## CLAIMS

What is claimed is:

1. A method of bevel edge processing a semiconductor substrate with a plasma in a bevel edge processing chamber in which the semiconductor substrate is supported on a semiconductor substrate support, comprising:

supplying process gas to the bevel edge processing chamber and energizing the process gas into a plasma;

bevel edge processing the semiconductor substrate with the plasma in the bevel edge processing chamber while evacuating the bevel edge processing chamber to a pressure of 3 to 100 Torr, without arcing in an outer bevel edge region of the semiconductor substrate, while preventing the plasma from reaching the center portion of the substrate, and while monitoring wafer voltage using a VCI probe and maintaining RF voltage measured by the VCI probe below a threshold voltage ~~level~~ value.

2. The method of claim 1, wherein the bevel edge process comprises:

flowing a processing gas comprising $CF_4$ and at least one of $SF_6$ or $NF_3$ into the bevel edge processing chamber;

forming the processing gas into a plasma; and

stopping the flow of the processing gas.

3. The method of claim 1, wherein the bevel edge processing, comprises providing a stack etch on the bevel edge, wherein at least one layer of the stack comprises aluminum, comprising:

flowing an aluminum etching gas comprising a chlorine containing component into a bevel edge processing chamber;

forming the aluminum etching gas into a plasma, which etches the at least one layer of the stack comprising aluminum; and

stopping the flow of the aluminum etching gas, after the at least one layer comprising aluminum is etched.

4. The method of claim 3, wherein the bevel edge processing further comprises:

flowing an aluminum passivation gas comprising a fluorine containing component into a bevel edge processing chamber after stopping the flow of the aluminum etching gas;

forming the passivation gas into a plasma, which passivates exposed parts of the at least one layer comprising aluminum while maintaining a pressure of 3 to 100 Torr; and

stopping the flow of the passivation gas.

5. The method of claim 4, wherein the aluminum passivation gas comprises $CF_4$ and at least one of $SF_6$ or $NF_3$.

6. The method of claim 5, wherein the aluminum etching gas comprises $BCl_3$ and $Cl_2$.

7. The method of claim 6, wherein the bevel edge processing further comprises providing a chamber temperature of greater than 40° C.

8. The method of claim 6, wherein the bevel edge processing further comprises providing a chamber temperature of at least 55° C.

9. The method of claim 8, wherein the stack further comprises at least one layer of TiN, at least one layer of TaN, and at least one siliconoxide layer.

10. The method of claim 3, wherein the bevel edge processing further comprises providing a chamber temperature of at least 55° C.

11. The method of claim 3, wherein the aluminum etching gas comprises $BCl_3$ and $Cl_2$.

12. The method of claim 11, wherein the bevel edge processing further comprises providing a chamber temperature of greater than 40° C.

13. The method of claim 1, wherein the bevel edge processing comprises:

flowing an aluminum passivation gas comprising a fluorine containing component into a bevel edge processing chamber after stopping the flow of the aluminum etching gas;

forming the passivation gas into a plasma, which passivates exposed parts of the aluminum while maintaining a pressure of 3 to 100 Torr; and

stopping the flow of the passivation gas.

14. A method for processing a semiconductor wafer with a stack with at least one layer comprising aluminum on a bevel of the wafer, comprising:

placing the wafer in a bevel edge processing chamber;

supplying process gas to the bevel edge processing chamber and energizing the process gas into a plasma;

providing a bevel edge processing chamber pressure of between 3 to 100 Torr, without arcing in ~~the~~ an outer bevel edge region of the semiconductor substrate, while preventing the plasma from reaching the center portion of the substrate, and while monitoring wafer voltage using a VCI ~~proble~~ probe and maintaining RF voltage measured by the VCI probe below a threshold voltage value;

etching the at least one layer comprising aluminum around the bevel of the wafer, comprising:

flowing an aluminum etching gas comprising a chlorine containing component into a bevel edge processing chamber;

forming the aluminum etching gas into a plasma, which etches the at least one layer of the stack comprising aluminum;

and stopping the flow of the aluminum etching gas, after the at least one layer comprising aluminum is etched; and

passivating part of the at least one layer comprising aluminum after stopping the flow of the aluminum etching gas, comprising:

flowing an aluminum passivation gas comprising a fluorine containing component into the bevel edge processing chamber;

forming the passivation gas into a plasma, which passivates exposed parts of the at least one layer comprising aluminum while maintaining a pressure of 3 to 100 Torr; and

stopping the flow of the passivation gas.

15. The method of claim 14, wherein the aluminum passivation gas comprises $CF_4$ and at least one of $SF_6$ or $NF_3$.

16. The method of claim 15, wherein the aluminum etching gas comprises $BC1_3$ and $C1_2$.

17. The method of claim 16, wherein the bevel edge processing further comprises providing a chamber temperature of greater than 40° C.

18. The method of claim 17, wherein the bevel edge processing further comprises providing a chamber temperature of at least 55° C.

~~19. The method of any of claims 14-15, wherein the aluminum etching gas comprises $BCl_3$ and $Cl_2$.~~

~~20. The method of any of claims 14-15 and 19, wherein the bevel edge processing further comprises providing a chamber temperature of greater than 40° C.~~

~~21. The method of any of claims 14-15 and 19, wherein the bevel edge processing further comprises providing a chamber temperature of at least 55° C.~~

~~22. The method of any of claims 3-5, wherein the aluminum etching gas comprises $BCl_3$ and $Cl_2$.~~

~~23. The method of any of claims 1-5 and 22, wherein the bevel edge processing further comprises providing a chamber temperature of greater than 40° C.~~

~~24. The method of claims 1-5 and 22, wherein the bevel edge processing further comprises providing a chamber temperature of at least 55° C.~~

~~25. The method of claims 3-5 and 22-24, wherein the stack further comprises at least one layer of TiN, at least one layer of TaN, and at least one siliconoxide layer.~~