

Claims

1. A plasma processing system comprising:
 - a processing chamber;
 - at least one gas source coupled to the processing chamber;
 - a controller coupled to the processing chamber and the at least one gas source;
 - the processing chamber including:
 - a top electrode disposed within a top portion of the processing chamber;
 - a substrate support disposed opposite from the top electrode;
 - a plasma processing volume having a volume less than a volume of the processing chamber, the plasma processing volume being defined by:
 - a surface of the top electrode;
 - a supporting surface of the substrate support opposing the surface of the top electrode; and
 - a plasma confinement structure enclosing an outer perimeter of the plasma processing volume, the plasma confinement structure includes a plurality of equally distributed openings disposed in a horizontal portion of the plasma confinement structure; and
 - a conductance control structure disposed adjacent to the plasma confinement structure, the conductance control structure being movably disposed proximate to the plurality of equally distributed openings,
 - wherein the conductance control structure restricts an outlet flow through the plurality of equally distributed openings when disposed in a first position to a first flow rate and wherein the conductance control structure increases the outlet flow through the plurality of equally distributed openings when disposed in a second position to a second flow rate,
 - wherein the conductance control structure is movable between the first position and the second position corresponding to a selected processing state set by the controller during a plasma process.
2. The system of claim 1, wherein the conductance control structure includes at least one opening corresponding to the plurality of equally distributed openings in the plasma confinement structure.

3. The system of claim 1, further comprising at least one RF source coupled to the processing chamber.
4. The system of claim 1, further comprising at least one RF source coupled to the processing chamber, wherein the at least one RF source includes a first operational state corresponding to the first position of the conductance control structure and a second operational state corresponding to the second position of the conductance control structure.
5. The system of claim 1, wherein movement of the conductance control structure is defined by rotation.
6. The system of claim 1, wherein the conductance control structure includes a plurality of equally distributed openings that are configured to be non-aligned in the first position and aligned in the second position.
7. The system of claim 1, wherein the conductance control structure in the first position increases a pressure in the plasma processing volume, and the conductance control structure in the second position decreases the pressure in the plasma processing volume.
8. The system of claim 7, wherein the controller sets a plurality of positions of the conductance control structure between the first and second positions, each of the plurality of positions of the conductance control structure corresponding to a selected outlet flow rate through the plurality of equally distributed openings that is between the first flow rate and the second flow rate.
9. The system of claim 7, wherein the controller coordinates an input flow rate of the at least one gas source into the processing plasma volume with coordination of the movement of the conductance control structure.
10. The system of claim 1, wherein each one of the plurality of equally distributed openings are arranged radially around the plasma confinement structure.

11. The system of claim 10, wherein the conductance control structure includes a plurality of equally distributed openings, and each one of the plurality of equally distributed openings of the conductance control structure is arranged radially around the conductance control structure.

12. The system of claim 11, wherein arranged radially defines an outward extension from an interior portion of the plasma processing volume toward a peripheral portion of the plasma processing volume.

13. A plasma processing system comprising:

a processing chamber;

at least one gas source coupled to the processing chamber;

a controller coupled to the processing chamber and the at least one gas source;

the processing chamber including a top electrode disposed within a top portion of the processing chamber, a substrate support disposed opposite from the top electrode, and plasma processing volume defined by a surface of the top electrode and a supporting surface of the substrate support opposing the surface of the top electrode;

a plasma confinement structure enclosing an outer perimeter of the plasma processing volume, the plasma confinement structure includes a plurality of equally distributed openings disposed in a horizontal portion of the plasma confinement structure; and

a conductance control structure disposed adjacent to and movable with respect to the plasma confinement structure, wherein the conductance control structure restricts an outlet flow through the plurality of equally distributed openings when disposed in a first position and wherein the conductance control structure increases the outlet flow through the plurality of equally distributed openings when disposed in a second position.

14. The system of claim 13, wherein the conductance control structure includes a plurality of equally distributed openings that are configured to be non-aligned in the first position and aligned in the second position.

15. The system of claim 13, wherein movement of the conductance control structure is defined by rotation.

16. The system of claim 13, further comprising at least one RF source coupled to the processing chamber, wherein the at least one RF source includes a first operational state corresponding to the first position of the conductance control structure and a second operational state corresponding to the second position of the conductance control structure.

17. The system of claim 13, wherein each one of the plurality of equally distributed openings are arranged radially around the plasma confinement structure.

18. The system of claim 17, wherein the conductance control structure includes a plurality of equally distributed openings, and each one of the plurality of equally distributed openings of the conductance control structure is arranged radially around the conductance control structure.

19. The system of claim 18, wherein arranged radially defines an outward extension from an interior portion of the plasma processing volume toward a peripheral portion of the plasma processing volume.