CLAIMS

1 A method of etching features in a dielectric etch layer disposed below a mask in a plasma processing chamber, comprising:

flowing an etch gas into the plasma processing chamber;

maintaining a top outer electrode at a temperature of at least 150° C during the etching of the features;

forming the etch gas into a high density plasma that is contained using a shroud that extends from the top outer electrode to a bottom electrode and forms a “C” shaped profile, which etches the etch layer, and

providing a grounded area to powered area ratio of greater than four.

2. The method, as recited in claim 1, wherein the etch gas flows into and out of the plasma processing chamber in less than 12 msec.

3. The method, as recited in claim 2, further comprising maintaining a pressure of at least 20 mTorr.

4. The method, as recited in claim 3, further comprising providing a bias of at least 1500 volts.

5. The method, as recited in claim 4, wherein the forming the etch gas into the plasma uses capacitive coupling to form the etch gas into the plasma.

6. The method, as recited in claim 5, wherein the capacitive coupling provides power through at least one bottom electrode and wherein a top central electrode and the top outer electrode are grounded.

7. The method, as recited in claim 1 wherein the forming the etch gas into the plasma provides a steady state for at least 360 seconds.

8. The method, as recited in claim 7, wherein some of the features have aspect ratios of at least 30:1 and CD on no more than 35 nm.

9. The method, as recited in claim 1, wherein the dielectric layer is at least one of silicon nitride or silicon oxide.

10. The method, as recited in claim 9, wherein the dielectric layer is a silicon nitride and silicon oxide bilayer.

11. The method, as recited in claim 10, wherein some of the features have aspect ratios of at least 30:1 and CD on no more than 35 nm.

12. The method, as recited in claim 11, wherein some of the features have aspect ratios of at least 50:1 and wherein less than 1% of the features have etch stop.

13. The method, as recited in claim 9, wherein some of the features have aspect ratios of at least 30:1 and CD on no more than 35 nm.

14. The method, as recited in claim 13, wherein some of the features have aspect ratios of at least 50:1 and wherein less than 1% of the features have etch stop.

15. The method, as recited in claim 1, further comprising maintaining a pressure of at least 20 mTorr.

16. The method, as recited in claim 1, further comprising providing a bias of at least 1500 volts.

17. A method of etching features in a dielectric etch layer disposed below a mask in a plasma processing chamber comprising a top central electrode, a top outer electrode surrounding the top central electrode, a bottom central electrode, and a bottom outer electrode surrounding the bottom central electrode, comprising:

flowing an etch gas into the plasma processing chamber;

maintaining the top outer electrode at a temperature of at least 150 ^{o} C. during the etching of the features;

forming the etch gas into a high density plasma that is contained within a shroud that extends from the top outer electrode to the bottom outer electrode and forms a “C” shaped profile, which etches the etch layer, and

providing a grounded area comprising the top outer electrode and the shroud, and providing a powered area comprising the bottom electrode, wherein the grounded area to powered area ratio is greater than four.

18. The method, as recited in claim 17, wherein the shroud comprises a plurality of apertures to allow gas and plasma to flow out of the shroud.

19. The method, as recited in claim 17, wherein the grounded area further comprises the top central electrode.