CLAIMS

1. A method for etching a bevel edge of a substrate in a processing chamber, comprising:

flowing an inert gas into a center region of the processing chamber defined above a center region of the substrate;

flowing a mixture of an inert gas and a processing gas over an edge region of the substrate;

striking a plasma in the edge region, wherein the flow of the inert gas and the flow of the mixture maintain a mass fraction of the processing gas substantially constant.

2. The method of claim 1, further comprising:

maintaining a pressure in the edge region of greater than 1 Torr.

3. The method of claim 1, wherein a flow rate of the inert gas into the center region is greater than a flow rate of a flow rate of the gas and the processing gas over the edge region.

4. The method of claim 1 wherein a flow rate of the inert gas in the mixture is a fraction of a flow rate of the inert gas to the center region.

5. The method of claim 1, wherein the inert gas flowing into the center region is a same gas as the inert gas flowing to the edge region.

6. The method of claim 1, wherein a mass fraction of the processing gas in the center region is maintained at about zero during the etching and wherein a mass fraction of the processing gas in the edge region is between about 0.1 and about 0.2.

7. The method of claim 1, wherein a flow rate of the inert gas in the mixture is a fraction of a flow rate of the inert gas to the center region and a flow rate of the processing gas is equivalent to the flow rate of the inert gas to the center region.

8. The method of claim 1, wherein a molecular weight of the inert gas in the mixture is less than a molecular weight of the inert gas flowing to the center region.

9. A method for cleaning a bevel edge of a substrate, comprising:

flowing an inert gas into a center region of the processing chamber defined above a center region of the substrate;

flowing an etchant gas over an edge region of the substrate; and

striking a plasma in the edge region through opposing annular electrodes proximate to the edge region, wherein the flow of the inert gas and the flow of the etchant gas maintain a mass fraction of the etchant gas substantially constant at the edge region while preventing the etchant gas from diffusing into the center region.

10. The method of claim 9, wherein a flow rate of the etchant gas is a fraction of a flow rate of the inert gas.

11. The method of claim 9, further comprising;

mixing an inert gas into a flow of the etchant gas over the edge region while maintaining the flowing of the inert gas into the center region.

12. The method of claim 9, wherein the flow of the etchant gas consists essentially of oxygen.

13. The method of claim 11, wherein a flow rate of the inert gas mixed with the flow of the etchant gas is greater than both a flow rate of the etchant gas and a flow rate of the inert gas into the center region.

14. The method of claim 9, further comprising:

maintaining a pressure in the edge region of greater than 1 Torr.

15. The method of claim 9 wherein the cleaning of the bevel edge is completed without inserts placed over the substrate.

16. The method of claim 9, wherein a mass fraction of the etchant gas in the center region is maintained at about zero during the cleaning and wherein the mass fraction of the etchant gas in the edge region is between about 0.1 and about 0.2.

17. The method of claim 11, wherein a molecular weight of the inert gas in the mixture is less than a molecular weight of the inert gas flowing to the center region.

18. The method of claim 11, wherein the inert gas flowing into the center region is a same gas as the inert gas mixing with the etchant gas.

19. A processing chamber, comprising:

a substrate support;

a pair of annular electrodes disposed over an edge region of the substrate support;

a gas distribution system including a first gas inlet providing an inert gas over a center region of the substrate and a second gas inlet providing a processing gas proximate to the edge region;

a pressure control system controlling a pressure inside the chamber;

a processor controlling the inert gas and the processing gas introduced into the chamber and the pressure inside the chamber; and

a memory in data communication with the processor, the memory storing a program to be operated on by the processor, the program including a first subroutine to control flow rates of the processing gas at the edge region and the inert gas over the center region in order to maintain a mass fraction of the processing gas at the edge region substantially constant, and a second subroutine to control mixing of the processing gas with another gas.

20. The processing chamber of claim 19 wherein the program includes a pressure control subroutine for controlling a pressure in the chamber at greater than 1 Torr.

21. The processing chamber of claim 19 wherein the first subroutine controls a flow rate of the processing gas to be less than a flow rate of the inert gas, and wherein the second subroutine controls a flow rate of the another gas at a rate less than the flow rate fo the less than the processing gas.

What is claimed is:

1. A method for etching a bevel edge of a substrate in a processing chamber, comprising:

flowing an inert gas into a center region of the processing chamber defined above a center region of the substrate;

flowing a mixture of an inert gas and a processing gas over an edge region of the substrate;

striking a plasma in the edge region, wherein the flow of the inert gas and the flow of the mixture maintain a mass fraction of the processing gas between about 0.1 and 0.2.

2. The method of claim 1, further comprising:

maintaining a pressure in the edge region of between about 1 Torr and 2 Torr.

3. The method of claim 1, wherein a flow rate of the inert gas into the center region is greater than a flow rate of a flow rate of the inert gas and the processing gas over the edge region.

4. The method of claim 1 wherein a flow rate of the inert gas in the mixture is a fraction of a flow rate of the inert gas to the center region.

5. The method of claim 1, wherein the inert gas flowing into the center region is a same gas as the inert gas flowing to the edge region.

6. The method of claim 1, wherein a mass fraction of the processing gas in the center region is maintained at about zero during the etching.

7. The method of claim 1, wherein a flow rate of the inert gas in the mixture is a fraction of a flow rate of the inert gas to the center region and a flow rate of the processing gas is equivalent to the flow rate of the inert gas to the center region.

8. The method of claim 1, wherein a molecular weight of the inert gas in the mixture is less than a molecular weight of the inert gas flowing to the center region.

9. A method for cleaning a bevel edge of a substrate, comprising:

flowing an inert gas into a center region of the processing chamber defined above a center region of the substrate;

flowing a process gas over an edge region of the substrate; and

striking a plasma in the edge region through opposing annular electrodes proximate to the edge region, wherein the flow of the inert gas and the flow of the process gas maintain a mass fraction of the process gas between about 0.1 and about 0.2 at the edge region while preventing the process gas from diffusing into the center region.

10. The method of claim 9, wherein a flow rate of the process gas is a fraction of a flow rate of the inert gas.

11. The method of claim 9, further comprising;

mixing an inert gas into a flow of the etchant gas over the edge region while maintaining the flowing of the inert gas into the center region.

12. The method of claim 9, wherein the flow of the process gas consists essentially of oxygen.

13. The method of claim 11, wherein a flow rate of the inert gas mixed with the flow of the process gas is greater than both a flow rate of the process gas and a flow rate of the inert gas into the center region.

14. The method of claim 9, further comprising:

maintaining a pressure in the edge region of between about 1 Torr and 2 Torr.

15. The method of claim 9 wherein the cleaning of the bevel edge is completed without inserts placed over the substrate.

16. The method of claim 9, wherein a mass fraction of the etchant gas in the center region is maintained at about zero during the cleaning.

17. The method of claim 11, wherein a molecular weight of the inert gas in the mixture is less than a molecular weight of the inert gas flowing to the center region.

18. The method of claim 11, wherein the inert gas flowing into the center region is a same gas as the inert gas mixing with the etchant gas.

19. The method of claim 1, wherein the striking of the plasma occurs between a pair of annular electrodes with an electrode disposed above the substrate and an electrode disposed below the substrate, the pair of electrodes spaced apart from a substrate support.

20. The method of claim 9, wherein the opposing annular electrodes are spaced apart from a substrate support.