of the ultrapure water to provide dissolved hydrogen peroxide gas in the second portion of the ultrapure water; and

forming an ultra-dilute cleaning solution by mixing the ultra-dilute ammoniated water and the dissolved hydrogen peroxide gas in the second portion of the ultrapure water.

2. The method as claimed in claim 1 further comprising:

filtering an amount of tetramethyl ammonium hydroxide gas through a tetramethyl ammonium hydroxide filter;

combining the tetramethyl ammonium hydroxide gas with the first portion of the ultrapure water; and

regulating the amount of tetramethyl ammonium hydroxide gas dissolved in the first portion of the ultrapure water using a tetramethyl ammonium hydroxide mass flow controller.

3. The method as claimed in claim 1 further comprising filtering the dissolved hydrogen peroxide gas in the second portion of the ultrapure water through an additional filter.

4. The method as claimed in claim 1 further comprising regulating the amount of the ammonia gas dissolved in the first portion of the ultrapure water using an ammonia mass flow controller.

5. The method as claimed in claim 1 further comprising regulating the amount of the hydrogen peroxide gas dissolved in the second portion of the ultrapure water using a hydrogen peroxide mass flow controller.

6. The method as claimed in claim 1 further comprising regulating the amount of the ammonia gas dissolved in the first portion of the ultrapure water using a conductivity sensor connected to an ammonia mass flow controller.

7. The method as claimed in claim 1 further comprising regulating the amount of the hydrogen peroxide gas dissolved in the second portion of the ultrapure water using a hydrogen peroxide sensor connected to a hydrogen peroxide mass flow controller.

8. The method as claimed in claim 1, further comprising regulating the amount of the hydrogen peroxide gas dissolved in the second portion of the ultrapure water using a hydrogen peroxide sensor connected to a hydrogen peroxide mass flow controller, regulating the amount of the ammonia gas dissolved in the first portion of the ultrapure water using a conductivity sensor connected to an ammonia mass flow controller, and mixing the ultra-dilute ammoniated water and the dissolved hydrogen peroxide gas in the second portion of the ultrapure water in a controlled ratio.

9. The method as claimed in claim 8, wherein the concentration of the hydrogen peroxide gas is two to three times the concentration of the ammonia gas in the mixture.

10. The method as claimed in claim 2, further comprising combining the tetramethyl ammonium hydroxide and the first portion of the ultrapure water to form ultra-dilute tetramethyl ammonium hydroxide water combined with the ultra-dilute ammoniated water at a membrane before forming an ultra-dilute cleaning solution by mixing the ultra-dilute ammoniated water, and the and the dissolved hydrogen peroxide gas in the second portion of the ultrapure water.

11. The method as claimed in claim 9, wherein the ammonia filter has a pore size of less than 5 nm.

12. The method as claimed in claim 11, wherein the hydrogen peroxide filter has a pore size of less than 5 nm.

13. The method as claimed in claim 9, further comprising checking the ultra-dilute cleaning solution with a conductivity sensor.

14. The method as claimed in claim 9, further comprising passing the ultra-dilute ammoniated water though a conductivity sensor and providing feedback to the ammonia mass flow controller regarding the concentration of ammonia gas in the ultra-dilute ammoniated water to allow for the ammonia mass flow controller to control concentration of the ammonia gas.

15. The method as claimed in claim 14, further comprising passing the hydrogen peroxide gas dissolved in the second portion of the ultrapure water though a hydrogen peroxide sensor and providing feedback to the hydrogen peroxide mass flow controller regarding the concentration of hydrogen peroxide gas in the second portion of the ultrapure water to allow for the hydrogen peroxide flow controller to control concentration of the hydrogen peroxide gas.

16. The method as claimed in claim 15, further comprising checking the ultra-dilute cleaning solution with a conductivity sensor.