CLAIMS

~~What is claimed is:~~

1. A substrate processing system, comprising:

a processing chamber;

a pedestal arranged in the processing chamber, the pedestal including a baseplate and at least one plate arranged on the baseplate;

an edge coupling ring arranged adjacent to a radially outer edge of the pedestal, wherein an inner portion of the edge coupling ring overlaps the at least one plate;

a lifting ring, wherein an outer portion of the edge coupling ring overlaps the lifting ring;

and

a first actuator configured to selectively move the edge coupling ring to a raised position and a lowered position relative to the pedestal, wherein, when the edge coupling ring is in the raised position, a bottom surface of the edge coupling ring is above an uppermost surface of the pedestal to define a clearance gap between the bottom surface of the edge coupling ring and the uppermost surface of the pedestal, wherein the gap is directly below the bottom surface of the edge coupling ring and above an upper surface of the at least one plate, and wherein, when the edge coupling ring is in the lowered position, the bottom surface of the edge coupling ring is supported by the upper surface of the at least one plate ~~to provide clearance between the edge coupling ring and the pedestal to allow a robot arm to remove the edge coupling ring from the processing chamber~~.

2. The substrate processing system of claim 1, ~~further comprising a lifting ring arranged below at least part of the edge coupling ring~~ wherein the first actuator biases the lifting ring and the lifting ring biases the edge coupling ring.

3. The substrate processing system of claim 2, further comprising a pillar arranged between the first actuator and the lifting ring.

4. The substrate processing system of claim 2, further comprising a robot arm configured to remove the edge coupling ring from the processing chamber when the edge coupling ring and the lifting ring are in a raised position.

5. The substrate processing system of claim 4, further comprising a holder connected to the robot arm, wherein the holder includes a self-centering feature that mates with a self-centering feature on the edge coupling ring.

6. The substrate processing system of claim 2, wherein the edge coupling ring includes a self-centering feature that mates with a self-centering feature on the lifting ring.

7. The substrate processing system of claim 2, further comprising a bottom edge coupling ring arranged below at least part of the edge coupling ring and the lifting ring.

8. The substrate processing system of claim 7, wherein the bottom edge coupling ring includes a self-centering feature that mates with a self-centering feature on the lifting ring.

9. The substrate processing system of claim 3, wherein:
the lifting ring includes a projection that extends radially outwardly;
the projection includes a groove formed on a bottom facing surface thereof; and
the groove is biased by the pillar when the edge coupling ring is lifted.

10. The substrate processing system of claim ~~1~~4, wherein the robot arm removes the edge coupling ring from the processing chamber without requiring the processing chamber to be opened to atmospheric pressure.

11. The substrate processing system of claim 2, further comprising a second actuator configured to move the edge coupling ring relative to the lifting ring to alter an edge coupling profile of the edge coupling ring.

12. The substrate processing system of claim 11, further comprising a middle edge coupling ring arranged between at least part of the edge coupling ring and the lifting ring, wherein the middle edge coupling ring remains stationary when the second actuator moves the edge coupling ring relative to the lifting ring.

13. The substrate processing system of claim 11, further comprising a controller configured to move the edge coupling ring using the second actuator in response to erosion of a plasma-facing surface of the edge coupling ring.

14. The substrate processing system of claim 13, wherein the controller is configured to automatically move the edge coupling ring using the second actuator after the edge coupling ring is exposed to a predetermined number of etching cycles.

15. The substrate processing system of claim 13, wherein the controller is configured to automatically move the edge coupling ring using the second actuator after the edge coupling ring is exposed to a predetermined period of etching.

16. The substrate processing system of claim 13, further comprising a sensor configured to communicate with the controller and to detect the erosion of the edge coupling ring.

17. The substrate processing system of claim 16, further comprising a robot arm configured to communicate with the controller and to adjust a position of the sensor.

18. The substrate processing system of claim 11, further comprising a controller configured to move the edge coupling ring to a first position using the second actuator for a first treatment of the substrate using a first edge coupling effect and then to a second position using the second actuator for a second treatment of the substrate using a second edge coupling effect that is different than the first edge coupling effect.

19. A method for maintaining an edge coupling ring in a substrate processing system, comprising:

arranging an edge coupling ring adjacent to a radially outer edge of a pedestal in a processing chamber;

using a first actuator to selectively move the edge coupling ring to a raised position relative to the pedestal; ~~and~~

replacing the edge coupling ring using a robot arm when the edge coupling ring is in the raised position; and

arranging a lifting ring below at least part of the edge coupling ring, wherein the first actuator biases the lifting ring and the lifting ring biases the edge coupling ring.

~~20. The method of claim 19, further comprising arranging a lifting ring below at least part of the edge coupling ring, wherein the actuator biases the lifting ring and the lifting ring biases the edge coupling ring.~~

~~22.~~20. The method of claim ~~20~~19, further comprising arranging a pillar between the first actuator and the lifting ring.

~~23.~~21. The method of claim ~~20~~19, further comprising attaching a holder to the robot arm, wherein the holder includes a self-centering feature that mates with a self-centering feature on the edge coupling ring.

~~24.~~22. The method of claim ~~20~~19, further comprising using a self-centering feature on the edge coupling ring to mate with a self-centering feature on the lifting ring.

~~25.~~23. The method of claim ~~20~~19, further comprising arranging a bottom edge coupling ring below at least part of the edge coupling ring and the lifting ring.

~~26.~~24. The method of claim ~~24~~23, further comprising using a self-centering feature on the bottom edge coupling ring to mate with a self-centering feature on the lifting ring.

~~27.~~25. The method of claim ~~21~~20, wherein:

the lifting ring includes a projection that extends radially outwardly;

the projection includes a groove formed on a bottom facing surface thereof; and

the groove is biased by the pillar when the edge coupling ring is lifted.

~~28.~~26. The method of claim ~~20~~19, further comprising moving the edge coupling ring relative to the lifting ring using a second actuator to alter an edge coupling profile of the edge coupling ring.

~~29.~~27. The method of claim ~~27~~26, further comprising arranging a middle edge coupling ring between at least part of the edge coupling ring and the lifting ring, wherein the middle edge coupling ring remains stationary when the second actuator moves the edge coupling ring relative to the lifting ring.

~~30.~~28. The method of claim ~~27~~26, further comprising moving the edge coupling ring using the second actuator in response to erosion of a plasma-facing surface of the edge coupling ring.

~~31.~~29. The method of claim ~~29~~28, further comprising automatically moving the edge coupling ring after the edge coupling ring is exposed to a predetermined number of etching cycles.

~~32.~~30. The method of claim ~~29~~28, further comprising automatically moving the edge coupling ring after the edge coupling ring is exposed to a predetermined period of etching.

~~33.~~31. The method of claim ~~20~~19, further detecting erosion of the edge coupling ring using a sensor.

~~34.~~32. The method of claim ~~27~~26, further comprising moving the edge coupling ring to a first position using the second actuator for a first treatment of the substrate using a first edge coupling effect and then to a second position using the second actuator for a second treatment of the substrate using a second edge coupling effect that is different than the first edge coupling effect.