CLAIMS

1. A gas distribution device for a substrate processing system, the gas distribution device comprising:

an upper plate including a first hole and a plurality of second holes, wherein the plurality of second holes are positioned radially outwardly from the first hole; and

a lower plate including

a recessed region formed in one of (i) an upper surface of the lower plate and (ii) a lower surface of the upper plate, wherein the recessed region defines a plenum volume between the upper plate and the lower plate, and

a raised fence located within the recessed region, wherein the raised fence separates the plenum volume into a first plenum and a second plenum, wherein the first plenum is in fluid communication with the first hole, and wherein the second plenum is in fluid communication with the plurality of second holes, and wherein the first plenum has a portion extending radially outwardly from the plurality of second holes.

2. The gas distribution device of claim 1, wherein the upper plate includes a receptacle, and wherein the first hole and the plurality of second holes are located within the receptacle.

3. The gas distribution device of claim 2, wherein the receptacle is configured to receive a central injector including a first channel and a second channel.

4. The gas distribution device of claim 3, further comprising the central injector, wherein the first hole is centrally located within the receptacle and wherein the first channel is aligned with and in fluid communication with the first hole.

5. The gas distribution device of claim 4, wherein the second channel includes an annular bottom portion that is aligned with and in fluid communication with the plurality of second holes.

6. The gas distribution device of claim 1, wherein the first hole is centrally located in the upper plate.

7. The gas distribution device of claim 1, wherein an area of the first hole is substantially the same as an overall area of the plurality of second holes.

8. The gas distribution device of claim 1, wherein the first plenum and the second plenum are coplanar.

9. The gas distribution device of claim 1, wherein a height of the raised fence is the same as a height of an outer portion of a corresponding one of the lower plate and the upper plate surrounding the recessed region.

10. The gas distribution device of claim 1, wherein the first plenum includes a first plurality of lobes, the raised fence includes a second plurality of lobes, and each of the second plurality of lobes surrounds respective ones of the first plurality of lobes, the recessed region forms a circle surrounding the first and second plurality of lobes, the second plurality of lobes each having a triangular spade-shaped portion extending away from a respective one of the first plurality of lobes.

11. The gas distribution device of claim 10, wherein the first plenum has a cloverleaf shape including four lobes.

12. The gas distribution device of claim 10, wherein the second plenum includes a third plurality of lobes located between adjacent pairs of the second plurality of lobes of the raised fence.

13. The gas distribution device of claim 12, wherein the raised fence includes switchbacks that connect the adjacent pairs of the second plurality of lobes and protrude inward between adjacent pairs of the first plurality of lobes.

14. The gas distribution device of claim 13, wherein the switchbacks define flow channels in respective ones of the third plurality of lobes.

15. The gas distribution device of claim 14, wherein the flow channels extend radially outward into the respective ones of the third plurality of lobes between the adjacent pairs of the first plurality of lobes and the adjacent pairs of the second plurality of lobes.

16. The gas distribution device of claim 14, wherein radially inward ends of the flow channels are aligned with the plurality of second holes.

17. The gas distribution device of claim 1, wherein the lower plate includes a first plurality of holes extending from the first plenum to lower surface of the lower plate and the second plurality of second holes extended from the second plenum to the lower surface of the lower plate.

18. The gas distribution device of claim 17, wherein the second plurality of holes is located radially outward of the first plurality of holes.

19. A gas distribution device for a substrate processing system, the gas distribution device comprising:

an upper plate including a first hole and a plurality of second holes, wherein the plurality of second holes are positioned radially outwardly from the first hole; and

a lower plate including

a recessed region formed in one of (i) an upper surface of the lower plate and (ii) a lower surface of the upper plate, wherein the recessed region defines a plenum volume between the upper plate and the lower plate, and

a plurality of grooves located within the recessed region, and

a plurality of sealing members located in respective ones of the plurality of grooves, wherein the plurality of sealing members separates the plenum volume into a first plenum and a plurality of second plenums, wherein the first plenum is in fluid communication with the first hole, wherein the plurality of second plenums is in fluid communication with the plurality of second holes, and wherein the first plenum has a portion extending radially outwardly from the plurality of second holes.

20. The gas distribution device of claim 19, wherein the sealing members are O-rings.