CLAIMS

1. A porous plug for use in a substrate support, comprising:

a porous central passageway; and

a solid outer shell bonded to and surrounding the porous central passageway such that there is no continuous gap between the porous central passageway and the solid outer shell along an entire length of the porous plug,

wherein the solid outer shell includes sealing surfaces disposed on:

a top end of the solid outer shell proximate a first end of the porous central passageway; and

an opposing bottom end of the solid outer shell proximate an opposing second end of the porous central passageway; and

wherein the sealing surfaces are configured to facilitate forming a seal along the sealing surfaces and surrounding the porous central passageway.

2. The porous plug of claim 1, wherein the sealing surfaces have a surface roughness Ra of 16 microinches or less.

3. The porous plug of claim 1, wherein the porous central passageway is made of a ceramic material.

4. The porous plug of claim 3, wherein the solid outer shell is made of a ceramic material.

5. The porous plug of claim 1, wherein the solid outer shell is made of a ceramic material.

6. The porous plug of any of claims 1 to 5, wherein at least one of:

the porous central passageway has a diameter of 1/16” to 3/4”;

the solid outer shell has an outer diameter of 1/4” to 1”; or

the sealing surfaces have a width of 3/32” to 1/4".

7. The porous plug of any of claims 1 to 5, further comprising one or more o-ring retaining grooves formed about an outer surface of the solid outer shell.

8. The porous plug of any of claims 1 to 5, wherein a height of the porous plug is 1/2" to 5”.

9. A substrate support, comprising:

a plurality of layers including a first electrode and a second electrode separated by an insulator plate;

a backside gas channel formed through the plurality of layers, wherein the backside gas channel includes a plug opening formed at least in the insulator plate;

the porous plug of any of claims 1 to 5 disposed in the plug opening, wherein the porous central passageway is aligned with the backside gas channel to facilitate flow of a backside gas therethrough; and

one or more first o-rings disposed between the sealing surfaces and ones of the plurality of layers adjacent to the plug opening.

10. The substrate support of claim 9, further comprising a gap defined between facing surfaces of the plug opening and the solid outer shell, wherein a distance measured across the gap is 0.001 to 0.030 inches.

11. The substrate support of claim 9, wherein the plurality of layers further comprises an electrostatic chuck comprising a dielectric layer bonded to the second electrode and having one or more electrodes disposed within the dielectric layer.

12. The substrate support of claim 9, wherein the porous plug is a first porous plug and further comprising:

a second porous plug disposed in a second plug opening, the second porous plug aligned with the first porous plug and including a porous central passageway aligned with the backside gas channel to facilitate flow of a backside gas therethrough and a solid outer shell bonded to and surrounding the porous central passageway such that there is no continuous gap between the porous central passageway and the solid outer shell along an entire length of the second porous plug; and

a second o-ring disposed between the sealing surfaces of the first and second porous plugs.

13. The substrate support of claim 12, wherein the second plug opening is disposed through the second electrode.

14. The substrate support of claim 9, wherein the plug opening is disposed through the insulator plate and the second electrode.

15. The substrate support of claim 9, further comprising:

one or more o-ring retaining grooves formed in one or more of an outer surface of the solid outer shell or sidewalls of the plug opening; and

a third o-ring disposed in each of the one or more o-ring retaining grooves.

16. The substrate support of claim 9, wherein at least one of:

the porous central passageway has a diameter of 1/16” to 3/4”;

the solid outer shell has an outer diameter of 1/4” to 1”; or

the sealing surfaces have a width of 3/32” to 1/4".

17. The substrate support of claim 9, wherein a height of the porous plug is 1/2" to 5”.

18. A processing chamber, comprising:

a chamber body and a lid which enclose an interior volume; and

a substrate support disposed in the interior volume, the substrate support comprising:

a plurality of layers including a first electrode and a second electrode separated by an insulator plate;

a backside gas channel formed through the plurality of layers, wherein the backside gas channel includes a plug opening formed at least in the insulator plate;

the porous plug of any of claims 1 to 5 disposed in the plug opening, wherein the porous central passageway is aligned with the backside gas channel to facilitate flow of a backside gas therethrough; and

one or more first o-rings disposed between the sealing surfaces and ones of the plurality of layers adjacent to the plug opening.

19. The processing chamber of claim 18, wherein the porous plug is a first porous plug and further comprising:

a second porous plug disposed in a second plug opening, the second porous plug aligned with the first porous plug and including a porous central passageway aligned with the backside gas channel to facilitate flow of a backside gas therethrough and a solid outer shell bonded to and surrounding the porous central passageway such that there is no continuous gap between the porous central passageway and the solid outer shell along an entire length of the second porous plug; and

a second o-ring disposed between the sealing surfaces of the first and second porous plugs.

20. The processing chamber of claim 19, further comprising:

one or more o-ring retaining grooves formed in one or more of an outer surface of the solid outer shell or sidewalls of the plug opening; and

a third o-ring disposed in each of the one or more o-ring retaining grooves.