CLAIMS

1. An apparatus for forming a plasma, comprising:

a receptacle configured to accommodate one or more gases, the receptacle being oriented along a first axis;

a radiofrequency (RF) coupling structure, substantially oriented in a plane and substantially surrounding the receptacle, the RF coupling structure configured to conduct an RF current to bring about formation of the plasma within the receptacle;

one or more linkages, coupled to the RF coupling structure, configured to permit the plane of the RF coupling structure to pivot about a second axis so as to tilt the plane of the RF coupling structure toward the first axis to reduce a non-uniformity of the plasma formed within the receptacle; and

a showerhead, coupled to the receptacle via a diffuser, configured to receive the plasma from the receptacle via the diffuser.

2. The apparatus of claim 1, wherein the one or more linkages is configured to permit the plane of the RF coupling structure to pivot from a neutral position so as to adjust a separation between a portion of the RF coupling structure and the receptacle by between about .1 cm and about 3 cm.

3. The apparatus of any one of claims 1 or 2, further comprising a directionally-adjustable nozzle configured to introduce temperature-regulating gas that, during operation, regulates a temperature of at least a portion of an outer surface of the receptacle.

4. The apparatus of claim 3, wherein the apparatus is configured such that, during operation when the temperature-regulating gas is flowing to the outer surface of the receptacle, the temperature of the at least the portion of the outer surface of the receptacle is maintained at between about 150°C and 400°C.

5. The apparatus of claim 3, wherein the directionally-adjustable nozzle is configured to direct the temperature-regulating gas to a designated region on the outer surface of the receptacle.

6. The apparatus of claim 5, wherein the designated region is selectable along a first dimension of the receptacle.

7. The apparatus of claim 6, wherein the designated region is selectable along both first and second dimensions of the receptacle.

8. The apparatus of any one of claims 1 or 2, wherein the first axis is perpendicular to the plane of the RF coupling structure, disposed in a neutral position, and wherein the second axis is substantially perpendicular to the first axis.

9. The apparatus of any one of claims 1 or 2, further comprising an RF power generator coupled to the RF coupling structure.

10. The apparatus of any one of claims 1 or 2, wherein the RF coupling structure is configured to form the plasma within the receptacle operating in an inductive mode.

11. The apparatus of any one of claims 1 or 2, wherein the receptacle comprises a quartz vessel configured to disperse the plasma into a semiconductor process chamber.

12. The apparatus of any one of claims 1 or 2, wherein the receptacle comprises an Aluminum Oxide vessel configured to disperse the plasma into a semiconductor process chamber.

13. The apparatus of any one of claims 1 or 2, wherein the receptacle is configured to accommodate one or more gases at a pressure of between about 0.25 kPa and 1.33 kPa.

14. The apparatus of any one of claims 1 or 2, wherein the RF coupling structure comprises a conductor configured to form a conductive loop.

15. The apparatus of claim 14, wherein at least one of the one or more linkages comprises a hinge configured to permit a portion of the conductive loop to tilt toward the receptacle.

16. The apparatus of any one of claims 1 or 2, further comprising an airflow controller configured to direct airflow from a directionally-adjustable nozzle toward a region on a surface of the receptacle responsive to receipt of a measurement of a temperature of the region of the surface of the receptacle.

17. The apparatus of claim 16, wherein the airflow controller is additionally configured to modify an airflow volume and an airflow temperature responsive to receipt of the measurement of the temperature of the region of the surface of the receptacle.

18. A semiconductor processing tool, comprising:

one or more input ports configured to receive a corresponding number of output signals from an RF power generator;

one or more process stations, each configured to receive and process a semiconductor wafer;

one or more receptacles configured to receive a gas from a gas source and to convert the received gas to a plasma for dispersing the plasma to the one or more process stations; and

one or more coupling structures each substantially oriented in a plane and configured to conduct a current from the RF power generator sufficient to convert the gas to the plasma within the one or more receptacles, the one or more coupling structures each having a linkage to permit rotation of the plane of the one or more coupling structures with respect to an axis that is at least approximately perpendicular to a major axis of the one or more receptacles; and

directionally-adjustable nozzles configured to control recombination of the plasma formed in the one or more receptacles into gas.

19. The semiconductor processing tool of claim 18, wherein the one or more process stations comprises at least 2 process stations.

