[0013] Another aspect of the disclosure is the microchamber system as described above, wherein the stage assembly includes a cooled chuck assembly.

[0014] Another aspect of the disclosure is the microchamber system as described above, wherein the top member is cooled.

[0015] Another aspect of the disclosure is the microchamber system as described above, wherein the stage assembly includes a ring member that in part defines the microchamber peripheral gap. The stage assembly includes an array of openings that support the flow of the gas from the at least one gas supply system into the microchamber peripheral gap.

[0016] Another aspect of the disclosure is the microchamber system as described above, wherein the peripheral microchamber gap has a width in the range from 0.01 mm to 2 mm.

[0017] Another aspect of the disclosure is the microchamber system as described above, wherein the peripheral microchamber gap has a width in the range from 0.1 mm to 1 mm.

[0018] Another aspect of the disclosure is the microchamber system as described above, wherein the stage assembly has a maximum velocity V_M relative to the top member, and wherein the gas entering the peripheral microchamber gap has a gas velocity V_G, wherein ~~$V_G < V_M$~~ $V_G > V_M$.

[0019] Another aspect of the disclosure is a method of processing a substrate without exposing the substrate to a reactive gas present in an ambient environment outside of a microchamber. The method includes supporting the substrate on a movable stage assembly in the microchamber. The microchamber is defined by a stationary top member and the movable stage assembly. The moveable stage assembly has a ring member that defines, in combination with the stationary top member, a peripheral microchamber gap. The stage assembly also has an outer periphery. The method further includes introducing a first gas into the microchamber, wherein the first gas has either no substantial amount of the reactive gas or has a select amount of the reactive gas. The method additionally includes introducing a second gas into the peripheral microchamber gap through the ring member to form a gas curtain adjacent the outer periphery of the movable stage assembly. The method also includes moving the movable stage assembly relative to the stationary top member. The gas curtain prevents the reactive gas in the ambient environment from entering the microchamber during the moving of the movable stage assembly.

[0020] Another aspect of the disclosure is the method as described above, wherein the first and second gases are the same gas.

[0021] Another aspect of the disclosure is the method as described above, the method further includes processing the substrate with at least one laser beam that passes from the ambient environment into the microchamber via at least one light-access feature of the top member.

[0022] Another aspect of the disclosure is the method as described above, wherein the at least one laser beam includes at least one annealing laser beam.

[0023] Another aspect of the disclosure is the method as described above, wherein the at least one laser beam reacts with the select amount of reactive gas in the microchamber to modify the substrate.

[0024] Another aspect of the disclosure is the method as described above, wherein the at least one light-access feature includes at least one of a through opening and a window.

[0025] Another aspect of the disclosure is the method as described above, wherein the movable stage assembly has a maximum velocity V_M relative to the top member, further providing the gas entering the peripheral microchamber gap with a gas velocity V_G such that ~~$V_G < V_M$~~ $V_G > V_M$.

[0026] Another aspect of the disclosure is the method as described above, wherein the peripheral microchamber gap has a width in the range from 0.01 mm to 2 mm.

[0027] Another aspect of the disclosure is the method as described above, wherein the peripheral microchamber gap has a width in the range from 0.1 mm to 1 mm.

[0028] Another aspect of the disclosure is the method as described above, wherein the first and second gases are at least one gas selected from the group of gases consisting of: nitrogen, argon, helium and neon.

[0029] Another aspect of the disclosure is the method as described above, wherein the movable stage assembly includes a heated chuck. And the method further includes heating the substrate using the heated chuck.

[0030] Another aspect of the disclosure is the method as described above, the method further includes cooling the movable stage assembly and the top member.

6. The microchamber system of claim 1, wherein the at least one gas supply system supplies the gas to the microchamber.

7. The microchamber system of claim 1, wherein the stage assembly includes a cooled chuck assembly.

8. The microchamber system of claim 7, wherein the stationary top member is cooled.

9. The microchamber system of claim 1, wherein the stage assembly includes a ring member that in part defines the microchamber peripheral gap and that includes an array of openings that support the flow of the gas from the at least one gas supply system into the microchamber peripheral gap.

10. The microchamber system of claim 1, wherein the peripheral microchamber gap has a width in the range from 0.01 mm to 2 mm.

11. The microchamber system of claim 10, wherein the peripheral microchamber gap has a width in the range from 0.1 mm to 1 mm.

12. The microchamber system of claim 1, wherein the stage assembly has a maximum velocity V_M relative to the stationary top member, and wherein the gas entering the peripheral microchamber gap has a gas velocity V_G, wherein ~~$V_G < V_M$~~ $V_G > V_M$.

