

CLAIMS

What is claimed is:

1. An edge ring system for a substrate processing system comprising:
a top edge ring including an annular body having an inner diameter and an outer diameter,
wherein the outer diameter of the top edge ring is smaller than a horizontal opening of a substrate port of the substrate processing system; and
a first edge ring arranged below the top edge ring including an annular body having an inner diameter and an outer diameter,
wherein the outer diameter of the first edge ring is larger than the substrate port of the substrate processing system and wherein the inner diameter of the first edge ring is smaller than the inner diameter of the top edge ring.
2. The edge ring system of claim 1, wherein a lower surface of the top edge ring mates with an upper surface of the first edge ring.
3. The edge ring system of claim 1, further comprising a second edge ring located below the first edge ring and radially outside of a baseplate of the substrate processing system.
4. The edge ring system of claim 3, wherein the second edge ring includes:
an annular body;
an upwardly projecting leg that extends from an upper and radially inner portion of the annular body; and
a downwardly projecting leg that extends from a lower and radially outer portion of the annular body.
5. The edge ring system of claim 3, further comprising a third edge ring located below the first edge ring and radially outside of the second edge ring.
6. The edge ring system of claim 5, wherein the third edge ring includes:
an annular body;

a radially inwardly projecting leg that extends from an upper portion of the annular body; and

a projection extending upwardly from an upper and radially outer surface of the annular body.

7. The edge ring system of claim 6, wherein:

the first edge ring includes an annular recess on a lower and radially outer surface thereof; and

the projection of the third edge ring mates with the annular recess to define a stepped path.

8. The edge ring system of claim 5, further comprising an annular seal arranged below the second edge ring and between the third edge ring and the baseplate of the substrate processing system.

9. The edge ring system of claim 8, wherein the annular seal includes an annular body and a leg extending radially inwardly from a lower portion of the annular body.

10. The edge ring system of claim 9, wherein a diameter at a radially inner surface of the leg is less than an outer diameter of the baseplate.

11. The edge ring system of claim 10, wherein a diameter of a radially inner surface of the annular body of the annular seal is greater than the outer diameter of the baseplate.

12. The edge ring system of claim 1, wherein:

the top edge ring includes a cavity defined by a lower and inner surface of the top edge ring between a radially inner leg and a radially outer leg of the top edge ring and the first edge ring; and

the lower and inner surface is located vertically higher than a lower surface of the radially outer leg of the top edge ring.

13. The edge ring system of claim 9, further comprising a seal material arranged on an outer surface of a baseplate of a substrate support between the baseplate and the annular seal and between the baseplate and the second edge ring.
14. The edge ring system of claim 13, wherein the seal material is arranged between the baseplate and a portion of an upper surface of the annular seal.
15. The edge ring system of claim 3, further comprising:
a vertical bore defined in the baseplate and including an upper opening and a lower opening;
a fastener including a body, a threaded portion, and a head,
wherein the fastener is received in the vertical bore and attaches the baseplate to an underlying surface; and
a plug including a body, wherein the body of the plug is received in an upper opening of the vertical bore above the head of the fastener.
16. The edge ring system of claim 15, wherein:
the plug further includes a flanged portion extending radially outwardly from the body; and
the flanged portion extends radially outside of the upper opening.
17. The edge ring system of claim 15, wherein the plug is made of a material selected from a group consisting of ceramic, elastomer, and polytetrafluoroethylene (PTFE).
18. The edge ring system of claim 1, wherein the top edge ring is moveable relative to the first edge ring.
19. The edge ring system of claim 18, further comprising a lift pin received in a vertical bore through the first edge ring to selectively move the top edge ring relative to the first edge ring.

20. The edge ring system of claim 19, further comprising a second edge ring, wherein the lift pin is further configured to selectively move the top edge ring relative to the second edge ring.
21. The edge ring system of claim 19, further comprising:
an actuator configured to bias the lift pin; and
a controller configured to cause the actuator to adjust a position of the lift pin in response to at least one of an output of a sensor and a predetermined period that the top edge ring is exposed to plasma.
22. A substrate support for a substrate processing system comprising:
a baseplate;
a vertical bore defined in the baseplate and including an upper opening and a lower opening;
an outer guide sleeve including a first flanged portion and a first cylindrical portion extending from the first flanged portion and defining a first inner bore,
wherein the first cylindrical portion of the outer guide sleeve is inserted in the upper opening of the vertical bore with the first flanged portion arranged adjacent to the upper opening of the vertical bore; and
an inner guide sleeve including a second flanged portion and a second cylindrical portion extending from the second flanged portion and defining a second inner bore configured to receive a lift pin,
wherein the inner guide sleeve is inserted into a bottom opening of the vertical bore and the first inner bore of the outer guide sleeve with the second flanged portion arranged adjacent to the lower opening of the vertical bore.
23. The substrate support of claim 22, wherein the upper opening of the vertical bore has a first diameter that is greater than an outer diameter of the first cylindrical portion and less than an outer diameter of the first flanged portion.
24. The substrate support of claim 23, wherein the lower opening of the vertical bore has a second diameter that is less than the first diameter, greater than an outer diameter of the second cylindrical portion and less than an outer diameter of the second flanged portion.

25. The substrate support of claim 22, wherein a first diameter of the upper opening is less than a second diameter of the lower opening.
26. The substrate support of claim 22, further comprising:
an edge ring arranged around the substrate support; and
a lift pin received in the second inner bore of the inner guide sleeve.
27. The substrate support of claim 22, further comprising:
an underlying surface located below the baseplate and including a vertical bore that is vertically aligned with the vertical bore of the baseplate; and
a guide sleeve including a third flanged portion and a third cylindrical portion extending from the third flanged portion,
wherein the guide sleeve is located in the vertical bore of the underlying surface and wherein the third flanged portion abuts the second flanged portion.
28. The substrate support of claim 27, wherein the third flanged portion includes a groove and further comprising an O-ring arranged in the groove.
29. The substrate processing system of claim 28, wherein the O-ring is biased by the third flanged portion against a horizontal surface of the vertical bore.