20. The semiconductor processing tool of any one of claims 18 or 19, wherein the one or more process stations comprises 4 process stations.

21. The semiconductor processing tool of claim 19, wherein each of the at least 2 process stations comprises a receptacle of the one or more receptacles and a coupling structure of the one or more coupling structures.

22. The semiconductor processing tool of claim 21, wherein the rotation of the plane of the one or more coupling structures is from a neutral position, the rotation operating to modify a separation between a portion of the one or more coupling structures and an outer surface of a corresponding receptacle by between about .1 cm and about 3 cm.

23. The semiconductor processing tool of claim 18, wherein the directionally-adjustable nozzles are configured to direct a temperature-regulating gas toward a selectable location on an outer surface of a corresponding one of the one or more receptacles.

24. The semiconductor processing tool of claim 21, further comprising one or more airflow controllers each configured to receive a signal from one or more temperature sensors configured to measure a temperature at a region of a surface of the one or more receptacles.

25. The semiconductor processing tool of claim 24, wherein the one or more airflow controllers is configured to direct airflow toward the region of the surface of the one or more receptacles responsive to receipt of the signal from the one or more temperature sensors.

26. The semiconductor processing tool of claim 24, wherein the one or more airflow controllers is configured to adjust airflow volume or airflow temperature responsive to receipt of the signal from the one or more temperature sensors.

27. A method of increasing uniformity in plasma formation within a plasma formation receptacle of a semiconductor processing tool, comprising:

coupling an RF signal to an RF coupling structure proximate with a chamber of the semiconductor processing tool;

detecting a nonuniformity in a plasma formed within the plasma formation receptacle in fluid communication with the chamber of the semiconductor processing tool;

adjusting a separation distance between a portion of the RF coupling structure and the plasma formation receptacle to reduce the detected nonuniformity in the plasma formed; and

adjusting a flow direction and/or volume of a temperature-regulating gas directed toward the plasma formation receptacle to additionally reduce the detected nonuniformity in density of the plasma formed.

28. The method of claim 27, wherein adjusting the separation distance between the portion of the RF coupling structure and the plasma formation receptacle comprises pivoting a plane of the RF coupling structure from a neutral position about an axis that extends through the plane of the RF coupling structure.

29. The method of any one of claims 27 or 28, wherein the RF coupling structure comprises a conductive loop and wherein pivoting the plane of the conductive loop operates to reduce a separation between a portion of the plasma formation receptacle and the RF coupling structure by between about .1 cm to about 3 cm.

30. The method of claim 27, wherein adjusting the flow direction and/or volume of the temperature-regulating gas directed toward the plasma formation receptacle comprises directing the temperature-regulating gas toward a particular region of a surface of the plasma formation receptacle.

31. The method of claim 27, wherein the adjusting the flow direction and/or volume of temperature-regulating gas brings about a temperature of at least a portion of an outer surface of the plasma formation receptacle of between about 150°C and about 400°C.

32. The method of any one of claims 27 or 28, further comprising receiving one or more signals from a temperature sensor at or proximate with the plasma formation receptacle and, responsive to the one or more received signals, directing a temperature-regulating gas toward a particular region of a surface of the plasma formation receptacle.

33. An apparatus configured to form a plasma, comprising:

a receptacle configured to receive one or more gases;

an RF coupling structure configured in a shape of a conductive loop, the RF coupling structure configured to receive an RF signal;

at least one linkage configured to permit a portion of the RF coupling structure to pivot in a direction toward the receptacle; and

an airflow controller configured to modify volume or airflow temperature responsive to

receipt of an output signal from a temperature sensor at the receptacle.

34. The apparatus of claim 33, wherein the at least one linkage is configured to permit the portion of the RF coupling structure to pivot between .1 cm and 3 cm toward the receptacle.

35. The apparatus of any one of claims 33 or 34, wherein the at least one linkage comprises a hinge.

36. The apparatus of any one of claims 33 or 34, further comprising at least one directionally-adjustable nozzle configured to provide an airflow in the direction of the receptacle.

37. The apparatus of claim 36, wherein the at least one directionally-adjustable nozzle is configured to provide the airflow so as to maintain a portion of the receptacle at a temperature of between 150°C and 400°C.