What is claimed is:

1. A microchamber system for processing a substrate without exposure to a reactive gas from an ambient environment, comprising:

a stationary top member having at least one light-access feature;

a stage assembly supporting the substrate, the stage assembly having an outer periphery and being disposed relative to the stationary top member to define a microchamber and a peripheral microchamber gap and being movable relative to the stationary top member, wherein the microchamber contains a gas having either a select amount of the reactive gas or no substantial amount of the reactive gas; and

at least one gas supply system pneumatically connected to the stage assembly, which is configured to support the flow of the gas from the at least one gas supply system into the peripheral microchamber gap to form a gas curtain adjacent the stage assembly outer periphery ~~and that~~ when the stage assembly moves relative to the stationary top member, wherein the gas curtain substantially prevents the reactive gas of the ambient environment from entering the microchamber ~~when the stage assembly moves relative to the top member~~.

2. The microchamber system of claim 1, wherein the at least one light-access feature includes at least one of a through opening and a window.

3. The microchamber system of claim 1, wherein the at least one light-access feature is configured to allow at least one laser beam to pass through the stationary top member and on to the substrate.

4. The microchamber system of claim 1, wherein the gas is one selected from the group of gases comprising: nitrogen, argon, helium and neon.

5. The microchamber system of claim 1, wherein the reactive gas is oxygen.

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 ~~any of claims 1 through 11~~ 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 $V_G < V_M$.

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

stage assembly, the ~~moveable~~ 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 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;

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~~ and;

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 of the stage assembly; and

wherein the gas curtain substantially prevents the reactive gas in the ambient environment from entering the microchamber during the moving of the movable stage assembly.

14. The method of claim 13, wherein the first and second gases are the same gas.

15. The method of claim 13, further comprising 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 stationary top member.

16. The method of claim 15, wherein the at least one laser beam includes at least one annealing laser beam.

17. The method of claim 15, wherein the at least one laser beam reacts with the select amount of reactive gas in the microchamber to modify the substrate.

18. The method of claim 15, wherein the at least one light-access feature includes at least one of a through opening and a window.

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 $V_G < V_M$.

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 ~~reactive~~ first gas present in an ambient environment ~~outside of a microchamber~~, comprising:

supporting the substrate on a movable stage assembly in ~~the~~ a microchamber, wherein the microchamber is defined by a stationary top member and the movable stage assembly, the ~~moveable~~ 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 ~~a~~ the peripheral microchamber gap through the ring member ~~to form a gas curtain adjacent the outer periphery, wherein the gas has~~

~~either no substantial amount of the reactive gas or has a select amount of the reactive gas and wherein the vacuum serves to draw a portion of the gas from the peripheral microchamber gap into the microchamber; and~~;

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 ~~reactive~~ 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 $V_G < V_M$.