13. A method of processing a substrate without exposing the substrate to a reactive gas present in an ambient environment outside of a microchamber, comprising:

supporting the substrate on a movable stage assembly in the microchamber, wherein the microchamber is defined by a stationary top member and the movable

19. The method of claim 13, wherein the stage assembly has a maximum velocity V_M relative to the stationary top member, further providing the gas entering the peripheral microchamber gap with a gas velocity V_G such that ~~$V_G < V_M$~~ $V_G > V_M$.

20. The method of claim 13, wherein the peripheral microchamber gap has a width in the range from 0.01 mm to 2 mm.

21. The method of claim 20, wherein the peripheral microchamber gap has a width in the range from 0.1 mm to 1 mm.

22. The method of claim 13, wherein the first and second gases are at least one gas selected from the group of gases comprising: nitrogen, argon, helium and neon.

23. The method of claim 13, wherein the stage assembly includes a heated chuck, further comprising heating the substrate using the heated chuck.

24. The method of claim 13, further comprising cooling the stage assembly and the stationary top member.

~~25. A method of processing a substrate without exposing the substrate to a first gas present in an ambient environment, comprising:~~

~~supporting the substrate on a movable stage assembly in a microchamber, wherein the microchamber is defined by a stationary top member and the movable stage assembly, the movable stage assembly having an outer periphery and a ring member that defines, in combination with the stationary top member, a peripheral microchamber gap;~~

~~forming a vacuum in the microchamber;~~

~~introducing a second gas into the peripheral microchamber gap through the ring member;~~

~~introducing a third gas into the microchamber, wherein the third gas includes at least one reactive gas;~~

~~moving the movable stage assembly relative to the stationary top member to cause the second gas to form a gas curtain adjacent the outer periphery, wherein the gas curtain substantially prevents the first gas in the ambient environment from entering the microchamber; and~~

~~passing a first laser beam through a light access feature in the stationary top member and into the microchamber to irradiate the substrate and the at least reactive gas of the third gas in the microchamber to modify the substrate.~~

~~26. The method of claim 25, wherein the at least one third reactive gas includes oxygen.~~

~~27. The method of claim 25, wherein the first gas includes oxygen and the least one third reactive gas includes oxygen.~~

~~28. The method of claim 25, wherein the second gas consists of one or more of nitrogen, argon, helium and neon.~~

~~29. The method of claim 25, wherein the peripheral microchamber gap has a width in the range from 0.01 mm to 2 mm.~~

~~30. The method of claim 25, wherein the peripheral microchamber gap has a width in the range from 0.1 mm to 1 mm.~~

~~31. The method of claim 25, further comprising passing a second laser beam through either the light access feature or another light access feature in the stationary top member and into the microchamber to irradiate the substrate and the at least one third reactive gas in the microchamber so that the second laser beam reacts with the at least one third reactive gas in the microchamber to modify the~~

substrate.

32. A method of processing a substrate in a microchamber without altering a select amount of a reactive first gas present in microchamber, wherein the microchamber resides in an ambient environment that includes the reactive first gas, comprising:

supporting the substrate on a movable stage assembly in the microchamber, wherein the microchamber is defined by a stationary top member and the movable stage assembly, the movable stage assembly having an outer periphery and a ring member that defines, in combination with the stationary top member, a peripheral microchamber gap;

introducing the select amount of the reactive first gas into the microchamber;

introducing a second gas into a peripheral microchamber gap through the ring member;

moving the movable stage relative to the stationary top member, thereby causing the second gas to form a gas curtain adjacent the outer periphery of the stage assembly, wherein the gas curtain substantially prevents the reactive first gas in the ambient environment from entering the microchamber and changing the select amount of the reactive first gas introduced into the microchamber.

33. The method of claim 32, wherein the first reactive gas comprises oxygen.

34. The method of claim 32, wherein the first reactive gas consists of oxygen.

35. The method of claim 32, wherein the second gas comprises at least one inert gas.

36. The method of claim 32, wherein the second gas consists of one or more inert gases.

~~37. The method of claim 32, wherein the peripheral microchamber gap has a width in the range from 0.01 mm to 2 mm.~~

~~38. The method of claim 32, wherein the peripheral microchamber gap has a width in the range from 0.1 mm to 1 mm.~~

~~39. The method of claim 32, further comprising directing at least one laser beam into the microchamber through at least one light-access feature in the stationary top member to irradiate the substrate and the at least one reactive first gas in the microchamber to modify the substrate.~~

~~40. The method of claim 32, wherein the movable stage assembly has a maximum velocity V_M relative to the stationary top member, and wherein introducing the second gas into the peripheral microchamber gap includes providing the second gas with a gas velocity V_G such that $V_G < V_M$.~~